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INDIA TRANSPORT REPORT

MOVING INDIA TO 2032

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Rakesh Mohan

Chairman
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January 31, 2014

Dear Hon'ble Prime Minister

I have great pleasure in submitting to you the Report of the National Transport Development Policy Committee.

I regret very much the great delay in submission of this report. Covering all the transport sectors in detail, while also addressing the various cross cutting issues, entailed a large amount of technical work, which proved to be time consuming. Much of the sectoral work was accomplished through the appointment of corresponding working groups. We also examined international best practice to inform our work; consulted state governments and other stakeholders; and commissioned research studies and papers on specific topics.

Projecting transport requirements and policy over a twenty year horizon is a complex task. This was made more difficult in the current circumstances of an economic slowdown. In our projections we have, however, assumed that the pace of overall economic growth will return to its potential in the coming years and ensuing decades. Transport investment is a response to emerging demand, but it is also an economic growth driver in itself. Transport planning and provision therefore must be seen as central to the growth planning process. That all modes of the country's transport network are under severe pressure is clearly evident. It will be difficult to achieve the kind of growth envisaged if adequate transport investment is not made in an efficient and timely manner.

We find that there has been an accelerating shift of traffic from the railways in favour of roads, partly in response to the stepped up allocation of resources to the roads sector. A massive effort is now required to carry out a similar enhancement of investment in the railways, which will also involve very significant modernization and reorganization, and will also lead to greater environmental sustainability.

The next two decades will witness very significant changes in energy prices, in the discovery and application of new technologies, demographic shifts, and in consumer requirements and tastes in transport. Any projections and policy recommendations made now are almost certain to need modification over time. We have therefore emphasized the importance of institution building for transport governance and of the need for capacity building in the human resources area to raise the level of skills and professional knowledge in the sector, and for research and development. We have also placed special emphasis on institution building and measures for the promotion of safety in all transport modes, and for protection of the environment.

A particular focus of the report is highlighting the need to achieve much greater transportation integration with the South and South East Asia regions. In a world characterized by rapidly increasing economic linkages between countries our region stands out as being among the least integrated. This must be repaired.

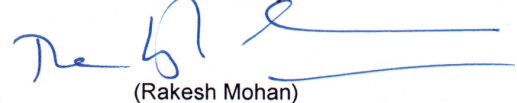
Our vision is that a well-developed and competent institutional system for planning, management and execution of transport should be in place as soon as possible, as it blends investment in and delivery of transport services by the public, private and joint sectors alike. The Report abstracts from current methodologies to solve today's problems, while forging a coherent strategy for the transport sector as a whole and for each of the modes of travel.

To meet the needs of India in the 21st century, radical structural change is necessary along with a new strategy for investment.

I would like to acknowledge the generous help and time given by all Members of the NTDP, the staff of the secretariat, and many other colleagues.


With warm regards,

Yours sincerely,


(Rakesh Mohan)

Dr. Manmohan Singh,
Prime Minister of India
South Block,
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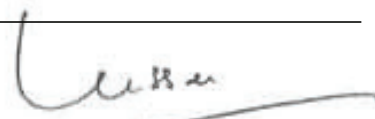
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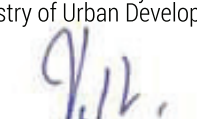
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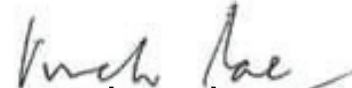
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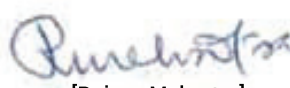
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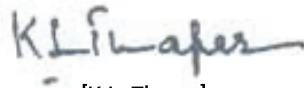
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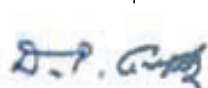
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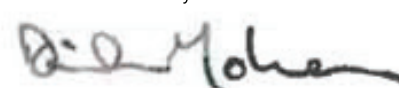
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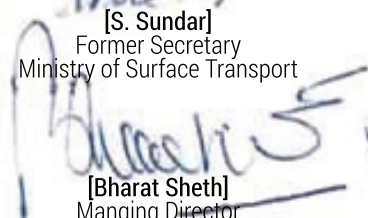
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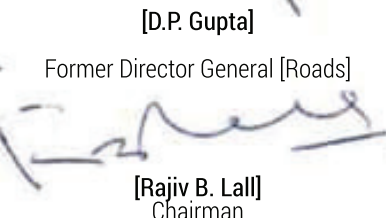
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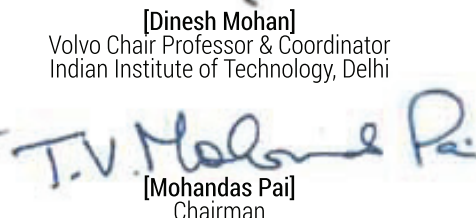
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1. **RAILWAYS**





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1. RAILWAYS

Indian Railways (IR), managed directly by the Ministry of Railways, Government of India (GoI), is the third largest railway network in the world under a single management. With its network of 64,974 route km, IR has played a critical role in integrating markets and connecting communities throughout the length and breadth of the country

It is rightly referred to as ‘the lifeline of the Indian economy’ as it facilitates industrial and economic development by transporting materials such as coal, iron ore, fertilisers and foodgrains. It touches the lives of people in both tiny villages and urban metropolises and assists the evolution of social forces like urbanisation and inclusive development.

Railways in India are a tool for development, equity and integration of all parts to the mainstream. Railways are considered critical not only from the standpoint of connecting remote regions and providing affordable transportation services (especially passenger services) but also from the perspective of defence movements, (which cannot be passed on to the private sector) and meeting the transportation requirement in the wake of national emergencies and natural catastrophes. Given the strategic role played by railways in the transportation space, rail transportation has been one of the three areas reserved for public sector in successive industrial policies of the country (the others being atomic energy and defence).

IMPORTANCE OF RAILWAYS IN THE INDIAN TRANSPORT NETWORK

IR occupies a unique and crucial place in the country's transport infrastructure. Presently, it operates 19,000¹ trains a day, transporting 2.65 million tonnes of freight traffic and 23 million passengers. IR is the topmost rail passenger carrier (in terms of passenger km) and the fourth largest rail freight

carrier in the world. During 2011-12, the freight loading by IR stood at 970 million tonnes, and the passengers transported, at 8.22 billion. The corresponding numbers in 1950-51 were 73.2 million tonnes and 1.28 billion respectively. Further, suburban traffic constitutes about 55 per cent of the total originating passengers and indicates the predominant role of IR in urban transport segment in the four metro cities of India. However, when viewed in terms of passenger kilometres - a measure of throughput - suburban transport makes up about 15 per cent of the total.

Over the years, the share of railways in freight and passenger transport has declined and road transport is emerging as the predominant mode for passenger and freight transport. The dominance of the road sector in freight transport in India is corroborated by two independent studies carried out by RITES Ltd.² and McKinsey³. Both the studies estimate the share of Railways in freight transport in Net Tonne Kilometres (NTKMs) in India to be around 36 per cent⁴ (Tables 1.1 and 1.2). The modal share of railways in freight transport is much lower in India relative to other comparable large countries like the US and China whose share is close to 50 per cent (Table 1.2). Annex 1.1 summarises the railways' share of domestic freight for seven countries and highlights the country specific factors affecting the modal share of freight.

The RITES study also shows that over the years IR's share (in originating tonnage) has come down

1. Comprising 12,000 passenger trains and 7,000 freight trains

2. Total Transport System Study (TTSS) on traffic flows & modal costs carried out by RITES for Planning Commission, GoI

3. McKinsey's Building India: Transforming the nation's Logistics Infrastructure, 2010

4. It is estimated that the share of railways in freight transport has declined further to about 33 per cent in 2011-12.

Table 1.1
Mode Share in Freight Traffic (2007-08)

MODE	MODAL SHARE IN TOTAL ORIGINATING TRAFFIC		PERCENTAGE SHARE IN TOTAL TRANSPORT OUTPUT (PER CENT)	
	TONNES(MILLION)	NTKMs (BILLION)	TONNES	NTKMs
Rail * @	769	508	30	36
Highways (Road) @	1,559	706	61	50
Coastal Shipping	59	86	2.3	6
Airways	0.28	0.29	0.01	0.02
IWT	55	3.5	2.1	0.24
Pipelines	113	105	4.5	7.5
TOTAL	2,555	1,409	100	100

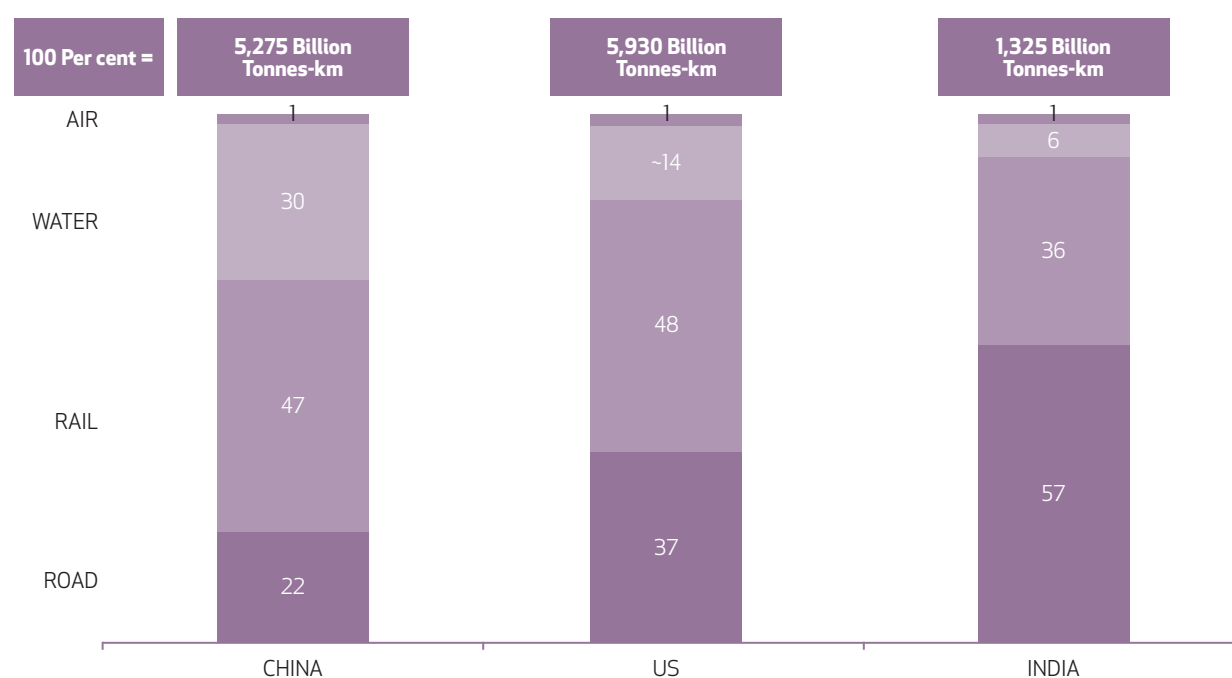
Notes:

* Includes IR & KRC 'non-revenue' inter-regional traffic as well as NTPC's MGR traffic aggregating to 1.86 million tonnes and 26.1 million tonnes respectively

@ Excluding intra-regional traffic of 96.6 MT by rail and 4640 MT assessed separately

Source: Total Transport System Study (TTSS) by RITES Ltd. (for Planning Commission, GoI)

Table 1.2
Mode Share in Freight Traffic
(Per cent of NTKM)



Note: Mode share estimated for 2007, excluding pipelines

Source: McKinsey's Building India: Transforming the nation's Logistics Infrastructure, 2010

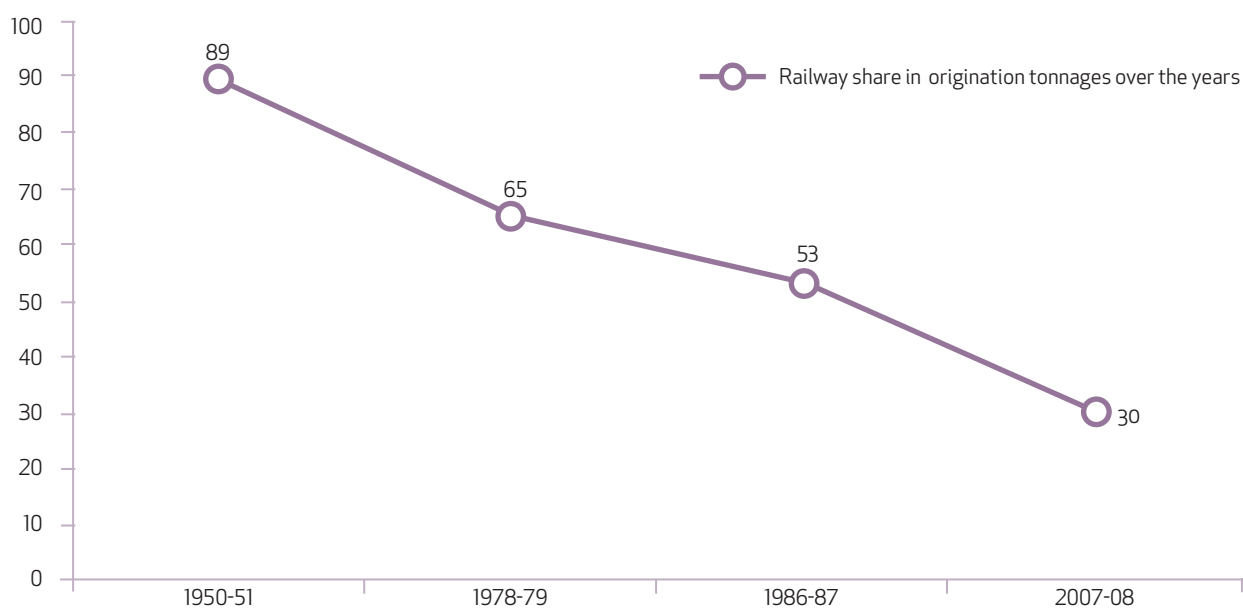
from 89 per cent in 1951 to 30 per cent in 2007-08 (Figure 1.1). A similar trend is observed in passenger transport, where the share of IR (in PKMs) has declined from 74.3 per cent in 1951 to 12.9 per cent in 2004-05, while the share of road has increased from 25.7 per cent to 86.7 per cent during the period⁵ (Figure 1.2). While the accuracy of this number could be open to challenge, the broad conclusion that road transport accounts for an overwhelming share of the total passenger transport is beyond dispute.

5. TERI, 2009

UNBALANCED MODAL MIX AND COST TO THE ECONOMY

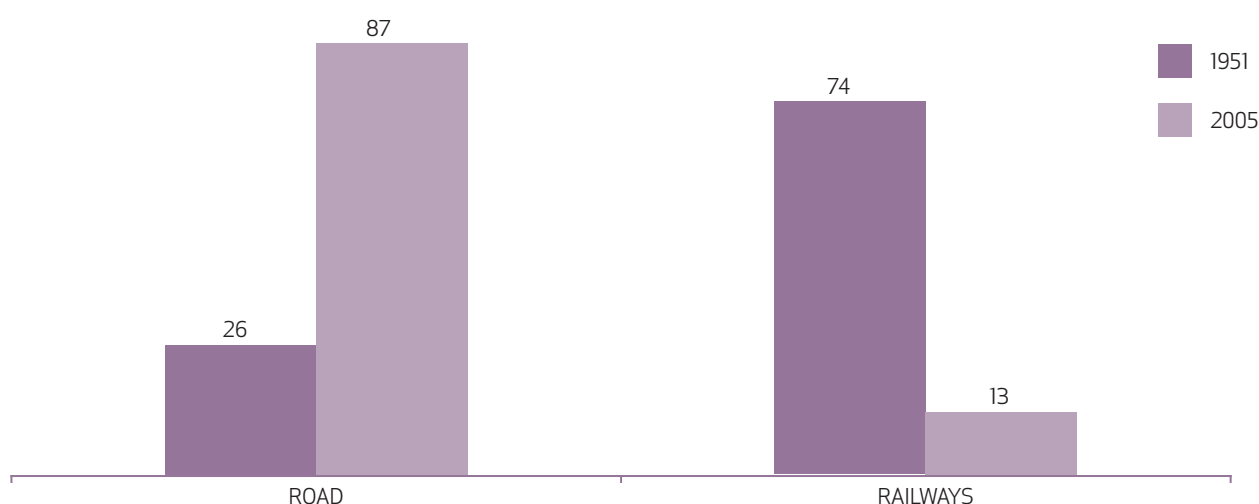
Studies show that excessive reliance of India's freight transport on the roadways is not sustainable from the standpoint of both logistics and resource cost to the economy. The McKinsey study shows that transportation by road is the most economical form of transport for distances up to 400 km. However, as distance increases rail and waterways become more economical. Given that close to 65 per cent of the

Figure 1.1
Railways' Share in Originating Tonnage
 [Per cent]



Source: Total Transport System Study (TTSS) by RITES Ltd. (for Planning Commission, GoI)

Figure 1.2
Relative Share: Passenger Transport
 [Per cent]



Source: TERI (2009)

India's freight traffic comprise bulk commodities and over 75 per cent (in NTKMs) is transported over distances of more than 400 km, it can be more economically served by rail and waterways⁶.

The RITES Total Transport System Study (TTSS) has estimated the total resource costs associated with different modes of transport, on the basis of financial user costs as well as the social costs, and based thereon had carried out an optimisation exercise that would assign transport flows to different modes

based on their total resource cost and break-even distances derived therefrom. The assessment of actual and optimal modal mix computed on the basis of this methodology is summarised in Table 1.3.

It shows that total throughput could increase by 44 billion tonne km (around 3 per cent) while cost of transportation could decrease by Rs 385 billion (constituting about 16 per cent of the total cost incurred on transportation during 2007-08), if the optimisation exercise could be undertaken in actual practice.

6. Ibid. (3)

Table 1.3
Actual vs Optimal Modal Mix (2007-08)

MODE	ACTUAL MODAL MIX			OPTIMAL MODAL MIX		
	FLOWS	COST	THROUGHPUT	FLOWS	COST	THROUGHPUT
	Million Tonnes	Billion Rs	Billion NTKM	Million Tonnes	Billion Rs	Billion NTKM
Rail	736	497	499	1,704	1,423	1,169
Road	1,559	1,556	692	591	245	66
Coastal	60	34	90	60	34	90
Total	2,355	2,087	1,281	2,355	1,702	1,325

Note: Coastal flows not subjected to the optimal analysis
Source: Total Transport System Study (TTSS) by RITES Ltd. (for Planning Commission, GoI)

Table 1.4
Comparison of Environmental and Social Sustainability of Rail and Road Transport

Energy Consumption	<ul style="list-style-type: none"> As compared to road, rail consumes 75 per cent to 90 per cent less energy for freight traffic and 5 per cent to 21 per cent less energy for passenger traffic
Financial Costs	<ul style="list-style-type: none"> Unit cost of rail transport was lower than road transport by about Rs 2 per NTKM and Rs 1.6 per PKM
Environmental Damage	<ul style="list-style-type: none"> Rail transport emits 17 gram CO₂ equivalent per PKM as compared to 84 gram per PKM in case of road transport Rail transport emits 28 gram CO₂ equivalent per NTKM as compared to 64 gram per NTKM in case of road transport
Accident Costs	<ul style="list-style-type: none"> Accident costs on road are significantly higher than those on rail For passenger transport, road accident costs are 45 times higher than rail For freight transport, road accident costs are 8 times that of rail
Social Costs (All-Inclusive Costs)	<ul style="list-style-type: none"> In terms of all-inclusive costs or social costs, railways have a huge advantage over road transport (the advantage is more in case of freight traffic) For urban areas, the cost advantage of rail (in the base year 2000) was as much as Rs 2.8 per NTKM and Rs 1.7 per PKM For non-urban areas, the cost advantage of rail (in the base year 2000) was as much as Rs 2.5 per NTKM and Rs 1.7 per PKM

Source: AITD report on 'Environmental and Social Sustainability of Transport- Comparative Study of Rail and Road' (2000); International Union of Railways (UIC); McKinsey's Building India: Transforming the nation's Logistics Infrastructure, 2010; Report of the Working Group on Railways (NTDPC)

However, the optimisation model should be used with due caution as it represents an extreme theoretical case, with the share of rail in total throughput estimated as 88 per cent.

Social and Environmental Costs: A number of studies carried out in the global context have established that railways are more energy-efficient and eco-friendly than other modes of transport (Table 1.4). Any shift of traffic from road to rail, especially in freight, would, therefore, result in substantial savings in energy consumption as well as reduced social costs. In view of the expected uncertainties related to the availability of future crude oil supplies, the attendant implications for energy prices, and the adverse environmental impact of fossil fuels, it is essential that an attempt be made to maintain the

recommended modal mix in favour of railways. This requires making a strategic decision in terms of the relative allocation of resources between rail and road, and accompanying pricing and taxation policies which can then be used to nudge transport demand towards the desired modal shares.

NEED FOR A STRATEGIC PLAN FOR IR

India needs an efficient and sustainable transport infrastructure to sustain the pace of economic growth. The quality, capacity and performance of railways would be of crucial importance in this regard. Roads are the dominant mode of transportation in India today (for both passenger and freight traffic), while IR has been suffering from severe capacity constraints and remains underinvested.

Figure 1.3
Mode Share in Freight: 2010 to 2020



Source: McKinsey's Building India: Transforming the nation's Logistics Infrastructure, 2010

The road sector has witnessed a surge in investments (both public and private) as the government launched the ambitious National Highways Development Project (NHDP).

IR is uniquely placed to serve the needs of the rapidly expanding and modernising Indian economy and meet the aspirations of the country. It is imperative for IR to draw out a strategic plan/programme so as to restore the balance in intermodal mix, as the current trajectory will reduce the share of railways in freight transport to 25 per cent by 2020 (Figure 1.3). IR has to institutionalise a strategic planning process taking a forward view over the next 20 years. The strategic plan has to be necessarily prepared involving the Zonal Railways and key stakeholders and will clearly lay down the goals to be aimed at and attained and the path to be traversed. A multi-year investment plan fully supported by a credible funding plan will form the bedrock of the strategic plan.

CURRENT STATE OF INDIAN RAILWAYS

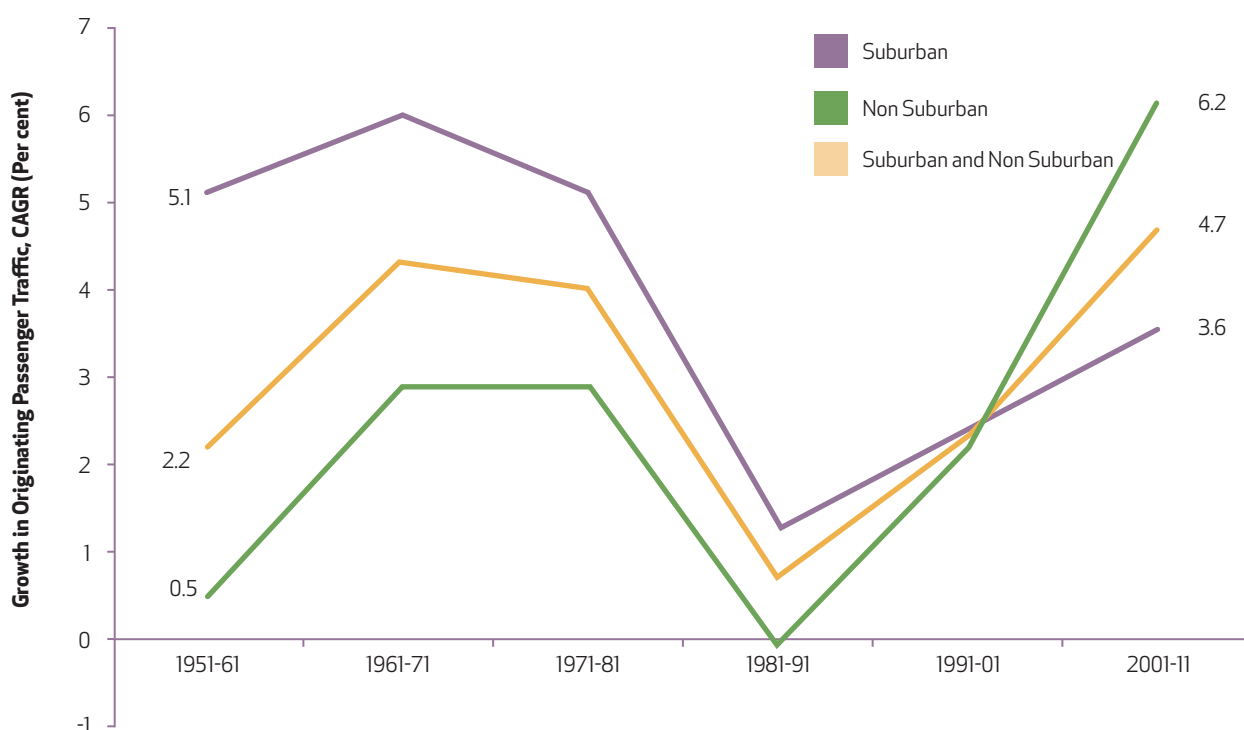
In order to analyse the current state of IR, operations and performance in each of its business segments have been looked into separately (passenger, freight, parcel and others). We have focused on the

growth experienced in the passenger and freight businesses underlining current trends, followed by an examination of the productivity and financial performance of IR as a whole. International benchmarking is necessary to realise the gap in productivity and technology that is prevalent in IR and the urgency needed to bridge this gap becomes clearly evident. Finally, a deeper analysis of tariffs and cost structures in the passenger and freight business brings out the challenges that currently exist due to cross-subsidisation, current tariff practices and capacity constraints. These practices have had a significant impact on IR's financial and operational performance over the years and understanding the current state of affairs of railways is the first step forward towards positive change.

PASSENGER BUSINESS

As mentioned earlier, Indian Railways provides passenger services of a large magnitude in both the suburban and non-suburban (that is, intercity/long distance) segments. In the latter category, there is a large variety—Rajdhani, Shatabdi, non-stop Duronto, mail/express, passenger trains, etc. Yet, IR is not able to meet the demand in full. Railways have an excellent operating protocol in place to run around 12,000 passenger trains a day. Train services are, by

Figure 1.4
Growth in Originating Passenger Traffic, CAGR
 [Per cent]



Source: Report of the Working Group on Railways (NTDPC), Yearbook 2010-11

and large, reliable and popular. However, these do not compare with best-in-class passenger railway systems elsewhere in the world in terms of speed, reliability and comforts; for a host of reasons such as infrastructural and capacity limitations, low level of technology, maintenance systems and procedures and poor upkeep of stations and coaches. While most developed countries have high speed railways (speeds up to 300-350 km per hour) and have rebuilt their conventional tracks for speeds up to 200 km per hour, the maximum permissible speed on IR is only 150 km per hour and the average speed actually achieved, lower in the range of 60-70 km per hour.

Over the last six decades, the number of **originating passengers** on IR has increased by almost six times, from 1.3 billion in 1950-51 to 7.6 billion in 2010-11. During the period 1951–2001, the suburban passenger category was driving the growth in total originating passengers with a compounded annual growth rate (CAGR) of 4 per cent as compared to a CAGR of 1.6 per cent for non-suburban category. However, during the last decade (2001-11) the trend reversed and non-suburban passenger category has been the key driver of growth in total originating passengers with a CAGR of 6.2 per cent, compared to 3.6 per cent for the suburban passengers (Figure 1.4).

Total passenger kilometres (PKM) increased to almost 15 times, from 67 billion in 1951 to 979 billion by 2011. The growth in PKM has been excep-

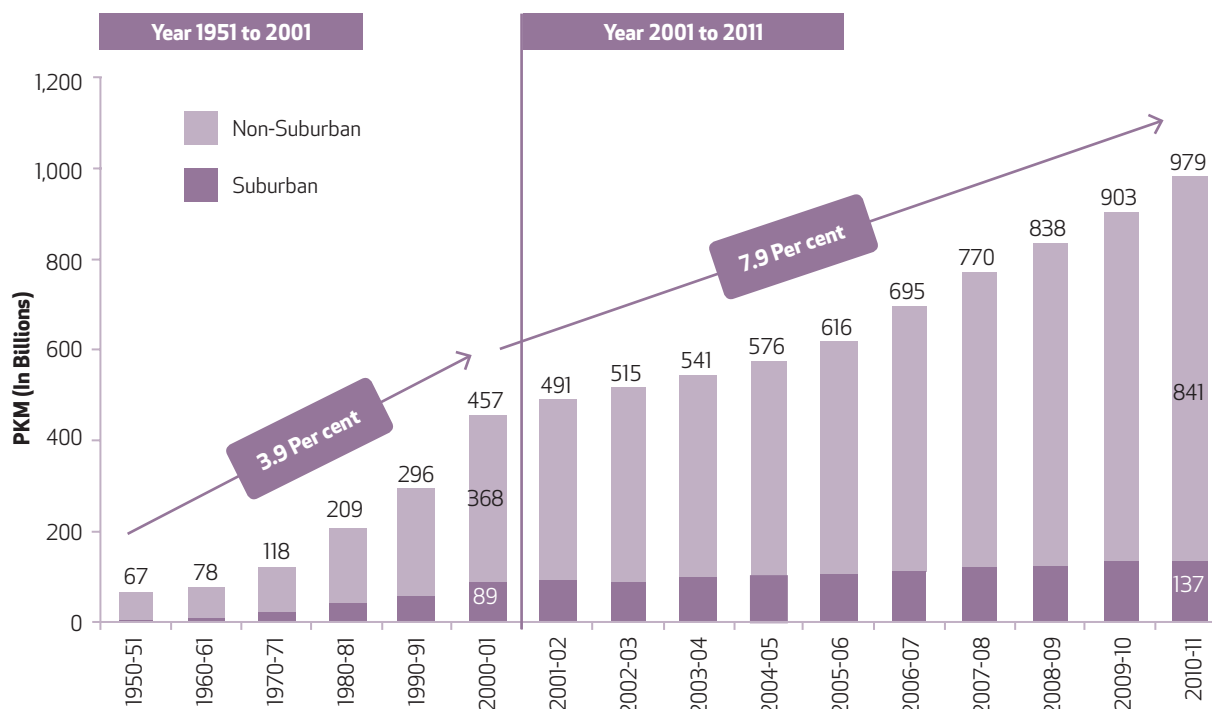
tionally high over the last decade (2001 to 2011), as it increased by 522 billion PKM (CAGR of 7.9 per cent), in comparison to an increase of only 390 billion PKM (CAGR of 3.9 per cent) during the preceding 40-year period (1951 to 2001). The growth in PKM over the last decade has been supported by the fast growth witnessed in non-suburban traffic. As of March 2011, non-suburban passengers comprised 47 per cent of the total originating passengers and accounted for close to 86 per cent of total PKM (Figure 1.5).

The **average lead** of passengers has increased from 52 km in 1951 to 128 km in 2011. While average lead in suburban category has become twice (16 km to 34 km), average lead in non-suburban category has grown more than 3.5 times (66 km to 234 km) over the same period. Further, over the last decade, lead in the non-suburban category increased much faster (CAGR of 3 per cent) compared to suburban category (CAGR of 0.8 per cent) over the same period (Figure 1.6).

Within the non-suburban category, passenger lead for the upper class segment has shown the highest rise, as it quadrupled from 152 km in 1950-51 to 623 km in 2010-11; while leads for the other two segments (second class ordinary and mail/express) doubled during the same time period (Figure 1.7)

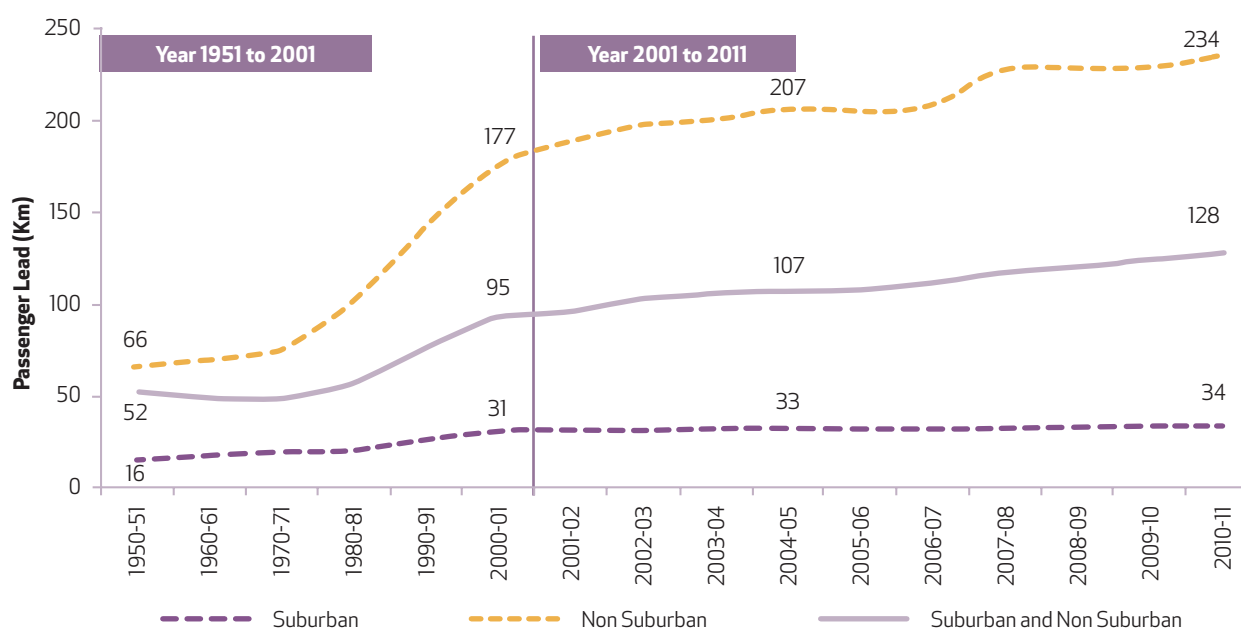
However, despite the spectacular rise in passenger lead, the upper class segment accounts for only 7 per cent of total PKM of the non-suburban cat-

Figure 1.5
Passenger Kilometres on IR
 [in Billions]



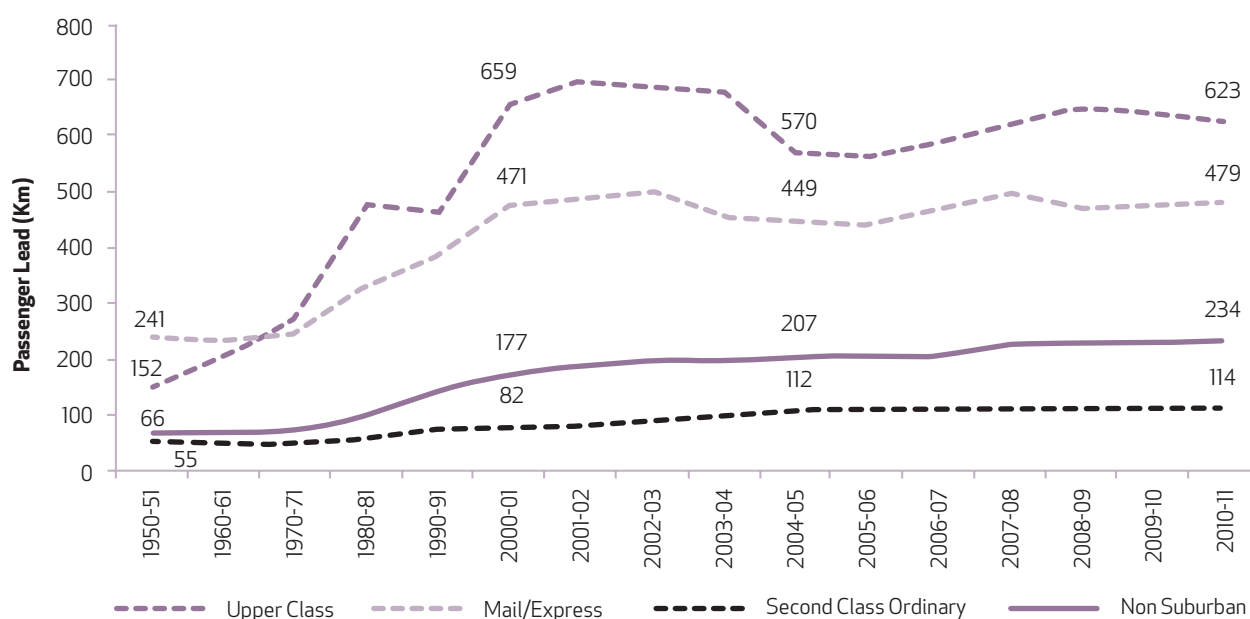
Source: Report of the Working Group on Railways (NTDPC), Yearbook 2006-2007, Yearbook 2010-11

Figure 1.6
Passenger Lead on IR
 [Km]



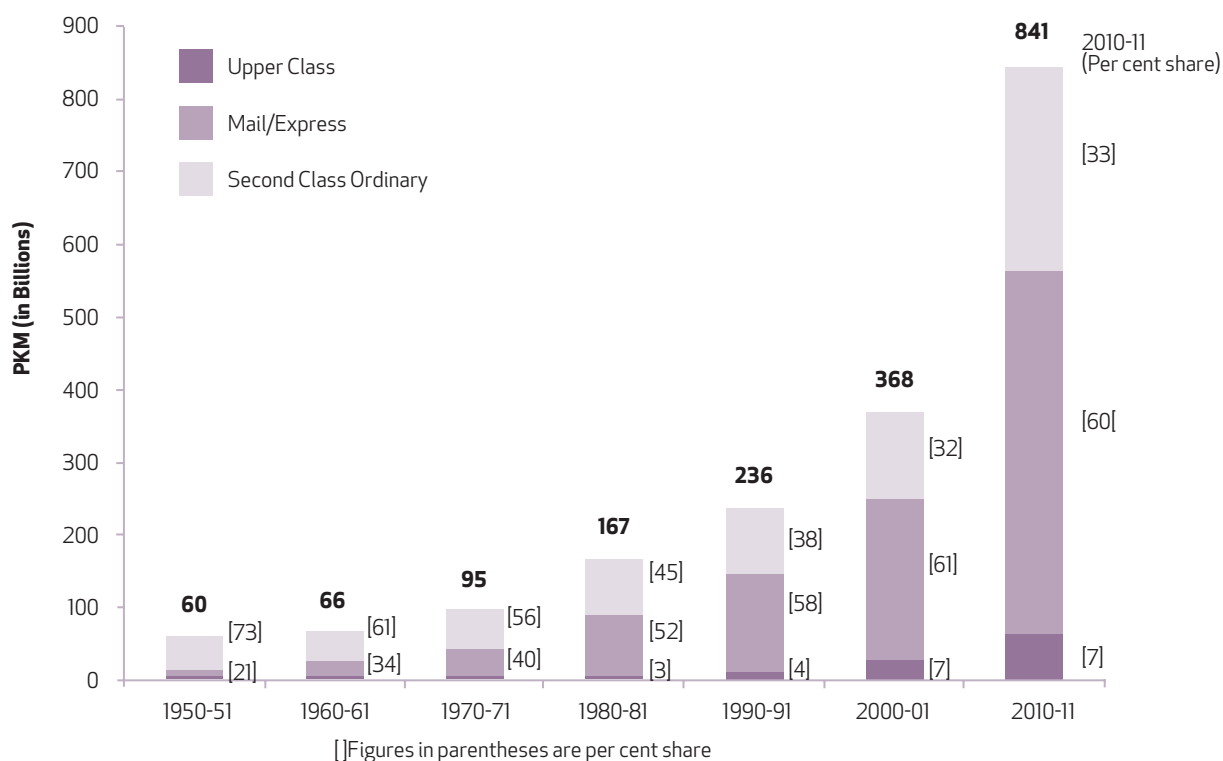
Source: Report of the Working Group on Railways (NTDPC), Yearbook 2006-2007, Yearbook 2010-11

Figure 1.7
Passenger Lead in Non-Suburban Category
 [Km]



Source: Report of the Working Group on Railways (NTDPC), Yearbook 2006-2007, Yearbook 2010-11

Figure 1.8
Passenger Kilometres for Non-Suburban Category
 [in Billions]



Source: Report of the Working Group on Railways (NTDPC), Yearbook 2006-2007, Yearbook 2010-11

Box 1.1

Indian Railways' Network Capacity

64,460 km Length of route network as of March 2011

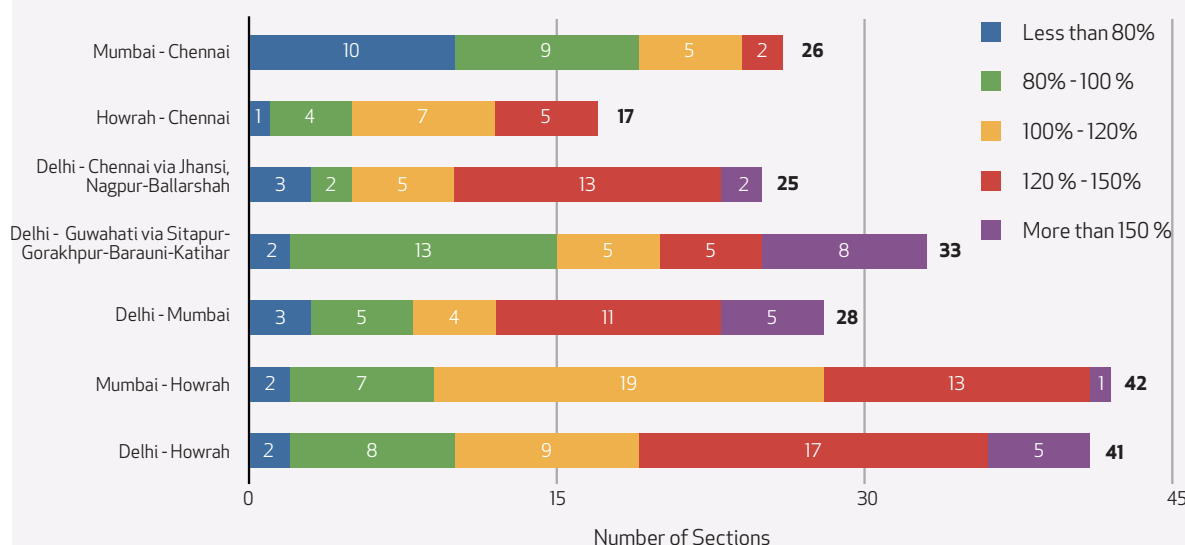
85.6 per cent Broad Gauge (BG)

10.6 per cent Metre Gauge (MG)

3.8 per cent Narrow Gauge (NG)

Traffic flows on IR's network are highly uneven and imbalanced. As of March 2011, the BG network, though forming 85.6 per cent of the route, generated almost 98 per cent of the passenger output (PKMs) and 99.9 per cent of the freight output (NTKMs). Further, passenger trains utilise nearly 65 per cent of network capacity but contribute to less than 30 per cent of the revenue. The Golden Quadrilateral and the diagonals connecting the four major metros, viz., Delhi, Kolkata, Chennai and Mumbai (along with the east-west diagonal extending to Guwahati) constitute less than 16 per cent of the route, but account for more than 50 per cent of the passenger and freight traffic. These routes have reached over saturated levels of capacity utilisation and at present are strained to the breaking point (See chart). A line-capacity utilisation of 80 per cent is considered optimum as smooth operation of trains requires some slack in the line-capacity to absorb and recover from unforeseen disruptions.

Line capacity utilisation of sections on High Density Network in 2009-10



212 Total sections on the High Density Network (HDN)

141 Sections with line capacity utilisation exceeding 100 per cent

189 Sections with line capacity utilisation exceeding 80 per cent

Source: Ministry of Railways, Yearbook 2010-11

egory, as this segment has a small base of originating passengers (100 million in 2010-11), equating to 3 per cent of the non-suburban passengers and 1 per cent of the total passengers (Figure 1.8).

FREIGHT BUSINESS

Freight trains constitute approximately 35 per cent of the total 19,000 trains run daily on IR network, but yield more than 65 per cent of the revenue. Freight

services share the track and infrastructure with passenger trains, but have lower priority vis-a-vis the latter in operational matters. There is a huge imbalance in the pattern of train operations: the trunk routes of the railways, which comprise 16 per cent of the network (connecting the four metro cities), carry close to 60 per cent of the freight and more than 50 per cent of the passenger traffic and are, therefore, oversaturated (Box 1.1).

Box 1.2

Efficiency of Heavy Load Trains

In most of the freight railways reviewed high density flows of rail-friendly traffics have created beneficial opportunities to operate longer, heavier trains and attain lower unit costs. Australia, Brazil, Canada, China, Russia and the USA have all pursued heavy axle loads, better wagon design and minimisation of dead-running to provide higher net-to-tare ratio, coupled with longer freight train length to reduce unit crew costs and (in some cases) release useable capacity. Germany and Japan are more constrained by the limited market availability of bulk freights (particularly coal), by their relatively short freight-hauls, and by the constraints of network parameters basically geared to passenger demands, but nevertheless they have also sought within their constraints to achieve the same sorts of efficiencies.

COUNTRY	EXAMPLES OF HEAVY-LOAD TRAINS AND TYPICAL FREIGHTERS
Australia	Typical interstate freighters East-West 5,000 tonnes, North-South 2-3,000 tonnes. Dedicated freight lines: Rio Tinto: 30,000 tonnes iron ore trains BHP Billiton: 44,500 tonnes iron ore trains Leigh Creek: 10,000 tonne coal trains
Brazil	Typical freighters: various Dedicated: Carajas Railway: 23,000 tonne iron ore trains
Canada	Typical long-distance freighter: Canadian National bulk trains: up to 20,000 tonnes
China	Typical long-distance freighter: 4,000 tonnes Dedicated: Daqin Railway (mainly coal): 20,000 tonne coal trains
Germany	Trains typically constrained to 740 metres but 835 m trains being introduced Hamburg to/from Denmark and long-term feasibility of running 1,500 m trains on key routes is being examined.
Japan	N/A
Russia	Typical long-distance freighters: 4,000 tonnes Iron ore to Finland: 5,500 tonnes
United States	Typical freighters: 3,000-5,000 tonnes. Double-stack container trains: typically 5,000-8,000 tonnes Some iron ore and coal trains: 10-20,000 tonnes

International containers have been a major rail freight growth market in all the countries reviewed. The USA and Canadian railways are leaders in the field with further multi-billion dollar investments planned. Double stacking has been facilitated by the USA's high average axle-loads (more than 50 per cent higher than Europe) and the fact that primarily diesel locomotive haulage provides higher loading gauge than would an electrified system with overhead wires. Australia has introduced double-stack wherever density of flows and the loading gauge permit it and China is currently adapting a number of routes from ports for double-stack. In the other countries constraints of current loading gauge and/or lack of market density make it difficult economically to justify the heavy cost of adaptation works, but it is likely that at least a few key routes will be fitted for double-stack in due course.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Paul Amos, July 2011

Lower operational priority and oversaturation have implications for quality of service of freight trains and severely restrict IR's ability to meet customer expectations. Speed of freight trains has largely remained stagnant and improved only marginally from 25 to 29 km per hour over the last three decades. These capacity constraints need to be further viewed in the context that IR does not operate truly heavy-haul freight trains that bring high level of cost-efficiency to freight operations as the infrastructure is common to both, the passenger and freight trains (Box 1.2). The maximum gross load carried on trains in IR is 5,400 tonnes, compared to 20,000-37,000 tonnes

in China, South Africa, Brazil and Australia. The position can change only when the Dedicated Freight Corridors (DFCs) get operational, as trains with maximum gross load of 12,000 tonnes are expected to run on the DFCs.

Furthermore, freight services are managed with excessive stress on productivity of assets rather than satisfaction of customers' needs. Productivity of assets is undeniably a worthwhile objective to pursue and improved rake utilisation over the years has enabled IR to meet requirements of bulk customers. However, there is a need to strike a balance between

Box 1.3

Auto-Carriage Opportunities

Auto-carriage is a typical example of what railways are losing and why. Globally, automobiles are mostly carried by rail. IR's share in India's growing automobile production and transportation is a mere 2 per cent. Railways do not have proper wagons to transport automobiles efficiently, nor well designed terminals. The few make-shift wagons that have been designed are not capable of carrying optimum number of cars per wagon. The terminal infrastructure for handling is absent. Investment by automobile companies does not come forth as the facilities cannot be shared with competitors and single-user volumes may not justify stand-alone investment. Automobile companies or third-party logistics providers can bring proven wagon designs from, say, the USA or Europe, but the RDSO's approval process is tedious, protracted and uncertain. Similar issues beset the transport of bulk cement, fly-ash and other potentially voluminous commodities not carried by rail in any sizeable quantity now.

The Ministry did announce a large number of policy initiatives in 2010 under the Public Private Partnership model to attract private sector investment in several areas - auto-carriage rolling stock, terminal development, development of ware houses, construction of railway lines, operation of tourist trains etc.

The initiatives have not been successful, indicating the need for a review of the terms and conditions including a dialogue with the interested parties for setting at rest their apprehensions.

Source: Report of the Working Group on Railways (NTDPC)

optimising asset utilisation and fulfilling the customer's requirements if the aim is to increase railway's share of cargo handled. IR does not perceive or define the freight business in terms of delivering transport or logistics solutions. Railways' customers have negative perceptions on its handling of demurrage (detention of rolling stock at terminals) and disposal of claims. Parcel size of cargo is presently restricted between the ranges 2,400 metric tonnes and 3,800 metric tonnes and, therefore, cuts out many customers even in the bulk cargo segment.

IR does not take responsibility for last-mile connectivity, nor does it incentivise customers to invest in such facilities. There is no institutional arrangement to attract and aggregate traffic of smaller parcel sizes (less than train-loads). As a result, IR is losing out in high potential markets like fast-growing consumer durables and information technology (CDIT), fast moving consumer goods (FMCG), hazardous chemicals, bulk cement, fly ash, automobiles and containerised cargo; where their share is low or negligible (Box 1.3). This traffic now moves mostly by road.

Given the above constraints, IR has focused on carrying bulk cargo in train-loads dominated by a narrow basket of nine commodities coal (46 per cent), iron ore, cement, fertilisers, steel, raw materials for steel plants except iron ore, foodgrains, petroleum products and container traffic together these account for over 90 per cent of the freight traffic (Figure 1.9a).

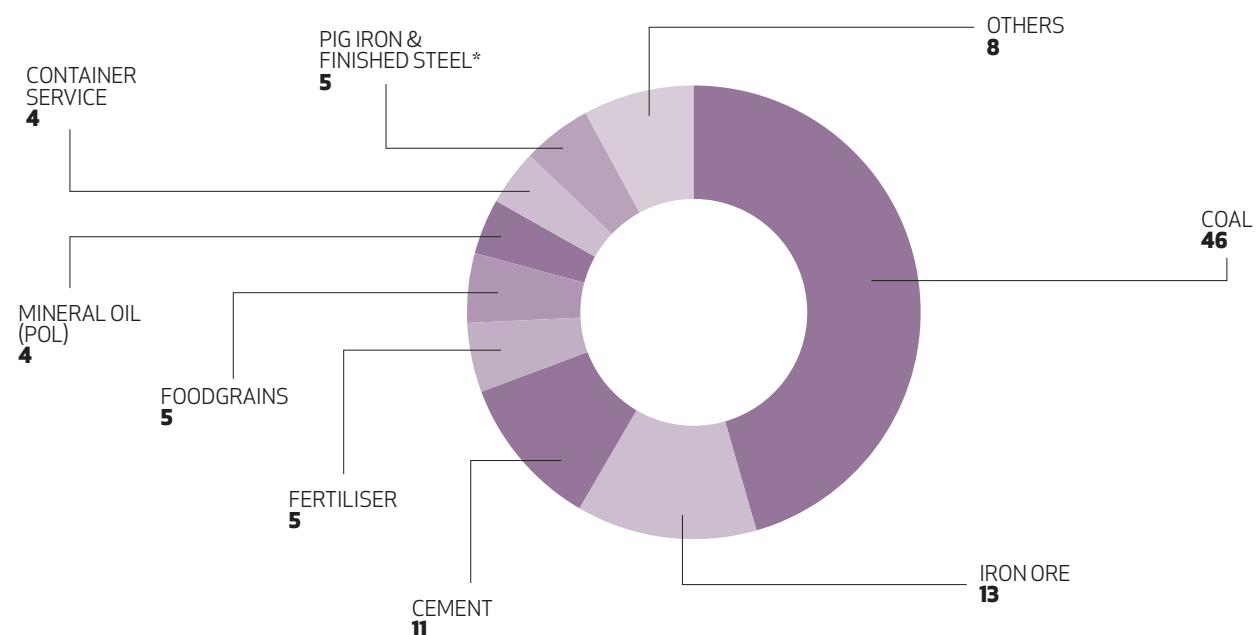
Figure 1.9b provides commodity-wise trends in freight growth over the period 2001-02 to 2010-11.

Growth and Performance of Freight: Figure 1.10 provides the growth of freight traffic in terms of total loading and freight output (in million tonnes and billion NTKMs respectively), as well as average lead (in km). Total loading of revenue earning freight traffic during 2010-11 was 922 million tonnes compared to 73 million tonnes in 1950-51. Similarly, the freight output increased from 38 billion NTKMs to 626 billion NTKMs over the same period. Further, during the last decade (2001-2011), the growth rate in freight loading and output has been much faster (CAGR close to 7 per cent⁷), compared to the preceding five decades (1951-2001) when they grew at CAGR of around 4 per cent. The average lead increased from 513 km in 1950-51 to 754 km in 1980-81, but it consistently declined thereafter and stood at 679 km in 2010-11.

Despite the higher growth witnessed in freight traffic during the last decade, IR's performance is much below the potential. Given the average GDP growth of around 8.5 per cent from 2005-06 to 2010-11, and the transport elasticity to GDP of 1.25, IR's freight could have grown at CAGR of greater than 10 per cent, while it grew only close to 7 per cent during the period. In meeting the demand generated by the economic upturn, the main challenges faced by IR were the constraints of infrastructure, particularly line capacity on busy routes, and terminal detentions on account of underinvestment.

7. There was a dip in freight growth in 2008-09 due to the economic slowdown and the target of 850 MT of loading could not be met; consequently freight growth was only 5 per cent.

Figure 1.9a
Commodity Basket for IR (2010-11)
 [Per cent]



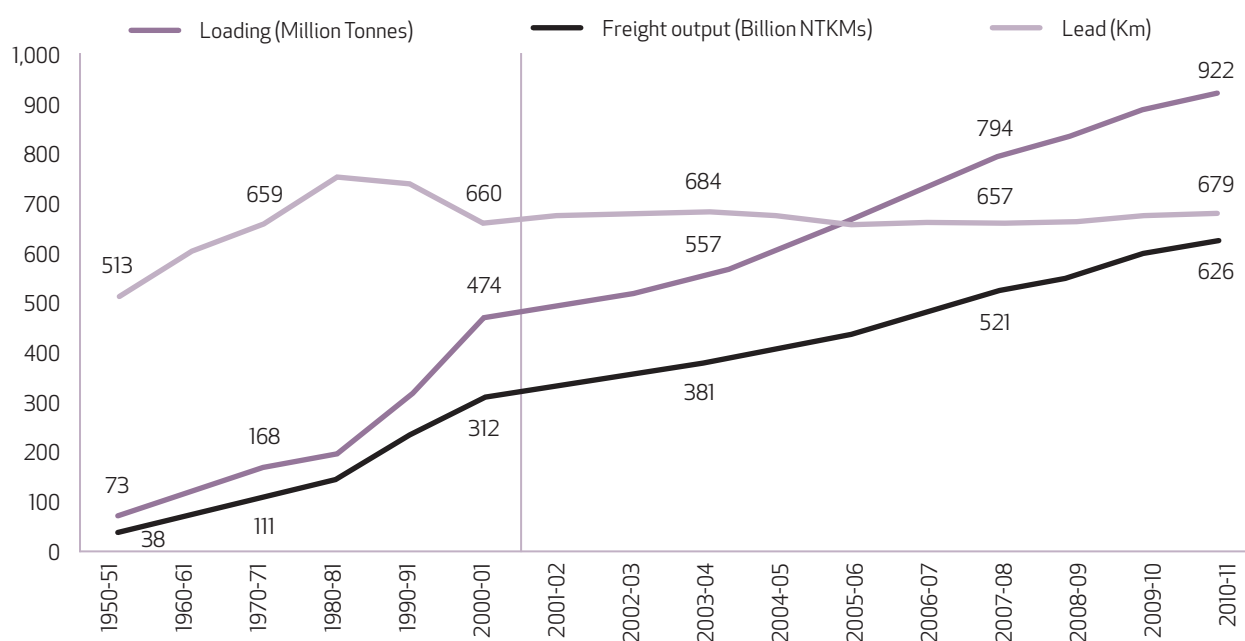
Note: *Pig iron and finished steel includes raw material for steel plants except iron ore
 Source: Yearbook 2010-11

Figure 1.9b
Freight Growth: Select Commodities



Source: Yearbook 2010-11, Yearbook 2005-2006, Yearbook 2004-2005

Figure 1.10
Freight Traffic on IR



Source: Report of the Working Group on Railways (NTDPC), White Paper on Indian Railways, Year Book 2010-11

Table 1.5
Parcel Traffic and Earnings

YEAR	TONNAGE (MILLION TONNES)	INCREASE OVER PREVIOUS YEAR (PER CENT)	EARNINGS (RS BILLION)	INCREASE OVER PREVIOUS YEAR (PER CENT)
2001-02	3.4	-	4.4	-
2002-03	3.5	3.2	4.6	5.0
2003-04	3.9	10.8	4.8	3.9
2004-05	4.2	7.2	5.3	11.7
2005-06	4.6	10.5	6.4	19.7
2006-07	4.9	6.7	9.0	41.2
2007-08	5.5	12.2	10.0	12.0
2008-09	5.9	6.7	10.8	7.2

Source: Special Study for setting up of FBO for parcel traffic, CRISIL Infrastructure Advisory, ADB TA No. 4053

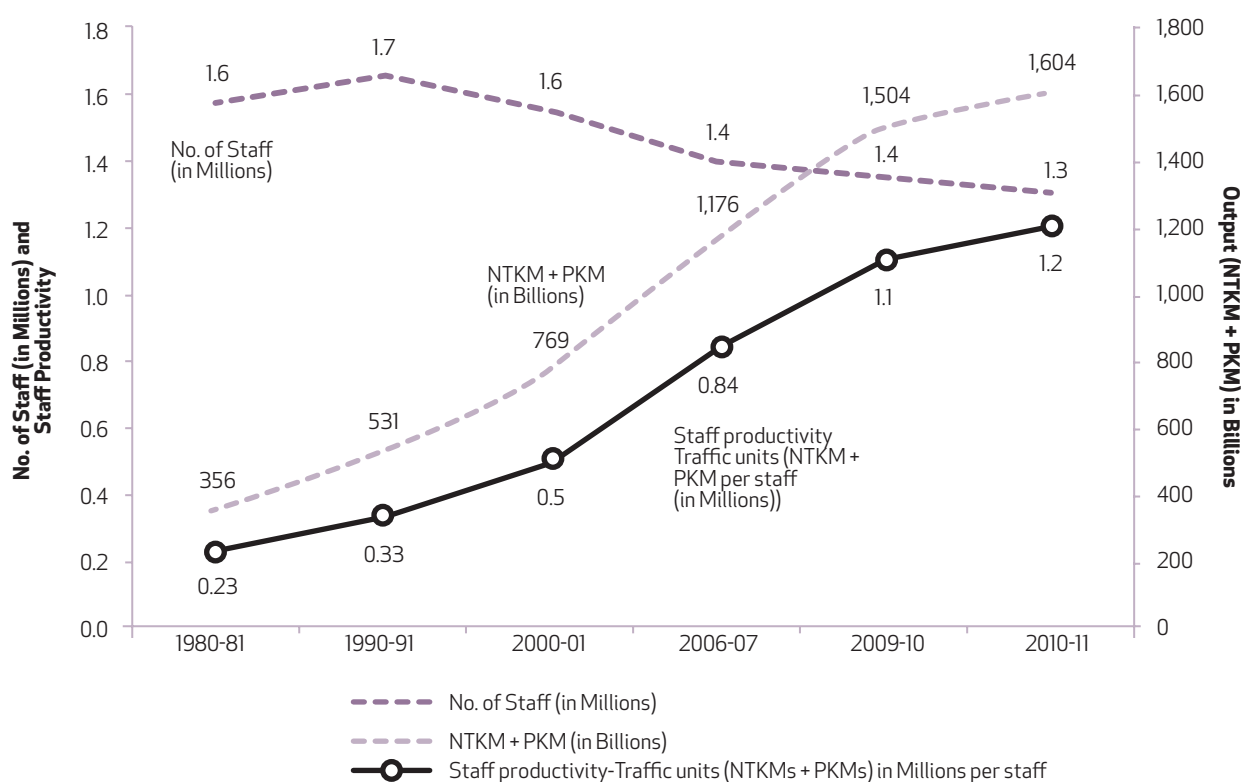
PARCEL BUSINESS

At present, parcel services are treated as a peripheral activity and managed as an associated service along with passenger trains; Railways Act defines a 'parcel' as 'goods entrusted to a railway administration for carriage by a passenger train or parcel train', there being no other elaboration or explanation. There is little marketing support and backward/forward services by IR. Freight and passenger segments of the business receive the attention of IR's management at all levels and at all times; this is not the case with parcel traffic. This has handicapped the growth of the business. The end result is carriage of parcels is a loss-making activity for the IR; in the financial year 2008-09, the net loss for this segment of business was estimated to be as high as Rs 18 billion.

The importance IR attaches to this segment of business can be gauged from the fact that no separate statistics pertaining to parcels is maintained and published; the Indian Railways Statistical Year Book gives no figures. Table 1.5 indicates the quantum of parcel traffic carried along with other related statistics:

The higher growth, both in terms of tonnage and earnings, has been due to a number of steps taken by the IR such as leasing of parcel vans, relating tariff to the class of service chosen, instead of commodity as earlier; obtaining, designing higher capacity parcel vans and running of point-to-point parcel trains. And, despite the growth, in absolute terms, the quantum of parcel traffic is insignificant. A study done by CRISIL Infrastructure Advisory (for Asian Development Bank) for setting up of a focused business

Figure 1.11
Staff Productivity



Source: Report of the Working Group on Railways (NTDPC), Year Book 2009-10, Year Book 2010-11

organisation for parcel traffic estimated⁸ that movement by road was over 400 million tonnes in 2007-08; IR's share is thus just 1 per cent.

The size of the parcel business in the country is huge and expanding rapidly but IR's share is negligible. A shift from road to rail is obvious for leads of 500 km and above. An efficient 'rail-borne parcel traffic' has to be multimodal if it has to be user-centric; institutional aggregation is a basic requirement. Collection and delivery have to be at locations decided by the users, with a single agency dealing with all matters documentation, enquiries, tracking, financial and tariff-related issues, claims, etc. This activity needs to be managed professionally as a separate business unit that combines the advantages and strengths of rail movement with those of road; otherwise IR will not be able to take advantage of the opportunities in the market for parcel movement.

OTHER BUSINESSES

Sundry earnings from sources like advertising and commercial utilisation of surplus land currently contribute around Rs 34 billion per annum (2010-11). The vastness of the network and large masses of people who use railway stations and facilities offer an attractive opportunity for advertising on freight and passenger trains, CCTVs at stations, on-board magazines for passengers, merchandising opportunities on tickets, foodstuffs and other materials

served on trains, etc. Laying optic fibre along the railway tracks and leveraging the optic fibre network for broadband would be yet another avenue. IR has not been able to fully exploit the potential from these sources as these activities are not managed professionally as separate profit-centres.

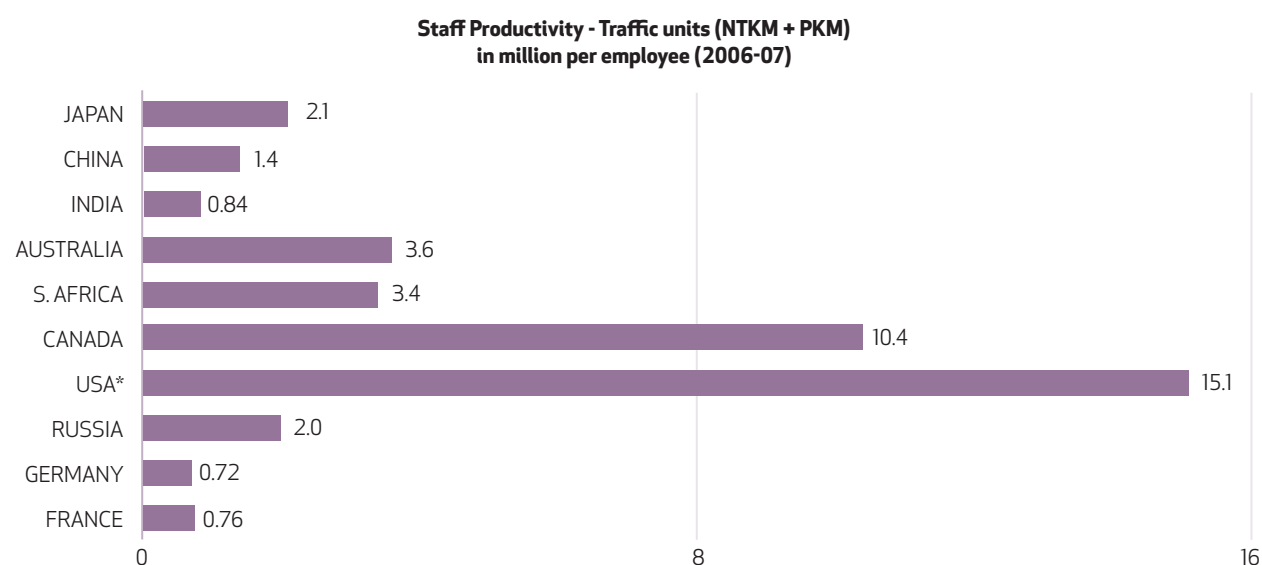
PRODUCTIVITY IN INDIAN RAILWAYS

Staff Productivity: Over the years, productivity measured in terms of transport output (NTKM+PKMs in millions) per employee of IR has increased from 0.23 (1980-81) to 1.2 (2010-11) (Figure 1.11). The major force driving the marginal increase in productivity has been the increase in transport volumes due to technology upgrade and appropriate operating strategies, combined with reduction in the number of employees from a peak of 1.65 million in 1990-91 to 1.32 million in 2010-11.

It is, however, important to compare productivity figures internationally. On doing so, we see that the productivity of employees measured in terms of average transport output for 2006-07 is relatively low for India (0.84) compared to the US (15), Canada (10.4), Japan (2.1), Russia (2) and China (1.4) (Figure 1.12). The much higher staff productivity in the US and Canada vis-à-vis India; China and Russia can be partly explained by the difference in overall freight and passenger mix, as the larger passenger volumes handled in India, China and Russia require

8. Based on the Total Transport System Study done by RITES, and 22 commodities that are amenable for transport as parcels by rail

Figure 1.12
Staff Productivity Comparison (2006-07)



Note: * US data for AAR Class 1 and Amtrak
Source: Report of the Working Group on Railways (NTDPC), White Paper on Indian Railways, UIC 2007

a more labour-intensive service response than freight. Similarly, several other factors such as the state of the infrastructure, the level of technology, the skill of the workforce and quality of the management, the degree of outsourcing, etc. also influence the productivity as measured by conventional parameters.

Asset Productivity: Box 1.4 provides estimates (based broadly on 2009 data) of asset productivity for India and five other countries.

FINANCIAL PERFORMANCE

Figure 1.13a provides a snapshot of IR's financial performance over the period 2004-05 to 2010-11. A combination of factors such as booming growth in the core sector and mineral industries; and IR's decisions to raise the axle load of existing wagons from 20.8 tonnes to 22.8 tonnes (thereby increasing the carrying capacity by 15 per cent), operate longer passenger trains, rationalise freight classification and introduce market-focused tariffs (e.g. lean season and empty flow discounts) contributed to improvement in the railway finances during the period 2005-06 to 2007-08. However, once these had run their course and the impact of award of the Sixth Pay Commission had to be absorbed, the operating ratio, which is used as a rough index of the health of the railway finance, has climbed back into the 90-100 range, leaving very little surplus for reinvestment. The sharp deceleration in revenue generation is mainly due to non-revision of passenger tariff for 10 years in a row and slowdown in the growth of the core sector, which is a primary contributor to railway freight. Further,

capacity constraints hamper IR's effort to diversify into other segments. Increase in expenditure due to higher wage and fuel bills complete the picture of financial distress.

Working Expenses: Operating and maintenance expenses incurred by IR can broadly be divided into staff costs (including payment of pension), fuel costs, material costs, lease charges and other miscellaneous expenditure. Of these, wages and pension constitute about 51 per cent, fuel 16 per cent, stores for operation and maintenance 4 per cent, lease charges for rolling stock procured through borrowings 4 per cent and miscellaneous expenditure 8 per cent of the earnings. Contribution to the depreciation reserve fund (DRF) for the replacement of assets takes away another 4 to 6 per cent of the earnings. Thus close to 85 per cent of the revenue is committed and invariable in the short run. Drastic restructuring or staff rationalisation and wage freeze are not politically and administratively feasible. Viability in the short run, therefore, dictates that the volumes expand at viable tariff levels. In 2008-09, there was a considerable jump in the working expenses of the railways, on account of the disbursement of Sixth Pay Commission arrears and increased salaries and wages and rates of allowances. Manpower productivity has steadily improved over the years and this has contributed to an increase in earnings and lower costs. However, the challenges of the coming years would necessitate much higher levels of productivity.

Earnings: Total earnings of IR have doubled over the period 2004-05 to 2010-11 from Rs 470 billion to Rs 945 billion (Figure 1.13b). Freight earnings have

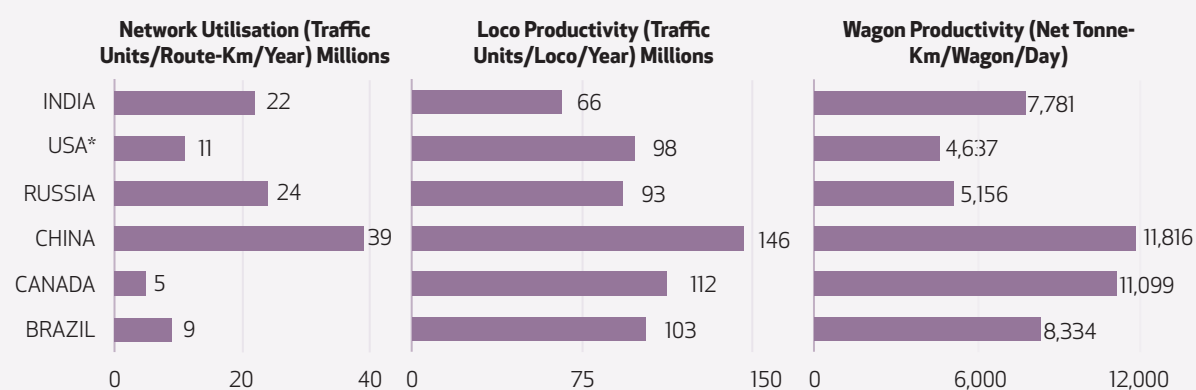
Box 1.4

International Comparison of Asset Productivity

Network utilisation: The three networks that handle substantial passenger volumes (India, China and Russia) as well as freight have the highest overall network use, but such use can also be heavily influenced by the technology and operational standards. The average is also affected by the relative intensity of use of different parts of the network. For example, whereas nearly China's entire network is heavily used, the Indian average contains around 9,000 kms (more than 14 per cent of the network) of little-used non broad-gauge lines carrying only around 1 per cent of rail traffic.

Locomotive productivity: The achievable productivity is partly influenced by the markets offering, which differ from country to country. Modern locomotive types and technologies also have higher haulage capability. Productivity is also influenced by the maintenance standards and efficiency of equipment. India is significantly behind other countries in locomotive productivity.

Asset Productivity Estimates (2009)



Wagon productivity: The achievable productivity depends partly on traffic mix; other things equal, it should be higher with longer length of haul, higher proportions of bulk relative to non-bulk traffic, and the use of non-specialist wagons for a variety of traffic types. It is also influenced by train operating strategies and the efficiency of customers' terminal operations. High utilisation generally assists in controlling operating costs, but it can occur at the expense of customers: for example many customers may prefer to use specialised wagons.

Source: Freight Railways Governance, Organisation and Management: An International Roundup; The World Bank; Paul F. Amos, 7 July 2011

been the backbone of IR's revenues, accounting for almost two-thirds of the total earnings. Earnings through commercial publicity account for a very small percentage of IR's earnings even though great scope exists for advertising initiatives in the interiors of trains and at stations. Figure 1.14 shows the growth rate of earnings over the reference period. The growth rate of total earnings has declined in the recent years, after growing at CAGR of more than 14 per cent during 2004-05 to 2008-09 (led by the strong economic growth during that period). The growth of freight earnings has also declined to single digits in recent years, after growing at a peak of 18 per cent during 2005-06.

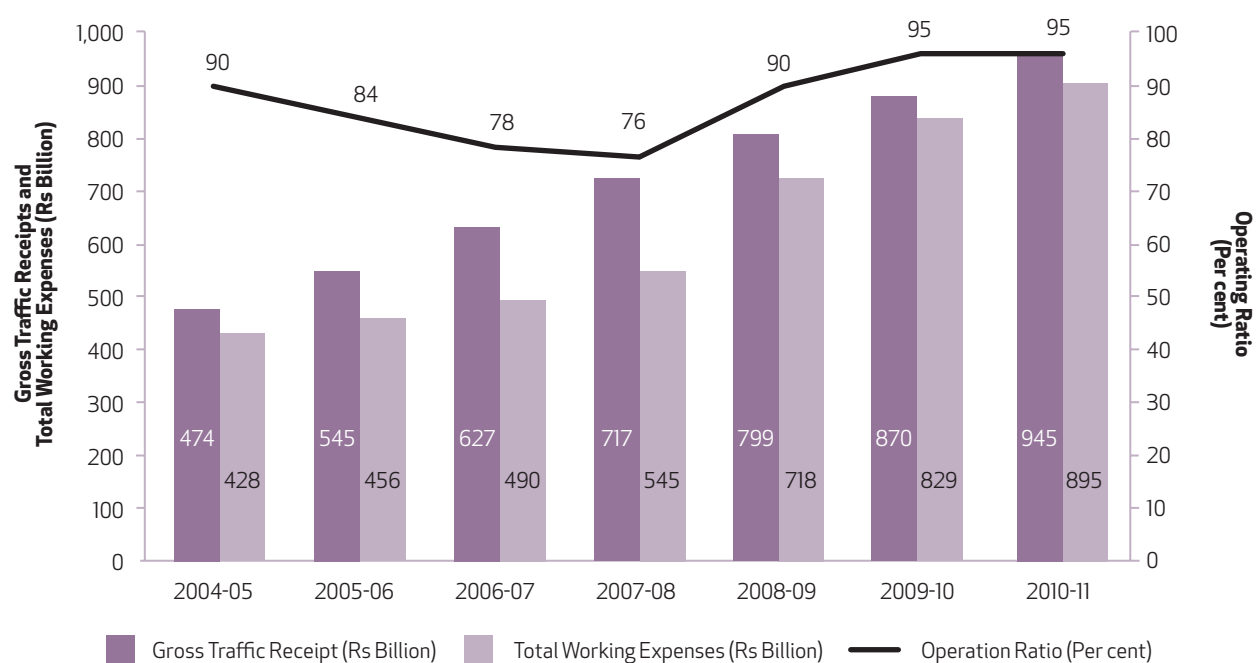
Investments & Sources of Funding: The total investment in railways in each successive plan started increasing at a sharp rate from the 6th Plan

(1980-85) onwards. The total public sector investment has increased manifold from around Rs 66 billion in the 6th Plan, to around Rs 1,900 billion in the 11th Plan. However, the IR's expenditure as a percentage of the transport sector expenditure has varied considerably over the Plan periods, as it moved from a peak of 67 per cent in the 3rd to a low of 30 per cent in the 11th Plan (Figure 1.15).

One of the key challenges faced by IR is finding resources to finance rail infrastructure that must be improved to bridge the current technology gap and capacity constraints. IR must not only meet operational expenses but must also generate adequate resources for replacement and planned investments. Railways Plan expenditure is financed through a combination of internal generation; money from the general exchequer extended as gross budgetary

Figure 1.13a

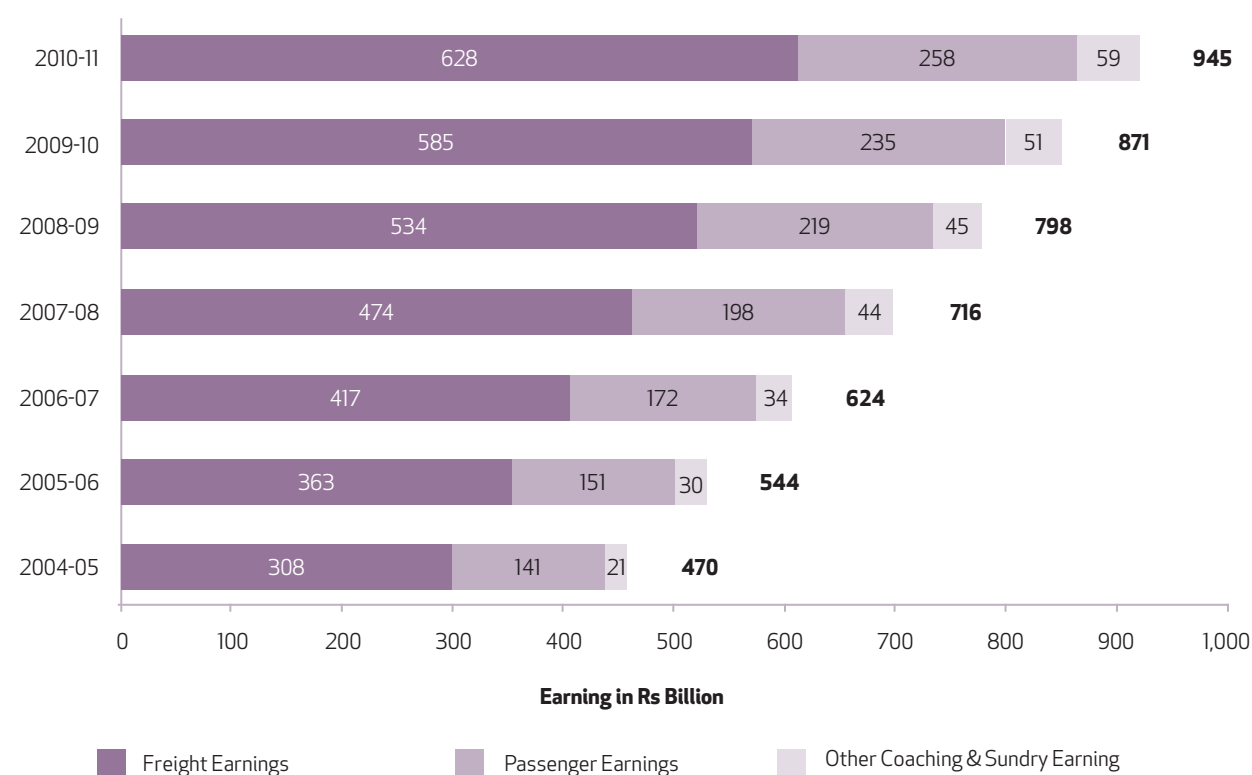
Gross Traffic Receipts, Total Working Expenses and Operating Ratio



Source: Report of the Working Group on Railways (NTDPC), Yearbook 2010-11

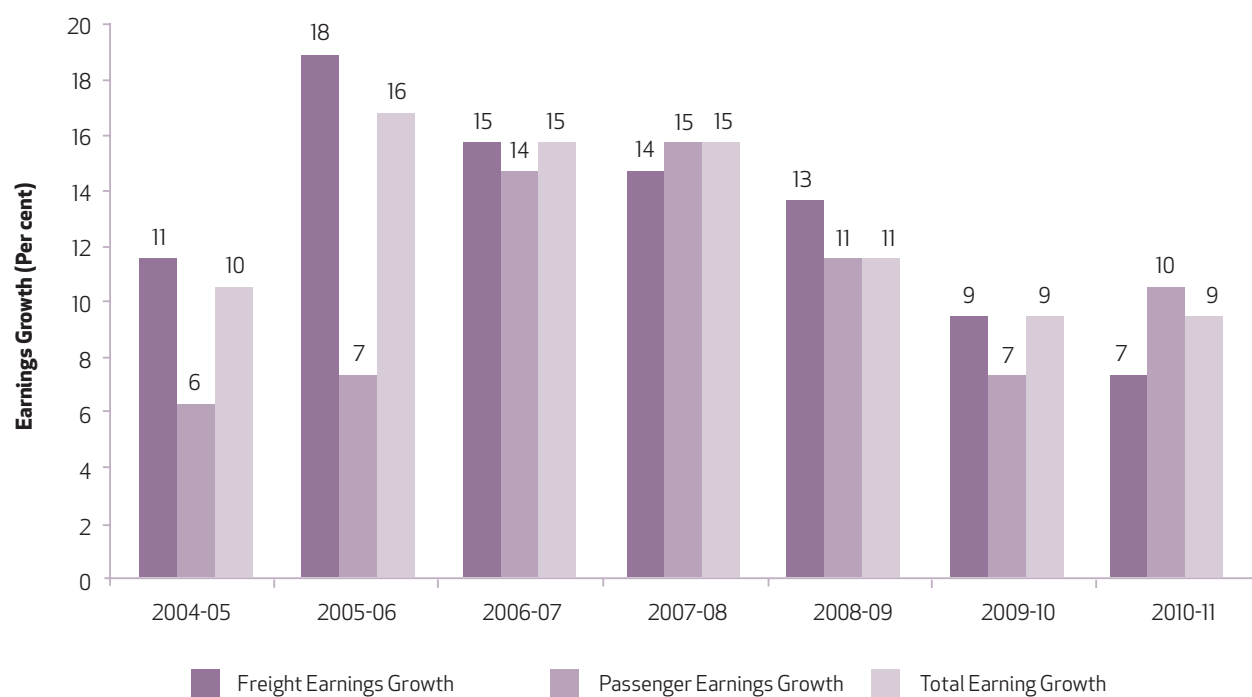
Figure 1.13b

Total Earnings [Rs Billion]



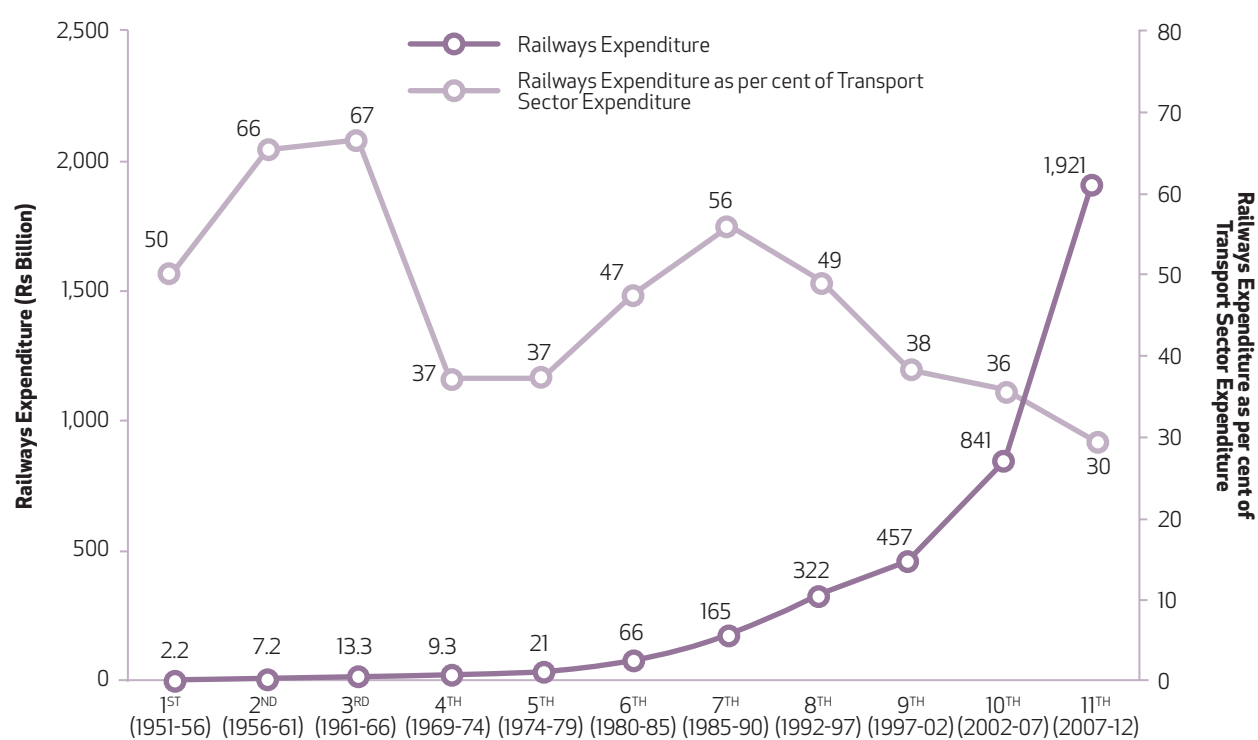
Source: Report of the Working Group on Railways (NTDPC), Yearbook 2010-11

Figure 1.14
Growth in Earnings
[Per cent]



Source: White Paper on Indian Railways 2009, Yearbook 2010-11

Figure 1.15
Trends in Railway Investments

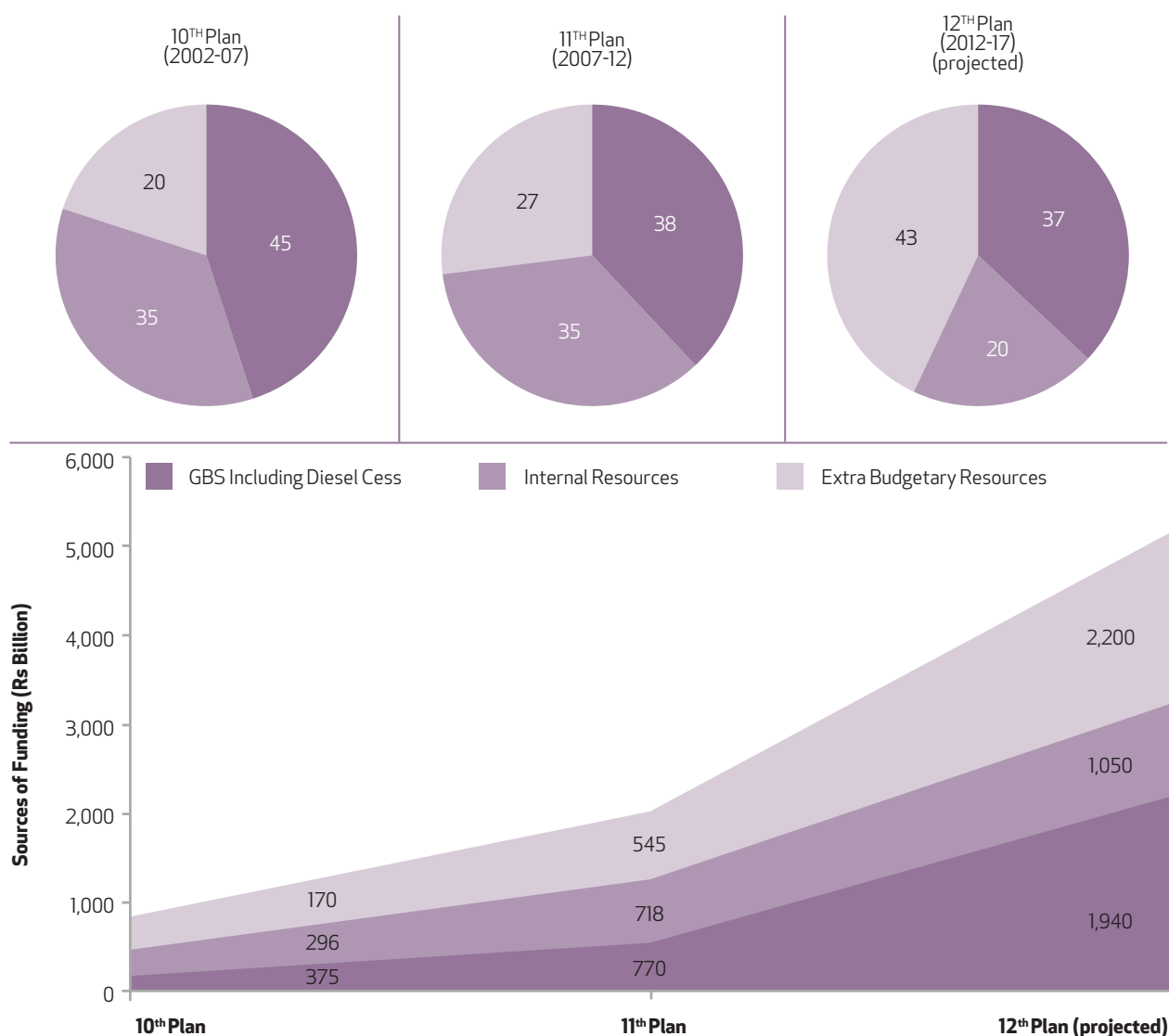


Source: Plan documents

Figure 1.16

Sources of Funding for 10th, 11th and 12th Five Year Plans

[Per cent and Rs Billion]



Source: White Paper on Indian Railways 2009, Report of the Working Group on Railways (NTDPC), Ministry of Railways

support (GBS), and market borrowings. Internal resources of IR are operated through the DRF, the Development Fund (DF) and the Capital Fund (CF).

The share of different sources of finance has varied significantly over the Plan periods. The share of GBS started declining from 75 per cent during the 5th Plan (1974-78) to a low of 23 per cent during the 8th Plan (1992-97). However, with the beginning of the 9th Plan in 1997, the trend reversed and share of GBS started rising and increased from a low of 18 per cent in 1996-97 to 56 per cent in 2004-05. In this period, internal generation levels were low and reviving the internal resource generation capability of IR became a key concern. Figure 1.16 compares the share of different sources of finance during the last two Plan periods (10th and 11th) with the projections of the 12th Plan period. The Plan expenditure, which increased

by 2.5 times from the 10th Plan (~ Rs 840 billion) to the 11th Plan (~Rs 2,000 billion), is again projected to increase by about 2.5 times to reach close to Rs 5,200 billion for the 12th Plan.

Further, IR has set an ambitious target for public private partnerships (PPP) and borrowings through IRFC, given that the share of GBS remains at the same level (about 37 per cent); and share of internal resource generation is expected to fall from 35 per cent during the last two Plan periods to 20 per cent in the 12th Plan. As a result the share of extra budgetary resources (borrowings and PPPs) is slated to rise from 27 per cent in 11th to 43 per cent in the 12th Plan.

Considering the increasing dependence of IR on budgetary support from the government, it may be useful to review the financing framework and fund-

Box 1.5

China's Self-Funding Railways: A Sustainable Model for India?

The Chinese railway is the only one in the world of a similar scale to India's. The government has increasingly required China's railways as a whole to be **self-funding**. The Ministry of Railways (MOR) is responsible for the railway financing through 18 regional rail administrations. Although MOR is part of the government, the railway sector is not treated as part of the government budget. **China Rail receives no operating subsidies from the national budget for either train or infrastructure maintenance**, and only modest support for capital investment for new lines to remote areas—less than 5 per cent of current capital funds.

China Rail earns a financial surplus overall; freight transport finances the greater part of China's network infrastructure operating, maintenance and capital costs. This is unsurprising as freight constitutes roughly 75 per cent of total traffic-kms and comprises customers with greater capacity to pay than passengers. The author considers it likely that passenger traffic as a whole more than covers its train operating expenses and makes a positive financial contribution to network infrastructure costs.

China has not adopted any policy of explicit payments for specific loss-making passenger public service obligations. China does not have the kind of suburban or intra-regional service networks (it actively discourages shorter distance passenger trips) which in many countries constitute the most loss-making parts of a passenger railway business. Nevertheless, a mixture of more or less profitable services exists, whether looked at by route or time of day. Different regions also exhibit a range of financial performance (mainly related to freight density) and MOR reallocates net revenues between regional rail authorities to ensure financial balance in each.

The Rail Construction Fund Surcharge is an important source of funding for major new construction projects and is possibly unique to China Railways. The surcharge has been imposed on the basic freight tariffs since 1990 and generates around 16 per cent of revenue. The surcharge revenue is 'ring-fenced' by the Ministry of Finance who administers the Fund. It is not subject to tax and can only be used for major upgrading, new construction and associated debt service. A second, electrification surcharge, was introduced in 1993 for all freight traffic moving on electrified lines and this revenue is used for extending electrification over the network.

A **joint venture (JV) model** was adopted in 2005 which is funded 50:50 by debt from local banks and equity from MOR and third parties (typically provinces and potential customers). Provincial equity often comes in the form of cleared land (and associated population resettlement costs). The JV model is now used for almost all new construction and upgrading projects, though regional rail administrations continue to operate the train services and question marks remain about how to get the right balance between railway system co-ordination/integration and protecting the interests of individual JV investors. China's MOR also raises **debt through loans and bonds** (usually short term), mostly through China's state-owned banks. The rapid build-up of such debt to finance the development of the High-Speed Rail network has provoked much comment regarding its sustainability. The burden would be mitigated if the debt were refinanced over tenures much more appropriate to the long-term nature of infrastructure provision. It is possible that the sovereign may need to absorb part of the debt directly.

Source: Passenger Railway Institutions and Financing, Paul F. Amos, 5 September 2011

ing sources in Chinese Railways which require only modest support from the government (Box 1.5).

INDIAN RAILWAYS: AN ASSESSMENT OF DEMAND AND GOALS FOR 2032

In any exercise of transport planning with a time horizon up to 2032, delineating the role the IR will have to play, an assessment of the desirable market

share for the railways, both in the freight and passenger segments, is essential, as also an enunciation of the strategies to achieve the objective.

VISION FOR INDIAN RAILWAYS

The Ministry of Railways has set up several expert groups in the recent past to formulate a vision for the Railways. **Report of the Expert Group on Railways** of 2001 (headed by Dr. Rakesh Mohan), the

White Paper on Indian Railways and **'Indian Railways Vision 2020'** brought out by the Ministry in 2009, the recent **Report of Sam Pitroda Committee on Modernisation of Railways** and the **Dr. Kakodkar Report on Safety**, provide guidance on strategies to aid transformation of the railways.

In **Indian Railways: Vision 2020**, the Ministry of Railways has articulated the following vision:

'Indian Railways shall provide efficient, affordable, customer-focused and environmentally sustainable integrated transportation solutions. It shall be a vehicle of inclusive growth, connecting regions, communities, ports and centers of industry, commerce, tourism and pilgrimage across the country. The reach and access of its services will be continuously expanded and improved by its integrated team of committed, empowered and satisfied employees and by use of cutting-edge technology.'

It is of the utmost importance that the various strategies set forth and the objectives mentioned in the above documents are pursued with determination for a transformational change of IR. An example of resoluteness to improve infrastructure that can be quoted is of NHDP which has brought about a phenomenal improvement in the national highways. Any failure to achieve the objectives or any slackening of the effort will only accelerate the loss in the IR's transport share to road, leading to greater pollution and environmental degradation. IR has to make a bold beginning in this direction, together with the required organisational changes.

An efficient railway transport system, along with expansion of the network, will bring in collateral benefits for the economy through industrial growth resulting from an efficient transport infrastructure and the enhanced demand for steel, wagons, engines, coaches, telecom, signalling, etc. The 12th Plan should initiate policies that encourage modern manufacturing facilities and innovation in these critical areas.

PLANNING FOR 2032

If India has to emerge as one of the largest economies of the world by 2032, railways must play its part in facilitating it. To be able to play its rightful role and attain the optimal share in the freight and passenger transport, IR would need to critically assess the business environment it faces and the internal capabilities it has. It also has to envision the future and align its resources towards attainment of the goals.

Existing scenario of freight and passenger traffic

Transport in India is dominated by road; in freight tonne-km, it contributes 57 per cent as against 36 per cent by the railways. In comparably large countries

(examples: US. and China), railways' share is 50 per cent (McKinsey's study: Building India: Transforming the Nation's Logistics Infrastructure). RITES in their Total Transport System Study have estimated that the railways' share in originating tonnage has come down from 89 per cent in 1951 to 30 per cent in 2007-2008; and by assigning transport flows to different modes, based purely on total resource costs and break-even distances derived there from, non-optimal intermodal distribution has cost the economy Rs 385 billion in 2007-2008, constituting 16 per cent of the total transport cost. This is a theoretical exercise as it implies railways' increasing its share to 75 per cent of the total transport output; further, nearly half of the commodities transported by road are non-bulk in nature, not easily amenable for movement by rail without an organised intermodal transport arrangement. Notwithstanding this, consistent shift of traffic to road is at considerable cost to the economy.

The McKinsey study too has touched upon this extra cost to the economy in its above study and estimated it at 4.3 per cent of the GDP. If the present trajectory of modal share continues, the railways' share in freight tonne km may decline to 25 per cent by 2020 and 20 per cent by 2030. McKinsey estimates the loss to the nation's economy at 5 per cent of the GDP by 2020. GDP growth at 9 per cent is also at risk.

Similarly, road transport has emerged as the predominant mode of passenger transport over the last few decades. The share of road assessed in passenger km has increased from around 26 per cent in 1951 to 87 per cent in 2005 while that of the railways has declined from 74 per cent to 13 per cent (Study by TERI, 2009).

The current trend is unsustainable from resource cost to the economy. Energy security would become increasingly important in times to come, as also environmental and social considerations, making a positive shift towards rail transport an imperative.

An integrated approach and an enabling policy framework are required to correct the existing distortion in favour of road. And it is obvious that IR will have to be prepared to rise to the challenge. The paragraphs that follow deal with desirable market share for sustainable growth of the economy.

Desirable Market Share for sustainable growth of economy

a. Potential for Freight Business

As discussed, RITES, in their Total Transport System Study, have estimated the total transport output in 2007-2008 at approximately 1,400 billion NTKMs (Table 1.1). Further, the TTSS has also estimated the total transport output (for select 52 commodities) in 2007-2008 at approximately 1,200 billion NTKMs, and the total transport demand for the year 2025-2026 at approximately 5,300 billion NTKMs (for these 52

Table 1.6
Projections of Total Freight Traffic
 [Billion NTKM]

TERMINAL YEAR OF THE PLAN PERIOD	11 TH PLAN 2012	12 TH PLAN 2017	13 TH PLAN 2022	14 TH PLAN 2027	15 TH PLAN 2032
GDP Growth Projections (Per cent)		6.9 ^P	8.0 ^E	8.5 ^E	9.0 ^E
Transport Elasticity	1.2				
Freight Traffic (Billion NTKM)	2,053 ^E	3,056	4,834	7,856	13,118

Notes:
 1. P: Projected in 12th FYP document
 2. E: Estimated (based on NTDPC research)
 Source: NTDPC

commodities). This figure has been arrived at by assessing the increased transport demand due to growth of 11 commodities that constitute a share of 53 per cent in a basket of a total of 52 commodities, and then applying the figure so arrived at for all the 52 commodities. The CAGR in percentage terms comes to 8.5 per cent. If the projection of RITES is extrapolated to 2032 at the overall growth rate of 8.5 per cent, the size of inter-regional freight movement comes to about 8,700 billion NTKMs.

The above approach is too conservative. A fast-growing Indian economy is expected to be accompanied by a proportionately high demand for transportation. If the country's GDP grows at an average of 8 per cent per annum over the 20-year period (2013-2032) and the elasticity of total freight traffic-to-GDP is estimated at 1.2, the transport growth rate would come to about 9.7 per cent per annum. At this rate, the total freight tonne kilometres would grow by a factor of 6.4, from about 2,050 billion NTKMs in 2011-12 to more than 13,000 billion NTKMs by 2032 (Table 1.6).

No attempt has been made for any detailed commodity-wise projections but the current trends and development plans of major freight generating sectors corroborate the conclusion that transport would continue to grow. Major freight generating sectors such as power, steel and cement industries and consequently coal, both domestically mined and imported, are poised for a massive expansion. Coal constitutes close to 45 per cent of the total railways' freight movement. Although part of the coal movement may shift to non-rail alternatives (e.g. pit-head or port-based power plants relying on merry-go-round or conveyor belt systems), concerns on pollution overload and energy security at state/regional level would lead to continued expansion of thermal generation capacity across the country. Both the volume and lead of coal transport would increase as a result. A large part of the movement would involve linkages to new mines or ports. IR can grow very fast in these segments and increase its share provided network and terminal capacity are built up expedi-

tiously and its service offerings satisfy the increasingly cost-conscious customers who now operate in a fiercely competitive environment. According to the McKinsey study, 65 per cent of the total freight traffic is bulk in nature and 75 per cent of the traffic, in terms of NTKMs, moves over distance slabs exceeding 400 km. This presents a huge opportunity for railways to increase their share.

As mentioned earlier, nearly half of the freight moved by road is in the non-bulk segment, and a substantial part of it, with a lead of over 500 km. If the objective of a shift to rail is to be achieved, the imperative need is for an organised intermodal transport system which will combine the advantages of rail with that of road. In this context, the need for the IR to capture a significant share of the fast-growing FMCG, CDIT, containerised cargo and other segments like automobiles, where its presence is negligible or minimal, is obvious. The 12th Plan has also recommended containerisation as a major strategy to gain share of the freight market (Box 1.6). Internationally also large rail freight providers have redefined their role beyond just running trains into the larger world of multi-modal freight transport and logistics (Box 1.7).

Given the realities of cost, economics and customer convenience, as also the modal share in comparable countries (China and the US), the Working Group on Railways (for NTDPC) has recommended that the Indian Railways must achieve a market share of 50 per cent by developing a sharper commercial focus. Table 1.7 provides the estimates for rail freight output till 2032.

In order to attain the desired market share of 50 per cent, railways' freight traffic has to grow at an average of 12 per cent over the next 20 years, which looks challenging given the growth rate of 8 per cent achieved in the last six years. A business as usual approach is just not an option as growing at 8 per cent per annum, while the transport market expands at close to 10 per cent, would mean that railways'

Box 1.6

Containerisation in Railways

Due to the economic and technological attributes of the railways, it has always been a challenge to attract consignments which are less than at least a thousand tonnes. Container trains combine the operational efficiency of unit trains with the commercial flexibility of booking 20 tonnes or even less at a time. According to the Total Transportation Study (TTS) conducted by RITES for the Planning Commission, the volume of non-bulk traffic in 2006–07 was 227.17 million tonnes out of the total traffic of 2386.97 million tonnes.

Indian Railways set up Container Corporation of India (Concor) in 1988 as a public sector company to spear head containerisation. It commenced operations in 1989 at which stage Indian Railways transferred all Inland Container Depots (ICDs) and container related business to Concor. From the 7 ICDs it took over from Indian Railways at inception, Concor has now expanded the network to more than 44 ICDs and 14 domestic and port side terminals and has 213 rakes of flat wagons. Using IR's network and haulage, it has pioneered the concept of multi-modalism through its core activities as a carrier of rail borne container traffic and terminal operation.

Anticipating higher container traffic at Indian ports, Railways liberalised the entry of private players in the area of rail-based haulage of containers in 2005. The response has been quite good with 15 new entrants. These 15 new operators have procured 132 rakes and developed 9 new terminals. Sizeable on-track competition has emerged in some of the exim sectors as well as the domestic sector. Competition also led to an increase in the growth of rail based intermodal traffic at a rate of 15.5 per cent in the period 2007–08 till 2011–2012 although there has been a negative growth rate in the domestic sector during 2011–12 due to introduction of container class rate for some of the commodities moved normally by conventional wagons. There is a need to expand containerisation business and improve Railways share in transport sector. Policies in the 12th Plan will aim at this.

Source: 12th Five Year Plan, Planning Commission, GoI

Box 1.7

Intermodalism, Multimodalism and Logistics Capability

Larger rail freight providers in the 8 countries (refer table below) have redefined their role beyond just running trains into the larger world of multi-modal freight transport and logistics. They have done so not only to better serve their markets but also to avoid becoming disconnected from final markets, and thereby becoming passive 'price-takers' from the 'middlemen', including freight forwarders and logistics companies who in many countries are increasingly responsible for overall transport organisation under contract to ultimate freight shippers or receivers. By engaging more effectively in supply chains the railways have increased market 'reach' without increasing network length.

COUNTRY	RAILWAYS AND LOGISTICS
Australia	Rail freight operators have had close partnering arrangements with freight forwarders for decades but since railway restructuring freight companies with wider logistics businesses now run most interstate freight trains in Australia.
Brazil	Many of Brazil's railways deal with bulk mining and agricultural products but the company with the largest network (with concessions in Brazil and Argentina) 'America Latina Logistica', markets itself as a full service logistics company.
Canada	CN promotes itself as a transportation company that offers integrated services: rail, intermodal, trucking, freight forwarding, warehousing and distribution. Canadian Pacific stresses ability to plan and manage logistics solutions and provides one-stop shopping for door-to-door transportation using long-haul capabilities of the railway and the local market access of trucking, for both rail and non-rail served customers.

(Contd...)

COUNTRY	RAILWAYS AND LOGISTICS
China	China Railway Container Transport Company was established to manage the container business, including rail and intermodal transport, cargo handling and delivery, the sale and leasing of wagons, containers and facilities. JV with international investors to establish 18 major intermodal centres linked by regular container train services.
Germany	DB Schenker, the main national rail freight operator, is a multimodal transport company offering through separate LOB divisions and subsidiaries services in rail freight, land transport, air freight, ocean freight, contract logistics.
Japan	With limited bulk traffic Japan Rail Freight Company has necessarily concentrated on efficient inter-modal logistics linking 140 container rail terminals with road, sea, and air routes.
Russia	Has established subsidiary companies to provide overall logistics services in shipping containers, domestic container service, automobiles, perishable goods.
United States	Many different models but Class 1 railways now typically have overall Logistics Planning capability offering solutions and management of logistics across modes, as a LOB or as subsidiary or associated companies.

One early form of integration with other modes was the so-called piggy-back service. After about 1975, there was substantial growth in the carriage of road truck trailers on rail flat-cars in N.America. The modest net/tare ratio of such arrangements and the sometimes cumbersome and labour-intensive loading process inevitably raises the costs of train operations and potential margins are at best thin. More substantially, maritime freight containerisation over the last 30 years has created a new niche for railways in an integrated transport market. This is particularly so for ISO containers on routes between international ports and inland cities but traffic can then take advantage of unbalanced container loadings and the availability of the low-cost container liner services. In the last few years' inter-modal traffic has overtaken coal as the single biggest generator of revenue in US railways. But the trailer traffic has declined & container transport, which is more cost-efficient for railways to handle (even more so with double-stacking) now dominates the intermodal market.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Paul Amos, July 2011

Table 1.7
Projections of Rail Freight Output
 [Billion NTKM]

TERMINAL YEAR OF THE PLAN PERIOD	11 TH PLAN 2012	12 TH PLAN 2017	13 TH PLAN 2022	14 TH PLAN 2027	15 TH PLAN 2032
GDP Growth Projections (Per cent)		6.9 ^P	8.0 ^E	8.5 ^E	9.0 ^E
Transport Elasticity	1.2				
Freight Traffic (Billion NTKM)	2,053 ^E	3,056	4,834	7,856	13,118
Modal share: Rail Freight (per cent) (Assumption)		35	39	45	50
Rail Freight Output (Billion NTKM)		1,070	1,885	3,535	6,559
CAGR (per cent) - Rail Freight Output		10	12	13	13

Notes:
 1. P: Projected in 12th FYP document
 2. E: Estimated (based on NTDP research)
 Source: NTDP

share would actually decline to less than 24 per cent by 2032. Even to retain the existing share of 36 per cent, IR has to keep growing at more than 10 per cent per annum. However, given the severe capacity constraints and various other challenges, a more realistic goal would be to grow at 9-10 per cent till 2022 and

accelerate the growth to 14-15 per cent per annum thereafter to reach 50 per cent market share by 2032. This will also be consistent with the proposed capacity creation and augmentation plans, whereby the two DFCs are likely to be operational only after 2017.

Table 1.8
Passenger Growth IR

YEAR	PASSENGER KILOMETRES (IN BILLIONS)		
	SUBURBAN (PER CENT)	NON-SUBURBAN (PER CENT)	TOTAL
2011-12 ^A	144 (14)	903 (86)	1,047
2016-17	189 (12.5)	1,320 (87.5)	1,509
2021-22	253 (11)	2,047 (89)	2,300
2026-27	342 (9.5)	3,254 (90.5)	3,596
2031-32	461 (8)	5,304 (92)	5,765

Notes:

1. A: Actual (from Railways yearbook 2011-12)

2. GDP growth projections:

• 12th Plan: 6.9 per cent (projected in 12th FYP document);

• 13th Plan: 8 per cent; 14th Plan: 8.5 per cent; 15th Plan: 9 per cent (NTDPC estimates)

Source: NTDPC, Report of the Working Group on Railways (NTDPC)

b. Potential for Passenger Business

The RITES study did not attempt an assessment of the size of the total passenger transport market in the country and its intermodal distribution among the various modes. Reliable information is available only in respect of rail and air transport, the two sectors which maintain statistics on a continuous basis.

RITES has also not carried out any optimisation exercise in respect of passenger transport, as has been done for freight. There is thus no reference base available for determination of an optimal share for the railways and projection of figures for 2032. This approach, that is, 'optimality consideration', may not be relevant as railways' passenger transport has long been operating under manifest supply constraints. There is also an imbalance in the passenger mix in that a preponderant proportion of passengers carried by IR are of short lead in nature, which perhaps could be better served by road.

Urban population constituted 30 per cent of the total population in 2010; this is projected to grow to 40 per cent by 2030 (India Urbanisation Econometric Model, McKinsey Global Institute). India's economic growth rate also presents a potential for higher demand for transportation; rapid urbanisation and the on-going structural transformation of the Indian economy would give rise to increased demand for travel. Extensive use of information technology for ticketing, reservation and overall improved convenience of passengers in recent years also presents an opportunity for the growth in passenger travel. Past

trends may not, therefore, be an accurate guide for projecting the figures for 2032.

Over the past 15 years, the elasticity of growth of passenger kilometres vis-a-vis GDP growth has been 1.1. Using this elasticity and the GDP growth estimates, the passenger traffic (in PKM) is expected to grow by a factor of 5.5 over the next 20 years. Further, the current trends of progressively declining proportion of suburban passengers and the increasing share of upper class and longer lead passengers would also need to be taken into account in planning. On the basis of this assumption, projected passenger growth is shown in Table 1.8.

c. Potential for Parcel Business

Parcel traffic, mostly transported along with passenger services, presently forms an insignificant proportion of about 2 per cent of the non-bulk traffic of the country. As per the data for 2011-12, IR transported approximately 7 million tonnes of parcels, generating revenue of about Rs 16 billion. Parcel business is at present a loss-making activity for IR.

The potential, however, is large. As mentioned earlier, CRISIL Infrastructure Advisory study has assessed the total movement by road of 22 commodities, out of a basket of 52 commodities, carried as per the data for 2009-10, at about 400 million tonnes. These 22 commodities are easily amenable for movement by rail as parcels for distances of 500 km and over.

If the modal share of the railways has to improve, a shift of long distance (500 km and above) trans-

port of parcels essentially non-bulk packaged items to rail is a must. It needs no reiteration that the IR has a major share of bulk movement and the need is for an ever-increasing market share of the non-bulk commodities.

The above would, however, need a market oriented strategy, with focus on total logistics support, value added services, rational cost and value based tariff, state-of-the-art IT applications for providing real-time online access to information on movement of consignments and adequate and appropriate rolling stock and public private participation in terminal operation and road bridging. Dedicated parcel terminals with mechanised handling facilities, specifically targeted at agricultural produce, automobiles, other industrial products and general parcels and a focused business organisation that would concentrate on marketing, sales and transport of parcel services within an agreed transit time through time-tabled trains and parcel specials form an essential feature of the strategy.

Indian Railways Vision 2020 recognises the above and has set a target of revenue of Rs 80 billion by 2019-2020. However, this segment being small on the whole cannot be the mainstay of freight traffic volumes.

SERVICE DELIVERY AND CUSTOMER ORIENTATION

IR must provide services to meet customers' requirements and expectations. It has to devise solutions that anticipate and meet customers' needs in different segments. In the freight service, bulk and non-bulk commodities would demand different approaches. In passenger services, premium and non-premium passengers, and suburban and intercity passengers would similarly demand different approaches.

The goal for service delivery should provide for the following:

A. FREIGHT BUSINESS

The goal for freight business is to have segregated freight corridors, improving the speed of transit and cost-efficiencies in bulk transport. The strategy for freight business should also specifically provide for:

- **Construction of six Dedicated Freight Corridors.**
- **Setting up of a focused business organisation for multimodal transport** of non-bulk commodities (e.g. parcels) under the PPP mode, combining the efficiency and advantages of rail and road.
- Improved connectivity to industry clusters as well as significant ports (major and non-major), based on their current and projected traffic volumes. Development of last-mile connectivity should be encouraged through PPPs.

- **Development of 15 to 20 logistics parks** as the main network hubs viz. Mumbai Bangalore, Cochin, Hyderabad, Kolkata, Delhi NCR, Ahmedabad, Nagpur, Vishakhapatnam and Siliguri, etc. IR must work in **partnership (in a joint venture) with state and city authorities** to set up rail-based multi-modal logistics parks to attract increasing volumes of miscellaneous cargo to rail.
- Upgrade rail wagons (higher axle load, better tare to payload by shifting away from carbon steel to stainless steel and aluminium/other light-weight bodies, increased payload of covered wagons (BCN) through use of well wagons, better maintenance cycles, etc).
- Upgrade wagons and track to 25 tonnes axle load.
- Improved infrastructure and rolling stock maintenance.
- Running of freight trains at 100 km per hour.
- Running of premium freight services with differential pricing and assured deliveries.
- Supply of rakes on demand with differential pricing for different demand lead times.
- Running of trains on schedule with guaranteed transit time.
- Development of a few selected corridors for heavy-haul operations.
- Running of automobile, hazardous material trains, movement of bulk cement, etc by private train operators.
- Reduction in cargo parcel size to 1,000 tonnes and aggregation mechanism for even smaller parcel-sizes.

B. PASSENGER SERVICES

Quality of services in terms of punctuality, safety, security, sanitation, and other value-added services needs to be upgraded. Access to railway services needs to be improved using existing and innovative networks of distribution channels like Internet, mobile telephones and other vending mechanism. Speed of trains should be enhanced on segregated passenger routes. The strategy for passenger business will include:

- Augmentation of supply (more trains and longer trains) to ensure full satisfaction of demand.
- Shift of focus to long-distance and inter-city transport and suburban corridors involving dense passenger movements.
- Upgrade speed to 160-200 kmph on selected corridors.
- Redevelopment of stations for smooth flow and comfortable experience of passengers as also to ensure clean and hygienic environment.
- Redesign of coaches to enhance travel comfort.
- Conversion of all stopping passenger trains to EMUs/DMUs or railcars; invitation to state governments to manage uneconomic and unpatronised services.

Box 1.8

A Competitive Freight Market

Indian Railways' freight services are moving from a captive to a competitive market. In order that the freight segment grows to its full potential, reliance on marketing alone will certainly not suffice. Even marketing in combination with innovating pricing solutions will not be adequate. The target customer and traffic stream needs to be considered at the stage of designing the scope of projects and determining the investment.

Developing a strategy for the bulk/non-bulk freight business:

Railways have traditionally focused on the bulk long haul traffic. With the increasing growth rates of the non-bulk segment, there is need to address the long haul non-bulk segment. This would involve developing multi-modal transportation solutions with road and other private industry participation. A detailed assessment of the bulk and non-bulk transport opportunities available for the Railways as also the organisational imperatives that need to be addressed to increase customer focus and responsiveness would be a critical step towards developing a profitably growing freight business.

The non-bulk and manufactured goods are high value traffic that can bear higher freight rates and yield higher profit. To improve the mix of goods as well as earn higher revenues and higher profits, it is necessary that Railways devise cost effective and efficient services, pricing structures and operational strategies to cater to this traffic. Railways must adopt the principle of logistics and supply chain management that offer total transportation solutions to the customers. For this purpose, it must move towards integration and partnership with complementary entities in other modes of transport and promote multi-modal transport systems.

The key imperatives and challenges to develop a cohesive strategy for the freight business would be to involve freight customers in the exercise and to gear the organisation for improved customer focus.

Source: The Indian Railways Report 2001: Expert Group on Indian Railways

- Development of select High Speed Rail (HSR) corridors (speed of 350 kmph), if and when deemed to be economically viable.

INVESTMENT REQUIREMENTS AND FINANCING PLAN

INVESTMENT REQUIREMENTS

The previous section sets out the following broad goals for IR for 2032:

- Achieve 50 per cent share in freight transport; and
- Meet the passenger service demand in full.

However, while the potential to grow in both freight and passenger traffic segments is immense, without adequate capacity all efforts to capture traffic would come to naught. **Therefore, capacity creation is the single biggest challenge confronting IR in the next few years. It is of the utmost importance that a vision similar to that of NHDP is laid down for the railways now so that we may expect a transformed network by 2032.**

Plans for capacity creation must encompass both infrastructure and rolling stock and cater to projec-

tions for both, the existing traffic streams and capacity needed to cater to new traffic streams. An analysis done by Long Range Decision Support Systems (LRDSS) of Ministry of Railways indicates that most of the traffic growth would come along the existing Golden Quadrilateral and Diagonals. This is also reinforced by the McKinsey report. Further, investments needed to modernise the railway system and ensure a zero-accident and fully reliable systems need to be ensured.

An investment plan for 20 years clearly articulating the goals and fully backed by a funding plan is needed. The following sections discuss the investment needs⁹ (tentative) over a time-horizon of 2012 to 2032, spanning four Five Year Plans (12th to 15th). The broad heads for investments are as follows:

- Capacity Augmentation (including safety works)
- Rolling Stock
- Stations & Terminals, Technological upgrade and modernisation

CAPACITY AUGMENTATION

Any serious effort at capacity augmentation must first and foremost focus on decongestion of congest-

9. The investment needs have been estimated assuming that IR attains a freight share of 50 per cent by the year 2032 with high GDP growth rate (about 9 per cent)

Dedicated Freight Corridors (DFCs): A Game Changer for the Indian Rail Sector

The Dedicated Freight Corridors on the Western and the Eastern routes is a strategic capacity augmentation initiative taken by Railways and involves construction of 3,338 kms of dedicated freight lines to carry predominantly coal and steel on the Eastern corridor and containers on the Western corridor. The ports in the Western region covering Maharashtra and Gujarat would be efficiently linked to the Northern hinterland and similarly on the Eastern side, coal would move to the power plants in the North. The Project completion cost is estimated at Rs 959 billion. A major part of the project is being financed through multilateral/bilateral debt. World Bank funding of part of Eastern DFC is estimated at US \$2.73 billion (Rs 136 billion) and JICA funding of 504 billion Yen (Rs 315 billion). Dankuni–Sonnagar section of Eastern DFC (Rs 100 billion) is to be implemented through PPP. The balance requirement would need to be met through Budgetary Support. Both Eastern and Western DFCs are targeted for completion in the terminal year of the 12th Plan.

Dedicated Freight Corridor can be justifiably called an innovation in rail transport in India because of a number of reasons. The average speed of freight trains will go up from 25 kmph to 70 kmph which will reduce the transit time by less than half from the present levels.

Railway technology would get a major up-gradation with the help of heavy hauled freight trains of 15,000 tonnes capacity and 1500 metres length. The axle loads of DFC routes will also go up from 25 tonnes to 32.5 tonnes which would enhance the track loading capacity from 8.67 tonnes per metre to 12 tonnes per metre. Wagons with much better pay load to tare ratio would also get introduced through this technology. Newer technology in signaling, train communication, track-maintenance and operations would get introduced in the Indian Railways system. The capacity released by freight trains can be used for running more passenger trains at higher speeds after upgrading the existing mixed corridors of Indian Railways.

In addition, this initiative is expected to offer significant reduction of Green House Gas (GHG) emissions in transport sector of India.

Pre-feasibility studies have also been completed on the four new Freight Corridors, viz. North-South, East-West, East-South and Southern corridors and Preliminary Engineering cum Traffic Survey is being undertaken by RITES. Based on the outcome of the PETS a beginning would be made in the Twelfth Plan in implementation of the new corridors in a phased manner.

Source: 12th Five Year Plan, Volume II, Planning Commission, Govt.

ed routes and segregation of freight and passenger traffic on the most heavily trafficked routes. This can be achieved by:

- Construction of Dedicated Freight Corridors (DFCs) on the busy high density network such as Delhi-Mumbai, Delhi-Kolkata, Delhi-Chennai, Kolkata-Mumbai, Chennai-Goa and Kolkata-Chennai routes, with specifications that enable high traffic and heavy-haul freight operations; and
- Construction of third and fourth lines on other saturated routes.

Six DFCs totalling 9,538 km that would be needed are:

- Western DFC (Delhi-Mumbai) 1,534 km;
- Eastern DFC (Ludhiana-Kolkata) 1,839 km;
- East West DFC (Howrah-Mumbai) 1,976 km;
- East-Coast DFC (Kharagpur-Vijaywada) 1,097 km;
- South DFC (Chennai –Goa) 902km; and

- North South DFC (Delhi-Chennai) 2,190 km.

Of these the first two are already under construction (expected to be commissioned by March 2017), and for the others pre-feasibility studies have been carried out. It is suggested that private sector participation should be encouraged by IR for development and operations of the DFCs.

Quadrupling (non-DFC lines) and fifth and sixth Lines:

In addition to the DFCs, a number of other saturated stretches (approximately 14,500 km) would also need third and fourth lines. Lines approaching major metropolises would also require additional fifth and sixth lines to effectively segregate commuter lines from non-commuter lines.

Doubling and Gauge conversion: Similarly, around 24,000 km of single lines facing congestion would need to be doubled. In other words, roughly

48,500 km of the network (which should exceed 90,000 km by 2032) would need to be either double or quadruple lines. Gauge conversion would have to be completed for the remaining part of the network (roughly 8,000 km).

Freight bypasses and traffic facility works such as splitting of block sections, construction of terminals and additional loops, etc. would also need to be taken care of in full.

Speed raising: A major effort is also required to upgrade speed on segregated passenger corridors to 160-200 kmph this would imply deployment of advanced signalling technology (ATP/Cab signalling/CTC), elimination of level crossings, fencing of tracks, removal of permanent speed restrictions, etc. The investment on this account would be of the order of Rs 1,000 billion.

Other safety works (signalling, removal of level-crossings, renewal/modernisation works for track/signalling, etc.) will entail investment to the tune of Rs 2,500 billion.

New Lines: Since independence, the pace of new lines construction has been roughly 200 km per annum. The Working Group on Railways (for the NTDP) has suggested that network expansion by way of new lines should be planned on a much bigger scale than has been done so far, and recommended to accelerate the construction of new lines to a level of at least 2,000 km per annum over the next 20 years. Accordingly, the Working Group envisaged that the total length of new lines to be constructed would be around 30,000 km (including national projects and projects required for strategic regions and international corridors), costing around Rs 3,000 billion at present-day costs.

However, the Committee (NTDP) is of the view that it is essential to abandon or not commence work on the many extraneous lines that have been initiated in the past, and on which almost no work has been done if consistent economic growth of 8-10 per cent per annum is to be achieved and IR has to achieve the goal of 50 per cent share in freight transport over the next 20 years. These extraneous lines are not only expected to be uneconomic routes but also meet the traffic requirements to a very limited extent. The 12th Plan also emphasises that excessive sanctioning of new projects annually, much beyond the resources available is a major problem in the railways and it only increases the throw-forward (number of projects under implementation). It shows that 132 new line projects (totalling about 14,200 km in length) are under implementation as of April 2012.

Further, acknowledging the importance of enhancing transport connectivity for inclusive growth, the

Committee (NTDP) recommends that focus should be on developing interconnectivity between different modes, e.g. instead of investing resources in uneconomic rail lines, the connectivity to the existing rail network should be strengthened through investments in improving road connectivity (e.g. PMGSY) and bus transport. This will ensure that people have access to economic transport services at a lower overall cost to the economy.

High Speed Rail (HSR): HSR is defined as a distinct category of passenger rail transport system that normally operates with separate track and rolling stock at speeds faster than 250 kmph. HSR has been in operation for nearly 50 years in Japan and for over 30 years in France. As of July 2012, about 17,500 km of HSR tracks were in operation, about 9,300 km were under construction and another 15,500 km were in the planning stage globally.¹⁰ China has the longest HSR network in the world today, even though it launched its HSR network only in 2003.

A review of the most important HSR projects carried out to date around the globe highlights that the potential demand for services must be particularly high in order to make investment in them socially profitable and that these projects must target the corridors linking densely-populated metropolitan areas, suffering from severe road congestion, and having deficient air links. Table 1.9 summarises the lessons learned from HSR implementation across Japan, France, Germany, Spain and Italy.

The Working Group on Railways (for the NTDP) has suggested that about 4,000 km of high-speed corridors costing Rs 4,000 billion could be planned in India. **However, the Committee (NTDP) is of the view that given the current financial situation of IR (limiting the funds available for expansion), priority should be given to projects such as DFCs which are self-financing, as compared to projects such as HSR network which require continuous fiscal support (Box 1.10).**

Further, the Committee believes that a more integrated approach is required to be taken of transport as a whole and choices will need to be made on the priorities to be placed on different investments. At present, this prioritisation and decision-making is disjointed as the decisions on investments in road expressways, on the one hand, and potential railway DFCs and high speed trains, on the other, are being made in isolation of each other. The investment in DFCs is critical if IR has to achieve the target of 50 per cent share of railways in freight transport by 2032. With the construction and commissioning of DFCs, freight trains would get substantially diverted to the new freight corridors. This would present an opportunity to increase the maximum permissible speed of passenger trains on the existing corridors

10. HSR: A Worldview and its Relevance to India (K.P. Singh, RITES Journal, Volume 1, Issue 1, January 2013)

Table 1.9
Summary of Lessons Offered by International Experiences of HSR Projects

SUMMARY OF LESSONS	
Motivation	HSR has to be devoted to solving congestion in corridors between large populated cities. Political or administrative objectives and extension of lines for regional equity and development lead to the economic failure of the project.
Design and Functions	The international experience shows that passenger-oriented HSR has a minimum economic impact on the territory served. Lower construction costs are associated with combining HSR and conventional rail. Routes have to be established according to demand (commercial basis). Adequate multimodal connections are needed.
Economic Cost	The development of an HSR network entails huge construction and operation costs (especially important land expropriation cost, bridges, and tunnels). The key decision that affects cost concerns complementarities (passenger/freight) and the extent of combination with existing conventional rail. Political pressures (connection and station costs) can increase HSR cost and constrain its profitability because of opportunism or private interests from both politicians and bureaucrats.
Mobility Impacts	Provide significant travel time savings when compared to conventional rail services, but similar door-to-door timings are reported for air transportation on routes of around 400 miles. Modal distribution of traffic is affected when HST starts operation, with the greatest impact on the airline industry.
Environmental Cost	Energy consumption and carbon dioxide emissions are lower for HST than for air transportation. However, they are also greater for HST than for conventional rail per seat mile. In fact, it is necessary to wait more than three decades to compensate energy and pollution generated during construction.
Economic and Regional Effects	HSR does not generate any new activities, nor does it attract new firms and investment, but rather it helps to consolidate and promote ongoing processes as well as to facilitate intraorganisational journeys, for which mobility is essential. For regions and cities whose economic conditions compare unfavorably with those of their neighbors, a connection to the HSR may even result in economic activities being drained away and an overall negative impact. Medium-sized cities may suffer the most because of the centralisation of activities in large nodes. Tourism and the services sector are the only activities favored, while no effects are reported for industrial and agricultural activities.

Source: HSR: Lessons for Policy Makers from Experiences Abroad, Public Administration Review, June 2012

to 160-200 kmph (at present the maximum permissible speed for passenger trains on IR is 150 kmph for a few trains and the average commercial speed is in the range of 70 kmph). This would, in turn, enable operation of overnight inter-city services in the distance range of 1,000-1,500 km, as also help connect cities within distance of 500-700 km with high-speed day services.

Increasing speeds to 160-200 kmph would need inputs by way of removal of speed restrictions, yard remodelling, fencing, improved signalling, easing of sharp curves etc; the most opportune time would be to commence the exercise and implement the scheme when any section of the Dedicated Freight Corridor gets commissioned, relieving the pressure of operating freight trains on an existing congested section. The aim can be to successively increase the average speed in phases, reaching 120 kmph ultimately. The end result is shown in Table 1.10. These services would be able to satisfy the requirement of high speed travel in a large measure. Annex 1.2 shows a map of the suggested routes for increasing the maximum permissible speed to 160-200 kmph.

Thus, given the substantial funding required from government to implement HSR projects, a programme for raising speed to 160-200 kmph on selected existing routes should be undertaken till the time the HSR projects are found commercially justified or operationally required to cater to the country's growth and mobility needs.

Summary of Capacity Augmentation: Figure 1.17 shows the summary of investments required for capacity augmentation by 2032. The total cost for various capacity augmentation initiatives discussed above is close to Rs 12,500 billion, excluding the investments on new lines and HSR (the investment requirement increases to Rs 18,200 billion including these initiatives).

ROLLING STOCK

Along with the envisaged investments in capacity augmentation, there would be a huge requirement of rolling stock, both for replacement combined with technological upgrade and increased needs of traffic, if IR has to achieve the goals set for freight and

Box 1.10

High Speed Rail in Indian context

High-speed rail (HSR) is defined as a distinct category of passenger rail transport system that normally operates with separate track and rolling stock at speeds faster than 250 kmph. It uses a different level of rail technology and management principle that positions it at an unbeatable advantage vis-a-vis other modes like cars and air-planes in the distance range of 500-1000 kilometres.

HSR has emerged as a fast and efficient transportation system for medium-distance travel of up to 1000 km. Some of the main reasons for introduction of HSR internationally are need for generation of additional capacity on the conventional network; regaining share from airlines and road; and energy security and environmental concerns. HSR network has various benefits such as lower energy consumption, lesser land usage for a given capacity compared to motorways, decongestion of metro cities, significant savings in journey time etc.

However, HSR networks world over require continuous fiscal support due to high costs of construction and rolling stock. It is estimated that an annual ridership of at least 20 million passengers are required just to cover the working expenses and interest costs and probably double that number to have any possibility of recovering the capital cost. In India, the cost of construction of a high-speed double line rail corridor between Pune-Mumbai-Ahmedabad has been estimated at Rs 630 billion (excluding rolling stock) for 640 kms i.e. around Rs 800 million per km. In comparison, cost of the construction for DFC is estimated to be Rs 250 million per km.

Source: Report of the Working Group on Railways (NTDPC)

Table 1.10

Possible Savings in Travel Time with Speed Raising on Suggested Routes

ORIGIN	DESTINATION	DISTANCE (KMS)	CURRENT DURATION (HOURS)	PROPOSED DURATION (HOURS)	TIME SAVING (HOURS)
Delhi	Ahmedabad	934	13.5	8.0	5.5
Delhi	Mumbai	1,384	16	11.5	4.5
Delhi	Allahabad	634	7.5	5.5	2.0
Delhi	Kolkata	1,453	16.5	12.0	4.5
Delhi	Chennai	2,176	28.5	18.0	10.5
Mumbai	Ahmedabad	491	6	4.0	2.0
Mumbai	Kolkata	1,968	26.5	16.5	10.0

Notes:

1. Current duration has been calculated based on scheduled departure and arrival timings of Duronto or Rajdhani trains between the origin and destination.
2. Proposed duration has been calculated assuming an average speed of 120 kmph, post commissioning of DFC and upgradation of speeds on the identified corridors.

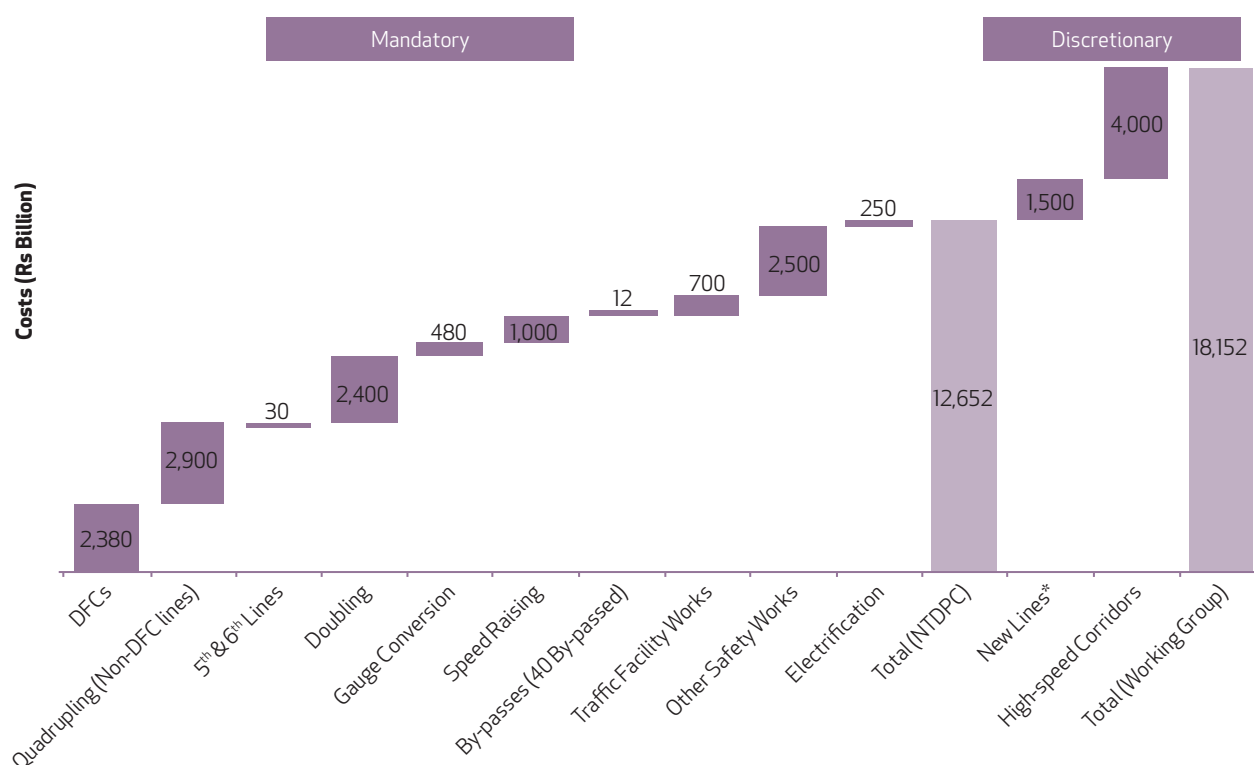
Source: NTDPC

passenger transport. Figure 1.18 provides the rolling stock requirement on the basis of the projections discussed earlier (Table 1.7). The rolling stock requirement has been worked out by taking into account 100 per cent improvement in utilisation of freight wagons, 50 per cent improvement in efficiency utilisation of freight locomotives, 20 per cent improvement in utilisation of passenger locomotives and the replacement requirements. These improvements may appear to be too high, but would need to be aimed at and realised given the scale of investment in track capacity, zero-accident/failure and high-horse power

locomotives envisaged. The investment required for rolling stock is estimated to be close to Rs 15,000 billion. In addition to the above, upgrade of Production Units (PUs) and Workshops for maintenance of the rolling stock would also require investment to the tune of Rs 750 billion.

The Committee is of the view that given the massive investment requirement for rolling stock, IR should encourage participation of private players (both domestic and international) in setting up manufacturing facilities for rolling stock and components.

Figure 1.17
Investment Requirement for Capacity Augmentation Needed by 2032



Note: Investment for new lines includes - (a) 132 projects already sanctioned and under implementation (11,200 km to be constructed out of 14,200 km); (b) new lines for economic development serving the industry estimated at 200 km p.a. for 20 years (these include international corridors and port connectivity works)
Source: Report of the Working Group on Railways (NTDPC), NTDPC

This would facilitate induction of world-class technology, besides being a source of capital for the resource constrained IR. As a first step, IR should corporatise its existing PUs/workshops. This aspect has been discussed in detail in the section on Organisational Reforms.

STATIONS AND TERMINALS

Indian Railways' operations require efficient terminals to make any impact in the transport market. At present, most of the freight transport is carried out in customer-owned private sidings. These are basically meant for exclusive use of major customers. There are roughly 1,300 good sheds owned and managed by the Railways. Of these, around 500 handle more than 10 rakes per month. IR needs to augment some of its good sheds to handle at least one rake per day with planned investment in lighting, circulating area, approach roads and facilities for customers. Moreover, the private sector should be encouraged to come forward and build efficient terminals, equipped with related logistics services like warehousing and inter-modal transfers, etc.

Similarly, major passenger stations catering to more than one lakh passengers a day must be upgraded. This would require segregation of incoming and

outgoing passengers, seamless connectivity with the surrounding city, ample parking space, comfortable concourse areas and platforms, etc. Further, modern coaching maintenance terminals capable of ensuring quick maintenance and washing of train-rakes with utmost safety and cleanliness will also be needed.

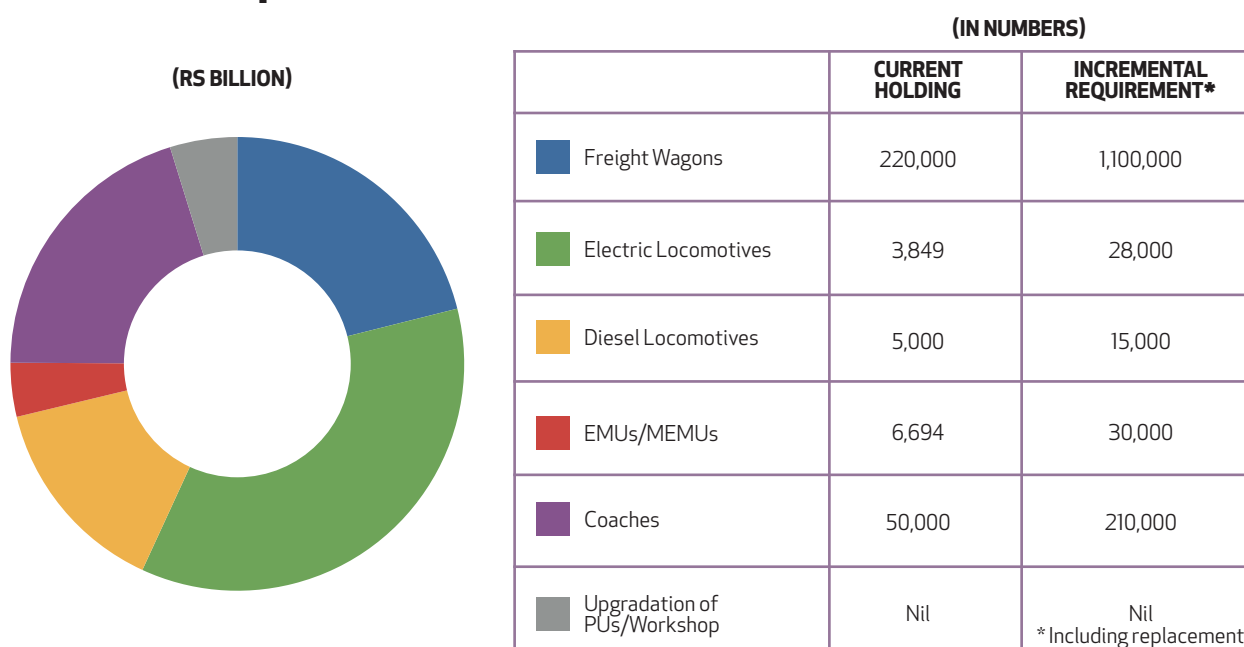
While investment for redevelopment of stations (roughly Rs 1,000 billion) and development of freight terminals (roughly Rs 500 billion) could be mobilised through private sector participation, investment in coaching terminals (around Rs 500 billion) would have to be publicly funded.

TECHNOLOGICAL UPGRADATION

In order to match the best of the railways in terms of technology and safety standards, investment would be required for upgrade of assets (track and bridges for better loading standards, relocation of structures to permit larger moving dimensions, signal and telecom, etc.), information technology and research & development. Given the prevailing security environment in India, investment would also be needed in beefing up security at stations, in trains and other railway installations. It is estimated that all these

Figure 1.18

Rolling Stock: Estimated Investment Requirement; Current holding and Incremental Requirement



Source: Report of the Working Group on Railways (NTDPC)

works may add up to about Rs 4,000 billion over the next 20 years.

SUBURBAN TRANSPORT

Indian Railway's network running through the country's fast-growing urban agglomerations, including major state capitals, already carries significant volumes of commuter traffic. In cities like Mumbai and Kolkata (and to some extent, Chennai), IR's commuter network constitutes the lifeline of suburban transport. As per central government policy, urban mass transport is now under the purview of state governments and Ministry of Urban Development. However, the existing suburban services on IR would continue to meet passenger demand. Its role will continue to be relevant despite the advent of metro rail networks that have started altering the urban transport landscape in several cities.

From the railways' standpoint, the foremost concern stems from the operational losses suffered on these services, in addition to the capacity constraints. These services are loss-making and have become a bottleneck for running of long-distance trains and freight trains on the same tracks. They contribute roughly 53 per cent in number of passengers over the IR's total passenger traffic; however, their earning share is only 7 per cent (2010-11).

Railway networks in urban areas were primarily built for long-distance inter-city transport. It is sug-

gested that IR should achieve physical separation of the long-distance network and the suburban network. The segregation of suburban and long-distance passenger/freight traffic is necessary for efficient provision of commuter service. A separate organisation should be created for suburban services with freedom to coordinate with state governments for connectivity/integration (Box 1.11). Modern accounting practices would ensure that infrastructure and rolling-stock resources used by these lines of business can be properly costed and charged for. MRVC in Mumbai and MMTS in Hyderabad are two successful models of financial participation and cooperation with state governments. Other states need to be engaged for similar initiatives. Viable cost-sharing arrangements need to be created for both infrastructure and rolling stock investment and management of commuter operations.

It is envisaged that over the next 20 years, IR's share of expenditure (@ 50 per cent) in augmentation of suburban networks would amount to roughly Rs 600 billion (Rs 30 billion per annum). In addition, two elevated rail corridors using the existing right of way of railways in both Western and Central Railways in Mumbai (Churchgate-Virar and Mumbai VT to Karzat) costing approximately Rs 400 billion could be implemented through PPP along with Viability Gap Funding (VGF). Similar other projects in Mumbai and other cities will come up in future. Overall, it is estimated that an investment of the

Box 1.11

Separation of Suburban Services from Other Train Services

Suburban services could be separated from other train services. The sequencing of actions could be separation of accounting, followed by organisational separation creating suburban entities, followed by partnership with state government and private sector in SPV. Such SPV should also have the mandate for modernisation and upgradation of services at the request of state government.

State Governments should agree to finance on the basis of Peak Cash Deficit Funding by the Indian Railways similar to the funding of Phase II of the rail component of the MUTP being implemented through MRVC. SPV should enter into an agreement with IR for gradually reducing the operating losses reaching zero within a time frame of 5-10 years. SPV should be allowed to develop alternative sources of revenues through advertising rights, leasing of spaces to service providers etc. IR should get better track availability for its long distance passenger and freight trains after such upgradation.

Source: Report of the Working Group on Railway Programmes for the 11th Five Year Plan

order of Rs 1,000 billion would be required for suburban transport over the next 20 years.

more investment purely from the view point of satisfying demand for freight and passenger traffic at the improved service level.

SUMMARY OF INVESTMENTS REQUIRED AND PHASING OF FUNDING

Figure 1.19 provides a summary of the investment required over the next 20 years (2012 to 2032) along with its phasing over the corresponding Five Year Plan periods. The total investment required over the 20-year period is estimated to be around Rs 35,000 billion¹¹. It is envisaged that bulk of the funding and project execution will take place during the 13th and 14th Five Year Plan periods (between 2017 and 2027). By the 15th Plan Period (2027-2032) most of the network capacity and modernisation works would have been completed and the spending would, therefore, slow down in the final five years.

The bottom-up assessment of the investment required has been crosschecked from a macroeconomic perspective. In 2009-10, investment in IR was 0.6 per cent of GDP. It is considered essential that the investment in railway infrastructure is ramped up to reach at least a level of 1.3 per cent of GDP by 2030 and stay at that level till 2032¹². Following this approach would imply that approximately Rs 58,000 billion would need to be invested in railways during the period 2012-13 - 2031-32, i.e. Rs 2,900 billion per annum on an average over the next 20 years¹³. The gap is explained by the fact that the Committee has been conservative on certain investment-intensive projects like HSR. Further, the Committee feels that once growth-inducing investments are made, enhanced efficiencies could bring down the need for

PRIORITISATION OF INVESTMENTS IN RAIL NETWORK

Given the massive investment requirements for development of the railway network, it is essential that priority is given for development of projects/routes that can quickly ease the capacity constraints or improve the operations and that have the highest impact. Further, given the high share of bulk commodities in India's freight traffic¹⁴, it is suggested that investments in railways be prioritised as follows:

- **Prioritisation of Dedicated Freight Corridors (DFCs):** As discussed in the Chapter 8 on Transportation of Energy Commodities, the Eastern DFC is likely to carry an overwhelming share of the long distance coal traffic, with its share increasing from about half currently to about two-thirds by 2031-32. Therefore, **the Eastern DFC must be given the highest priority among the DFCs, and should be completed within the 12th Five Year Plan.**

The Western DFC will carry imported coal and container traffic mostly from Gujarat to the northern and north-western states, and is already slated for completion by the end of the 12th Plan. However, because it is not as important for movement of bulk materials, we suggest that about 80 per cent of the investment be done in the 12th Plan and the remaining 20 per cent in the 13th Plan. The East-West, East-Coast and North-South DFCs will carry about

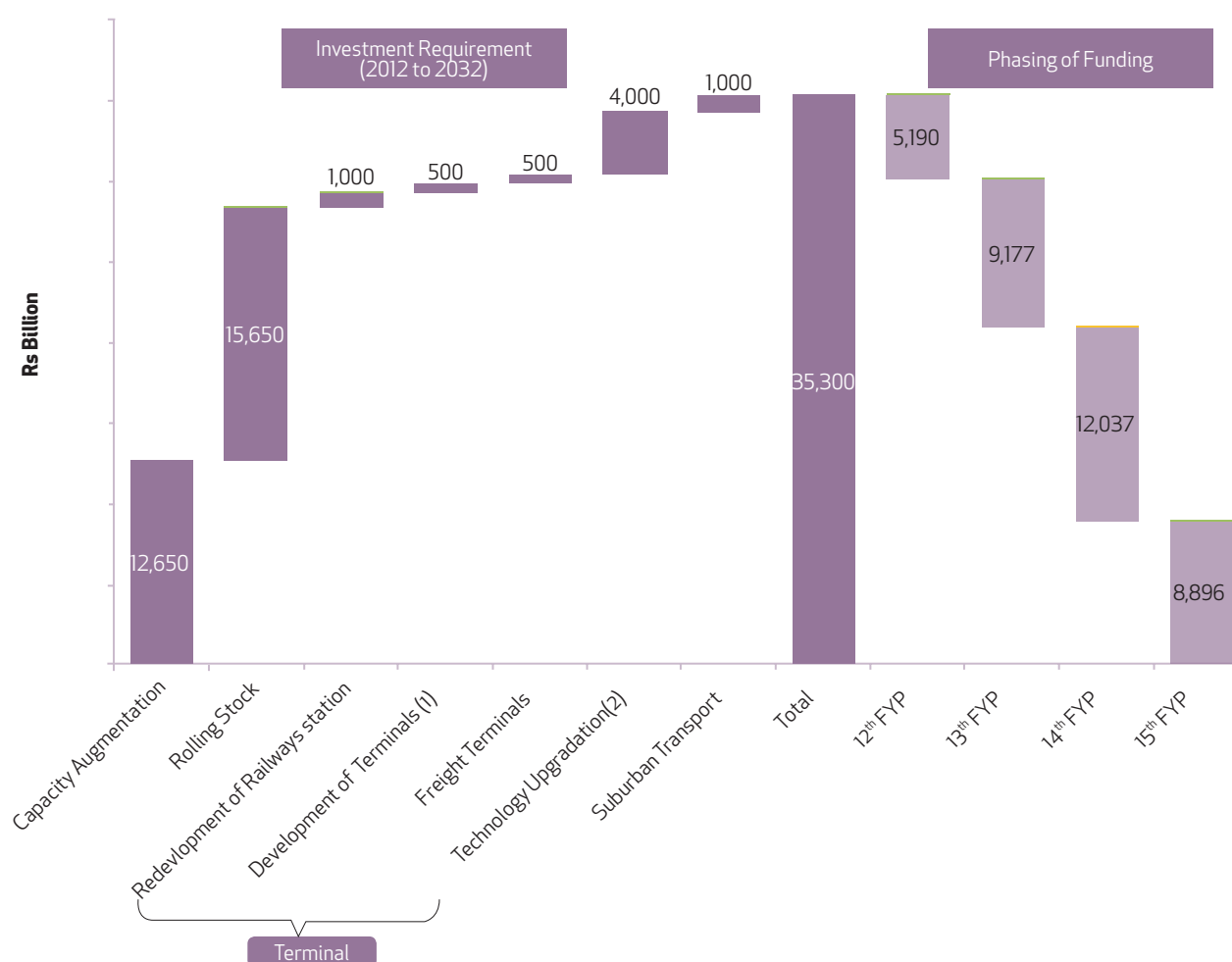
11. Rs 40,500 billion if investment in HSR and new lines is included

12. In the year 2001, investment in Chinese Railways by the Government of Republic of China represented 0.8 per cent of the GDP. In the year 2009, this figure stands at approximately 1.7 per cent of GDP.

13. This is based on the assessment of GDP growth @ 9 per cent made by the NTDP secretariat

14. 65 per cent of the total freight traffic is bulk in nature and 75 per cent of the traffic, in terms of NTKMs, moves over distance slabs exceeding 400 km (McKinsey: Building India: Transforming the nation's Logistics Infrastructure, 2010)

Figure 1.19
Investment Required by 2032 and Phasing of Funding



Notes: 1. Development of coaching maintenance terminals
2. Technological upgrade and modernisation (tracks, bridges, Signal & Telecom, Information Technology, Research & Development and other miscellaneous works).
Source: Report of the Working Group on Railways (NTDPC); NTDPC

the same amount of coal as each other but much less than the Eastern DFC and should be completed by the end of the 13th Plan. The Southern DFC, which is not important for movement of bulk commodities and is expected to carry almost no coal, can be completed by the end of the 15th Plan.

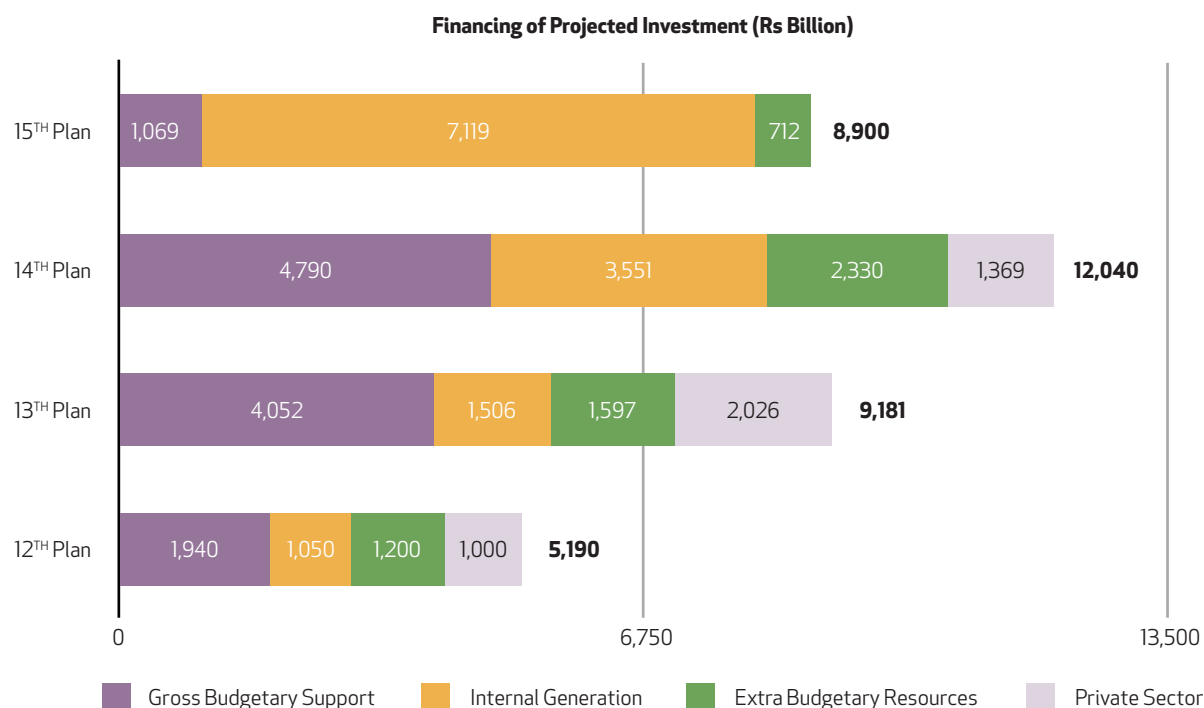
- **Construction of Eastern, East-West and East Coast DFCs must start from the eastern end:** The traffic on these three DFCs will be highest closest to the coal-fields and will decrease as coal is unloaded at successive states on the route to the furthest state. For example, the eastern end of the Eastern DFC is likely to carry coal destined for several states: Bihar, UP, Delhi, Haryana and Punjab, but by the time it gets to the western part of the country, it will be carrying coal only for Haryana and Punjab, the rest of the coal having been unloaded en-route in Bihar, UP and Delhi.

This importance of the eastern end would also apply to the other DFCs for similar reasons.

Another reason for focusing on the eastern end of the DFCs is that transport of coal within coal-producing states and to neighbouring states is likely to use sections of DFCs that are short but the volume of traffic is likely to be high. Almost all the use of short sections of DFCs will occur in the eastern part of the country.

- **Critical Feeder Routes at Mines (coal, iron ore):** Feeder routes that will carry coal and iron ore from mines to the trunk routes are critical to ensure that power generation and steel production keep up with the economy's requirements. However, eight critical feeder routes for coal with a combined length of about 600 km and several other critical links for the steel industry with a combined length of about 2,340 km are awaiting completion (See Chapter 8 on 'Transportation of Energy Commodities' for a detailed list of these routes). **The total cost of these routes will be about Rs 35 billion for coal routes and Rs 117 billion for steel routes (under 3 per cent of**

Figure 1.20
Funding Sources
 [Investment in Rs Billion at 2011-12 prices]



Source: Report of the Working Group on Railways (NTDPC)

the Railways budget for the 12th Plan); but with large benefits for the economy. These critical routes must be completed on the highest priority within the 12th Plan.

- **Feeder routes to power plants within coal producing states:** In-state consumption of coal for power is likely to increase and much of this new capacity will come up in clusters of about 3,000-4,000 MW each. Accordingly feeder routes from the mines to the power plants will need to be provided. We estimate that such links will be about 70-100 km long and will be required to carry about 20 mtpa each. Consumption of domestic coal within coal-producing states is expected to grow at about 24 mt per year in the country. Therefore, roughly one such feeder route to a cluster of power plants will be required every year in the tri-state region of Odisha, Jharkhand and Chhattisgarh.

These links should be designed for heavy haul technology where a rake per day carries 4 Mtpa. It is likely that some of these feeder routes may overlap to some extent, with each other or the feeder routes that bring coal from the mine to the trunk route. Because each such feeder route will take a minimum of six years to complete, planning for these routes

must be coordinated with investments being planned in the power sector, and decisions for the corresponding transport investment should be taken simultaneously.

RESOURCE MOBILISATION AND SOURCES OF FUNDING

As discussed earlier, railways' Plan expenditure is financed through a combination of internal generation; money from the general exchequer extended as gross budgetary support (GBS), and market borrowings. Although it is difficult to determine the precise mix of funding sources over the next 20 years, the projections for resource mobilisation have been worked out on the basis of investment requirement of Rs 35,000 billion. In order to meet the massive investment requirement, public investment would have to play a significant role in creating the necessary capacity for growth in the initial 10 years, supplemented by borrowings (within prudent limits) and implementation of select projects through PPPs.

Figures 1.20 and 1.21 show the estimated contribution of different sources over the next 20 years. The proposed funding plan relies heavily on budgetary resources in the initial period. Internal generation is expected to pick up and contribute an overwhelmingly large share in later periods. The share of internal generation rises from about 20 per cent in the 12th

Figure 1.21
Funding Sources
[Per cent share]



Source: Report of the Working Group on Railways (NTDPC)

Plan to 80 per cent by the 15th Plan. The share of GBS is expected to be in the range of 40 per cent till the 14th Plan and falls to about 12 per cent in the 15th Plan. Box 1.12 lists the major assumptions based on which the projections for mobilisation of internal resources have been worked out.

IR aims at mobilising over Rs 5,000 billion through private sector participation (PSP) during the 20-year period. PSP/PPP programmes may start with a few identified projects where quick wins are scored and then scaled up further. PPP mode may be tried for projects such as segments of dedicated freight corridors, elevated rail corridor in Mumbai, last-mile connectivity, high speed rail corridors, rolling stock and other service provisions, etc. PPPs and partnerships with state governments can also play a significant role in implementation of suburban projects. The projections show that if capacity is built, market share goals are achieved and rationalisation of tariff is carried out, IR would be able to finance its investments by 2027-32 mostly through internal generation with little need for reinvestment of dividends payable.

Needless to say, attainment of the ambitious growth is dependent on necessary investment in capacity augmentation and enhancement and modernisation of the network. IR's ability to implement this programme would be a critical determinant in achieving these projections.

MAJOR ISSUES CONFRONTING RAILWAYS

In order to meet the ambitious goals set for 2032, it is essential to identify and address the major issues being faced by the IR. The following paragraphs discuss the major issues confronting the network, classified under the following broad heads:

- Capacity constraints;
- Lack of clarity on social and commercial objectives;
- Safety;
- Inadequate Research & Development;
- Optimisation of land use;

Box 1.12

Assumptions for Internal Generation Projections

The projections for mobilisation of internal resources are based on, inter alia, the following assumptions:

- Rail freight traffic would grow at slightly more than 10 per cent in the first nine years and at close to 13 per cent in the next 10 years to reach around 6,500 billion NTKMs by 2032. Thereafter, rate of growth could slow down and match the rate of GDP growth. This would represent roughly 50 per cent of the country's freight transport task in that year compared to 606 billion NTKMs in 2010-11.
- Passenger traffic (PKM) will grow at close to 9 per cent p.a. to reach around 5,700 billion passenger kms in 2032 compared to 1047 billion passenger kms in the year 2011-12.
- Revenue per NTKM (i.e. the freight tariff) will remain unchanged in real terms but revenue per PKM (passenger tariff) will grow by 4 per cent p.a. in real terms to reach a level of 54.7 paise in 2030 compared to 26 paise at present. If this is done, the freight to fare ratio which is roughly 4 at present will be corrected to 2. The ratio will still not be equal or close to unity as in case of countries like France and China.
- Other coaching earnings and sundry earnings will increase 5 per cent p.a.
- Operating ratio will start at 98 per cent in 2010-11 and will improve by 1 per cent p.a. till 2016-17 and 2 per cent p.a. thereafter for the next four years to reach 84 per cent in the year 2020-21 where it will get stabilised.
- Net dividend to exchequer will grow by 10 per cent p.a. and appropriation to Depreciation Reserve Fund will also grow 10 per cent p.a. from the level of Rs 70 billion budgeted for 2011-12.

Source: Report of the Working Group on Railways (NTDPC)

- Energy conservation;
- Organisational and Human Resource issues.

CAPACITY CONSTRAINTS

A major reason why Indian Railways has suffered a steady decline in its share in freight and passenger transport is that its network is plagued by infrastructural and carrying-capacity constraints. This has forced IR to focus on bulk cargo and forego the immense opportunity for growth in non-bulk and non-train-load segments. In passenger traffic, this has meant that the supply of seats/berths has always lagged demand.

As discussed earlier, traffic flows on IR's network are highly uneven and imbalanced. As of March 2011, the BG network, though forming 85.6 per cent of the route, generated almost 98 per cent of the passenger output (PKMs) and 99.9 per cent of the freight output (NTKMs). The Golden Quadrilateral and the diagonals connecting the four major metros, viz., Delhi, Kolkata, Chennai and Mumbai (along with the east-west diagonal extending to Guwahati) constitute less than 16 per cent of the route, but account for more than 50 per cent of the passenger and freight traffic. These routes have reached over-saturated levels of capacity utilisation and at present are strained to the breaking point (Figure 1.22).

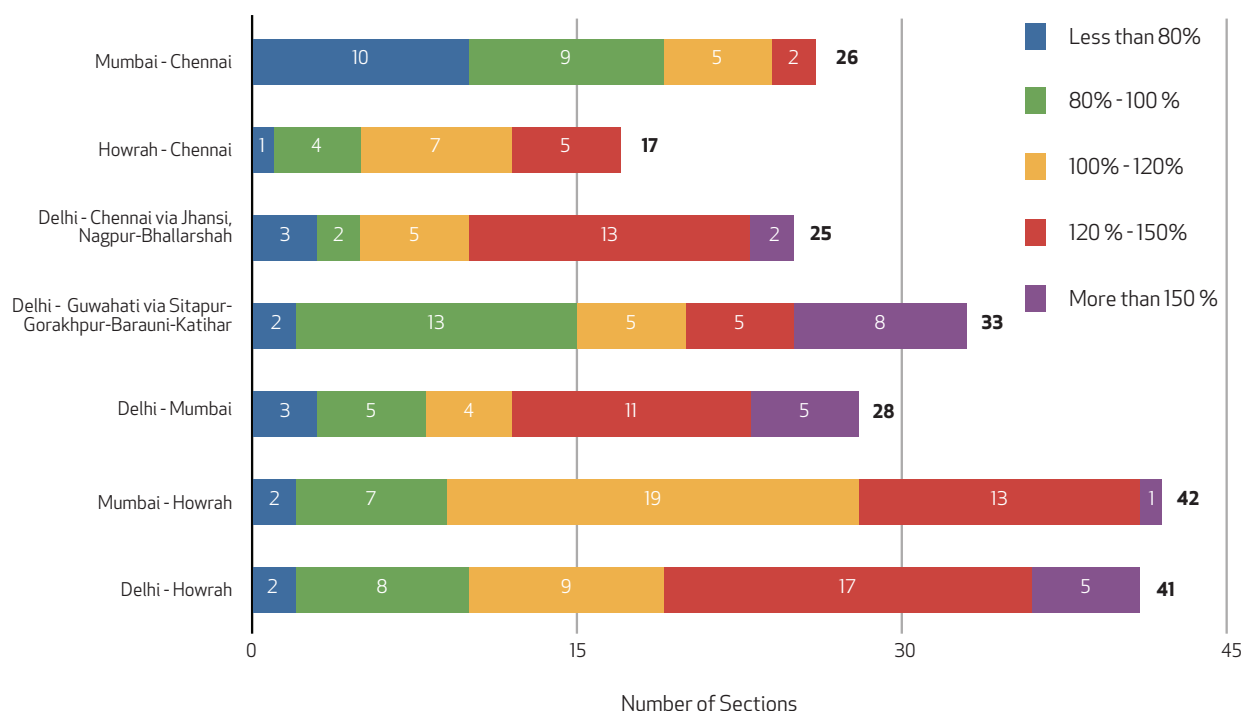
A line-capacity utilisation of 80 per cent is considered optimum as smooth operation of trains requires some slack in the line-capacity to absorb and recover from unforeseen disruptions. Figure 1.22 shows that 189 sections out of the total 212 on the high density network (HDN) have already reached saturation in line capacity utilisation. Moreover, 141 sections have already crossed 100 per cent utilisation. The unsatisfactory state of affairs extends to seven other secondary HDN corridors feeding to or distributing traffic from the primary HDNs.

Further, both passenger and freight trains share the same track capacity. **The passenger trains utilise nearly 65 per cent of network capacity but contribute to less than 30 per cent of the revenue.** While mixed traffic is beneficial for efficient use of capital-intensive railway infrastructure, such operation of mixed traffic in the face of saturation on the network imposes insuperable constraints on running of heavy-haul freight trains and high speed passenger trains, categories that can yield maximum efficiency in transport.

According to the McKinsey Report¹⁵, 'India's current infrastructure is over-stretched and even with a conservative annual growth rate of 7.5 per cent, India's freight traffic is most likely to more than double by 2020. A two-and-a-half times increase in freight traf-

15. Source: McKinsey's Building India: Transforming the nation's logistics infrastructure, 2010

Figure 1.22
Line Capacity Utilisation of Sections on High Density Network (2009-10)



Source: Report of the Working Group on Railways (NTDPC)

fic in the next decade will put further pressure on India's logistics. Moreover, investments in the current network design will only lead to increased inefficiencies and losses.'

LACK OF CLARITY ON SOCIAL AND COMMERCIAL OBJECTIVES

The report of the Expert Group on Indian Railways headed by Dr Rakesh Mohan in 2001 mentioned that 'IR has been suffering from a split personality. On the one hand, IR is seen by the government, and by itself as a commercial organisation. It should therefore be financially self-sufficient. On the other hand, as a department of the government it is seen as a social organisation which must be subservient to fulfilling social needs as deemed fit by the government. It is now essential for these roles to be clarified'.

For long-term sustainability, railways have to be run as a business on sound commercial principles. However, the several social/national responsibilities of the IR prevent it from operating on a purely commercial basis. A large section of the population views it as a public utility and expects IR to discharge a number of social obligations ranging from sanction and construction of un-remunerative lines, provisions of suburban and other passenger services below cost, transportation of essential commodities at a loss, etc.

While IR has to fulfil both the roles, it is essential that the commercial and social roles are kept distinct and separate. The commercial part of the business has to be run with a clear set of objectives and judged by commonly accepted financial measures such as revenue, profit, return on capital, productivity of assets, etc. The social part of the business would need to meet different goals and judged by parameters such as improvement in connectivity, service level, patronage and efficiency of delivery/provision of projects/services.

It is imperative for IR that the projects taken up on social considerations must be categorised separately and their funding must come separately either through national /strategic projects or from state governments. The two categories of projects must not be mixed up and must be handled by different project organisations with different project leaders.

The lack of clarity between its public-service obligations and commercial objectives affects several other operational practices/systems of IR, such as, investment planning, project execution, costing & tariff practices, accounting system, etc., making it even more difficult to reconcile these roles. Some of the challenges imposed by these systems are:

INVESTMENT PLANNING

Investment planning on Indian Railways is politically and departmentally directed rather than

Table 1.11
Off Track: Time and Cost Overruns in Railway Projects

PROJECT	DATE OF COMMISSIONING		DELAY IN MONTHS	COST OVERRUN (PER CENT)
	ORIGINAL	ANTICIPATED		
Udhampur-Baramulla (new line)	March-01	Dec-17	201	700
Bankura-Srinagar-Damodar (Gauge conversion)	March-05	June-16	135	1162
Tamluk Digha (Line doubling)	June-05	June-16	132	270
Belapur-Seawood-Uran (Electrified double line)	March-04	March-14	120	276
Howrah-Amta-Champadanga (New line)	March-07	March-15	96	1,489

Source: Project Implementation Overview, December 2012, MOSPI, GoI

need-driven. The consequence of political control in a departmental set up has been the extension of a number of uneconomic lines with every budget. The project approval process is loaded in favour of uneconomic, un-remunerative and socially desirable projects, rather than focus on projects which remove bottlenecks, ease congestion, and augment IR's capacity to carry traffic, or improve the productivity of operations.

For an organisation struggling with crippling capacity constraints over its most important routes, the purpose and direction of investment planning should be clear and obvious. A complete revamping of the investment planning system is required.

IR needs to shift to a programme approach from the current project-oriented approach. Plan-head wise investment approach has to be dispensed with as it distorts investment priorities and promotes departmentalism. Investment should be focused on total capacity creation including rolling stock, asset renewal, technology induction, information technology and identified investments in modernisation, etc. This should be quantifiable in terms of incremental tonne kms.

Prioritisation of projects is crucial especially since IR is struggling with a large shelf of sanctioned projects in the face of limited resources. Investment in railways has to be focused and directed towards solution of the capacity constraints or improvement of operations. More investment should be directed towards projects and activities that would remove bottlenecks and generate the greatest returns. Operationally urgent and quick pay-off projects that can ease capacity constraints the fastest (such as doubling) need to be prioritised for full funding and time-bound execution. For rolling stock, procurement must be linked to the traffic projections so as to avoid excessive procurement of rolling stock which is less in demand, or under procurement of rolling stock actually required for meeting demand.

Replacement and renewal of assets should be ensured. For this purpose, the ad hoc approach presently followed in respect of appropriation to Depreciation Reserve Fund needs to be overhauled. A rule-based approach that adequately meets the requirement needs to be put in place; and such an approach must satisfactorily provide for the replacement of fixed assets and rolling stock that bring in technological upgrade with increased productivity, efficiency and reduced outgo on maintenance.

PROJECT EXECUTION

IR has a poor track record of project execution. Several projects of IR are suffering from time and cost overruns. For example, as of October 2011, out of the total of 132 projects costing more than Rs 1.5 billion, in 101 projects the anticipated cost is 181 per cent higher than the original estimated cost. Moreover, 26 projects are having time overruns ranging from two to 213 months (Economic Survey 2011-12). Table 1.11 highlights the extent of delays and time overruns in railway projects.

Some of the major reasons for project delays are as follows:

- At present, a large number of projects are started without adequate funding and without a specified date of completion. And more often than not, they are sanctioned without adequate field investigation, followed by a detailed project report. The funds available are spread on numerous projects instead of providing adequate resources for a select few and getting those completed. As a result, every project suffers from time and cost overruns.
- Railway's project organisation is also organised on a zonal or a territorial rather than on a project basis. This further reinforces the ingrained practice and bias towards distribution of funds, rather than rational allocation of funds to projects that need to be completed on priority.
- Incentives for project teams and leaders to deliver projects on time and within budget are also absent.
- Other reasons for project delays include issues

Box 1.13

Building China's Railways

China's railways entered a new phase of development with the Mid and Long-Term Plan (MLTP) adopted in 2004 and revised upwards in 2008. It currently aims to increase the total rail network from 75,000 to 120,000 route-km by 2020. It includes construction of 16,000 km of high-speed routes, three new regional inter-city networks, new dedicated coal lines and substantial double tracking and electrification.

China has successfully managed to deliver project after project much faster than is typical of just about any other country. A project that in China might take about 5-6 years from government approval of project concept to system commissioning would, in the authors' experience, take 7-15 years in almost any other country. For example, the 1,068 km Wuhan-Guangzhou high-speed railway, started construction in 2005 and was commissioned in December 2009.

Following three factors dominate the reasons for this exceptional project delivery:

- **Single-Point Responsibility:** China's Ministry of Railways (MOR) enjoys a potent combination of: (a) the responsibility to plan, design and deliver major projects; (b) the legal and institutional power it needs to do so, and; (c) access to the operating cash flows of one of China's largest single businesses to borrow against, together with a dedicated capital fund from railway construction surcharges on freight. This heady confluence of responsibility, power and resources, has created a goal-driven culture at all stages of project delivery.
- **Strong Technical Capacity and Process:** MOR adopted the 'six in one' principle as the foundation for railway project implementation; which encompasses quality, safety, completion time, investment benefit, environmental protection, and technical innovation. Following are some of the initiatives taken across all stages of the project cycle, from planning to commissioning:
 - **Planning and Design:** The priority and time-frame for project implementation (including the budget, technical parameters, preliminary design and schedule for each project) are frozen at the point of National Development and Reform Commission (NDRC) approval. The detailed and meticulous planning and design facilitate timely implementation as there are minimal changes during construction.
 - **Procurement:** Standardisation of designs and technical specifications, administering procurement through professional tendering companies, emphasis on physical and financial capacity on contractors, tight contract award process etc. are some of the factors that assist expeditious procurement.
 - **Project Management:** MOR establishes a project management team which is delegated the funds, the design and above all the authority to implement the project. The project team remains together until the job is done and is held fully and collectively accountable. This continuity, together with significant financial incentives built into team earnings for timely delivery of the project, acts as a strong motivator of team performance.
- **The Programme Effect:** the articulation of the MLTP and its scale resulted in a programme effect. The programme effect created a whole new industry that was confident in the continued long-term development of China's railways, and led to a huge increase in the capacity of the industry, from technical institutes through to contractors, manufacturers, service suppliers and many others.

Source: China Transport Topics No. 03; Fast and Focused— Building China's Railways; World Bank Office, Beijing

like land acquisition, clearances, shifting of utilities resettlement & rehabilitation, etc.

IR must review and adopt some of the best practices in project execution from China's railway sector, which has built an astonishing number of large and complex railway projects over the past few years (Boxes 1.13 and 1.14).

RECOMMENDATIONS

Following are some of the recommendations which should be implemented to improve the project execution on Indian Railways:

- Considering the need for massive capacity augmentation over the next 20 years, it is recommended that a separate body/organisation, partially independent of the Ministry of Railways should be set up to expedite the delivery of projects. Such a body should have greater autonomy, for example, the authority to finalise tenders for projects. Box 1.15 provides some recommendations on the institutional arrangement for speeding up capacity enhancement and project execution on IR. Here it may be mentioned that in the Railway Budget 2011-12, a Central Organisa-

China's Railways' Building Skills and Knowhow to Improve Project Delivery

The short time taken for delivering projects on China Railways follows years of investment in building skills and know-how. Ministry of Railways (MOR) in China undertook years of capacity building leading up to the MLTP. For e.g., in case of high-speed passenger lines, specialised units were set up many years in advance to study and adapt technologies employed internationally such as track systems, rolling stock design, signalling and communications, and electric traction. The technologies selected were absorbed, in some cases by technology transfer agreements with foreign manufacturers, but with considerable adaptation to match China's needs.

There are six major railway design institutes in China. All except one are legally independent of MOR, though they are commercially dependent on MOR contracts, for which they compete (all are state owned enterprises). Their role typically includes route surveys, environmental assessments (sometimes with specialist environmental firms), project feasibility reports and preliminary and detailed designs.

Typically each major design institute employs about 3,000-4,000 people. This capacity together with a singular focus provides the means and the ability to produce a feasibility report within a 6-12 month time frame. In most countries feasibility studies for major railway construction projects take up to two years to specify, procure, complete and report.

Source: China Transport Topics No. 03; Fast and Focused— Building China's Railways; World Bank Office, Beijing

tion for Project Implementation (COPI)¹⁶ was proposed to be set up with offices in Delhi, Kolkata, Mumbai and Bangalore, each headed by an officer of GM rank. COPI was to ensure uniformity of systems/methodologies, follow the best practices and optimise on resources. It was expected to monitor and ensure that the funds allocated to different projects are fully utilised and not surrendered or diverted, and that the projects are completed in time. However, no progress has been made on the ground for setting up of the COPI. In any event, the entire issue of setting up agencies for project execution needs a review, considering that as on date, zonal railways, RVNL and DFCCIL are involved in execution; a rationalisation with the objective of 'in time delivery' with massive investments contemplated is the objective.

- DFCCIL, besides handling the Eastern and Western corridors, should also be given the project execution responsibility for the other four proposed high speed corridors. Additionally, it may be given the responsibility for capacity augmentation of the entire high density network. DFCCIL should be given more autonomy - instead of the Chairman Railway Board (CRB) acting as the part time Chairman of DFCCIL, the Managing Director should be made the Chairman.
- Funding should be earmarked for each project before it is taken up for time-bound commissioning. The concept of financial close (as in case of PPP projects) should be introduced for each project.

- The project managers should continue in their positions till successful completion of the project, and they along with the project teams should be held accountable for timely completion of the projects.
- Performance-linked incentives should be provided and penalties for failure should also be imposed. Best practices in contract management should be identified and introduced.

ACCOUNTING SYSTEM

Being a ministry of the GoI, the accounting system of the Indian Railways is organised to cater to government budget and control functions and does not follow accounting standards as prescribed in the Companies Act 1956. The Acworth Committee (1920-21) recommended the separation of railway finances from the general exchequer, because the budget of IR formed a significant portion of the total government finances and there was considerable unease in keeping it as an integral part of the overall budget. The separation of railway finances (effected in 1924) and the creation of an in-house accounting machinery, however, also intended to ensure flexibility in the financial administration of the railways as a commercial undertaking.

The accounting and financial systems of IR have been reviewed by various committees since 1924, and each one of them have found the existing system unsatisfactory and affirmed that the original intention of commercialisation has not been achieved. IR has continued to be run like a government department rather than as a commercially oriented enterprise, and its accounts are not in line with normally used

16. Speech of the Railway Minister, introducing the Railway Budget 2011-12

Box 1.15

Institutional Arrangement for Speeding Up Capacity Enhancement on IR

IR carries out its construction projects through a construction wing which works in every Zone under the General Manager. The budget of this department varies from Rs 2.5 billion to around Rs 10 billion, a bulk of which goes unutilised for tailor made reasons which are endemic on every Zone. The annual budget of IR for such construction works is around Rs 300 billion and for achieving the growth envisaged for the year 2032, we may have to upscale it to Rs 1,000 billion. At present, works on IR are sanctioned at current rates and token allocation of funds is made till the project takes off. After this, the political sagacity compels allocation of funds to as many projects as possible and speedy completion becomes the first victim of the process. There is an urgent need for an organisational restructuring - both functionally as well as administratively.

Following are some recommendations:

- All works having a budget outlay of more than Rs 5 billion (or may be Rs 10 billion) should be entrusted to an 'Authority', which may be called the '**National Railway Construction Authority**' (NRCA).
- The NRCA would be an umbrella organisation having a national level presence, fully autonomous, and having extensive powers for award of works. It will award contracts for construction, supervise quality of construction and would ensure smooth flow of funds for the works to continue unimpeded. Repayment of loans, tax-free bonds etc. would be channelised through it.
- The projects should be taken up as EPC contracts with fixed time-outlay and watertight fund provision. No time over-run and cost over-run may be allowed.
- Sanction of the project should be for the cost as envisaged till its completion so that no further sanctions are necessary.
- The chief of the NRCA should be selected through Public Enterprises Selection Board (PESB). He may be allowed to have his team selected through another well-defined process of selection to scout and attract best talents available in the country.
- The NRCA will have a multi-disciplinary structure to ensure that all decisions relating to every facet of construction are taken under single roof. It may engage Advisors of international and national repute in various fields to assist it in discharging its duties in the best possible manner.
- Various agencies instituted by the Railway Ministry for expediting construction like DFCCIL, RVNL etc. may either be transferred under NRCA's control or allowed to participate in the bidding process for award of contracts for construction to have better competition.

The establishment of NRCA can go a long way in ensuring speedy completion of important Railway capacity enhancement projects.

Source: NTDP

commercial conventions recommended by ICAI. The financial results of IR, as presented to Parliament and for public information, include a Statement of Revenue Receipts and Expenditure (Profit and Loss account) and a Balance Sheet, however, the contents of these documents depart substantially from the disclosure standards that are expected of going concern entities. Box 1.16 highlights some of the anomalies and limitations of the present accounting system of IR.

It is imperative that IR's accounting system is revamped for the following reasons:

- **IR requires a substantial infusion of funds from sources other than budgetary support and internal surplus over the next 20 years**, in order to undertake the envisaged capacity augmentation to improve the modal
- share of IR in freight transport. **In order to access capital from external sources, it is essential to recast IR's accounts in a format that is readily interpretable by lenders and investors.** The present system of accounting does not give a true and fair financial picture of IR. For example, the balance sheet does not show depreciation provisions and as a result it is impossible to ascertain the net block of IR. Similarly, there is a no clear separation between revenue and capital, or between 'top of the line' and 'below the line', and the data is presented in a way in which one cannot ascertain labour productivity or employee cost.
- **IR must focus on financial discipline and targeting so as to ensure generation of sufficient surplus for investing in capac-**

ity enhancement. The present system of accounting gives little information on how to control costs, as accounts are kept on 'heads of account' rather than on the basis of activities. The accounts do not provide a clear segregation on the cost and revenue of various activities and services. As a result, computation of the losses on various activities and the contribution made by various services is difficult. It is critical for any business entity to gain an appreciation of its profit centres to manage them better. **IR's accounting system should be revamped to accurately reflect the cost of various activities and throw light on train-wise and route-wise profitability to aid managerial decision-making.** This would help assess the usage charge of infrastructure and rolling-stock resources and also in accurate allocation of overheads. It would also help in computation of the cost of operation of trains and services and appraisal of profitability of various business lines.

- It is important for IR and the Railway Board to know how the organisation would fare if its accounts were presented as per the Indian GAAP followed by companies incorporated under the Companies Act.

Only with a credible accounting system, IR can manage the commercial and social parts of the business on a rational footing. The commercial part of the business must be managed to yield a surplus for reinvestment in the system.

RECOMMENDATIONS

Following are some of the recommendations which should be implemented in a mission mode approach to ensure timely completion:

- It is important that the accounts of the Railways should be recast into a company account format in line with the Indian GAAP so that the true state of Indian Railways finances become clearer. It would provide activity-based revenue cost data meeting generally accepted accounting standards. Such an accounting reform would facilitate assessment of profitability of different operations, routes and sections and accounting separation of various lines of business and services within the lines of business. The principles for identification and allocation of joint costs and methodology for computation of operation and maintenance cost should be possible. Such recasting is feasible since it has already been done on a pilot basis first by the Railways Capital Restructuring Committee, 1994 and by the 2001 Expert Group.
- Codification of these principles and development of an IT-based system to provide timely compilation of accounting and budget statements should be attempted. This would facili-

tate determination of cost of infrastructure services and the operational activities with an acceptable degree of exactitude and help decisions on rational pricing on the basis of train-wise, route-wise profitability analysis.

The need for Accounting Reform has been recognised and accepted in the Railway Board. An Accounting Reform project was initiated and sanctioned in 2004-05. However, the work has made a tardy progress and the final results are far off yet. There is a need to hasten and complete the process.

If the railways undertake the kind of accounting reform proposed, it will become much easier to make informed decisions on the areas of investment where budgetary support is to be given. For example, budgetary support could be provided in three parts. First, support could be provided to the commercially justified remunerative projects which are part of a strategic plan. Second, where the government mandates new lines for social considerations, funds could be provided on a grant basis. Third, budgetary support could also be provided for the projects/schemes that result in immediate benefit by way of increased throughput for greater efficiency or cost reduction or on the grounds of safety considerations, that is, implementation of a 'modernisation plan'.

COSTING & TARIFF PRACTICES

Costing and tariff practices have had a long-term impact on the expenses and earnings of IR, and the ability of managers to assess and control the same.

Current costing practices are based on a top-down approach, using total cost at an aggregate level, and are not based on activity-level costing. However, disaggregated information is necessary for pricing. Further, since the costs on railway networks are largely common (or joint) to different services and a substantial part of the costs are fixed, the economies of scale can be fully exploited only with large traffic volumes. This renders a certain degree of cross subsidisation between services and/or between segments of the network unavoidable. This has matched well with the conventional theory of price discrimination which provided the basis for differential pricing (differing price elasticities) and hence cross subsidisation.

Historically, passenger services have been incurring losses at the aggregate level, made good by cross-subsidy from freight services. The cross subsidisation exists at different levels¹⁷:

- a. Cross subsidisation between freight and passenger services: here it must be understood that passenger service is a direct consumption item while freight service is an intermediate item. Cross subsidisation here has involved imputing a lower weightage to surplus generation by producers vis-à-vis surplus generated by consumers from a lower passengers tariff.

17 AITD, 2001; Report of the Working Group on Railways (NTDPC)

Limitations of The Present Accounting System of IR

Limitations of the Statement of Revenue and Expenditure (Profit & Loss Account):

- **Inadequate disclosure in respect of the in-house manufacturing effort:** IR engages in manufacturing operations through its major production units and by virtue of a large number of engineering and repair facilities where substantial production effort is carried out. The P&L Account does not disclose the value of the manufactured goods, the disposal on completion of production or internal capitalisation.
- **Depreciation Reserves:** The amounts allotted to Depreciation Reserve Fund (DRF) tend to be fixed in an ad-hoc manner and are not determined by financial principles that would withstand close scrutiny. Also, the reduction in the value of total assets post-depreciation is not shown.
- **Contribution for Pension Payments:** The procedure adopted by IR with regard to pensions is what is normally termed as 'pay as you go', a system that no commercial enterprise operating in a market environment can sustain for long. For an organisation such as IR that spends over half of its revenues on staff related expenses, the practice precludes reliable long-term financial projections and prudent financial management itself.
- **Utilisation of Net Revenue:** The residual of gross traffic receipts after meeting working expenses and allocation to the two funds (DRF and Pension Fund) is termed 'net traffic receipts'. The sum of this figure and the miscellaneous transactions is called 'net revenue'. In a manner of speaking the 'net revenue' corresponds to IR's gross profit. The 'net revenue' (in IR terminology) is allocated for - (a) Payment of the interest on loan capital to GoI, representing the servicing cost for IR's capital-at-charge (termed 'dividend' in Railway accounts); (b) anything that remains after payment of 'dividend' is transferred to other Railway funds (Capital Fund, Development Fund, Safety Fund) that are used for IR's plan expenditure.

Though the Companies Act lays down that no dividend shall be declared until provision is made for depreciation on fixed assets of the company, IR, being governed by separate provisions, has been paying out dividend to the government on the capital-at-charge without observing this requirement.

Further, the Capital Fund was set up in 1992 with the original objective of financing schemes like gauge conversions, doublings and route electrification which were insufficiently funded by amounts received as 'Budgetary Support'. In practice, much of this investment has gone to finance projects that are not remunerative.

Limitations of the Balance Sheet:

- **Unreliable estimate of capital stock: IR does not maintain a register of assets.** The balance sheet does not separately show gross block, depreciation and net block. All assets are shown at original costs, and further capital expenditure incurred from year to year is capitalised. The leased assets are not shown separately. Fixed assets are not classified in terms of opening balance and additions/deletions for the year.
- **Depreciation Reserve Fund:** The sum of the amounts that are appropriated annually to the DRF are not shown in the balance sheet but only the so called 'improvement element' is reported. Because of this, there is no depreciation provision in the application of funds and, hence, no net block. This has two implications. First, IR overstates its profit by under-provisioning for the amounts earmarked for the DRF. Second, and much more serious, IR has grossly over-capitalised itself.

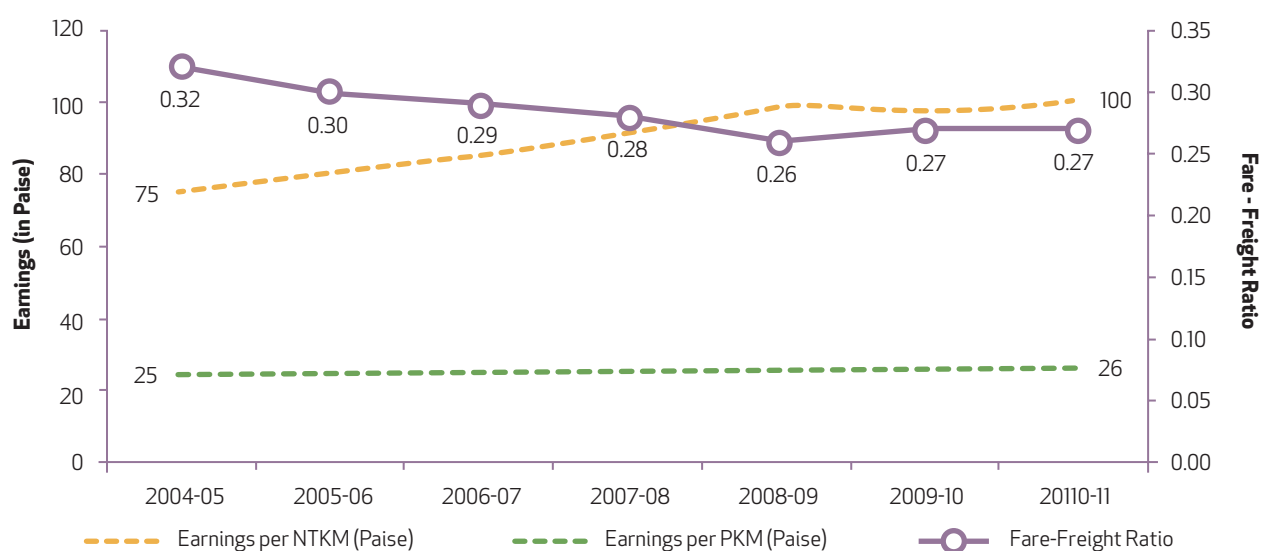
Source: The Indian Railways Report 2001: Expert Group on Indian Railways

- b. Cross subsidisation between different classes of passenger traffic: part of the problem is that the willingness to pay by common people is often deliberately underestimated. It should be easily possible to segment the market for the passenger services by appropriately differentiating the product and accordingly

attempting to recover the cost of services. This would help delimit size of the market requiring effective subsidy.

- c. Cross subsidisation across the zones: This is partly because of the composition of traffic. The passenger component is substantial in many of the zones, and as a result the losses

Figure 1.23

Average Realisation on Freight and Passenger and Fare-to-Freight Ratio

Source: White Paper on Indian Railways 2009, Yearbook 2010-11, Yearbook 2009-10

cannot be compensated by profit from the freight segment.

However, cross subsidisation has resulted in high tariffs for freight and diversion of traffic to non-rail modes involving higher use of scarce resources of the society. In other words, the market response to the cross-subsidy may also lead to sub-optimal allocation of resources. The extent of effective cross-subsidy needs to be measured to determine an optimal level of cross-subsidisation.

Figure 1.23 shows some of the parameters that emphasise the cross-subsidisation on IR. The average realisation for PKM at 26 paise is one of the lowest in the world while average freight revenue per NTKM is one of the highest in the world, second only to Germany (White Paper on Indian Railways, 2009). On the passenger side, the range between the lowest charged and the highest charged classes is wide (from 13 paise per PKM to Rs 1.06 per PKM). Fare to freight ratio that roughly captures the balance between the passenger fares and freight tariffs is also one of the lowest in the world for Indian Railways (0.27) compared to France (1.3) and China (1.2). **The above clearly argues for the need for rational non-distortional prices for freight and passenger services.**

Freight Pricing: The freight rates are commodity specific and yet costs are not available at commodity level. The logic for pricing based on the ability of the commodity to bear is an age-old principle in the Railway industry. In recent times, however, most railways worldwide have moved away from a commodity based pricing mechanism to either a haulage costs based rating or individual contractual agreements based on the shipper's requirements. With the sepa-

ration of the infrastructure owner and the service provider, a new market for access to paths and pricing of paths, has developed. Thus at this stage Indian Railways has to make a choice - whether to continue to rely on a regime of commodity based pricing or to move to newer methods of pricing.

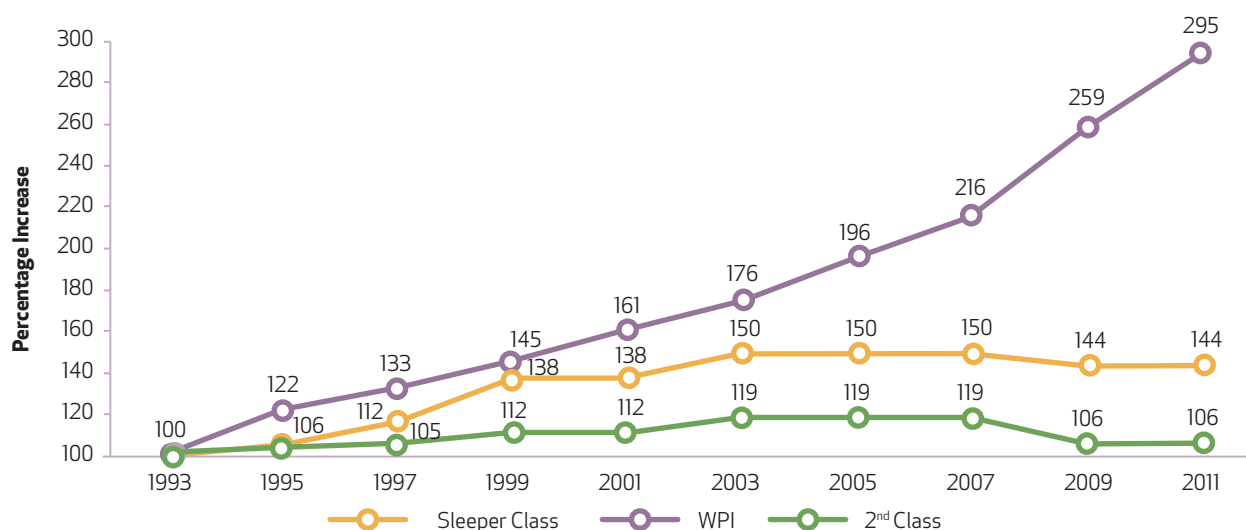
There are two key aspects of commodity based pricing:

- a) **The ability to correctly discern what the commodity can bear:** In recent years, in the case of iron ore for export, the railways were able to informally peg the price to the export price and thus align itself to the market. However, for other commodities there are no such readily available proxies which the IR can use to gauge the market. It would probably not be unfair to state that the IR priced itself out in the case of POL products when pipelines were being considered as an alternative.
- b) **To know the cost of transportation:** As discussed above, in IR costs tend to be aggregated and averaged in a manner that does not clearly indicate the commodity specifics. Greater emphasis on disaggregated costing methodologies is important in a commodity based pricing regime.

The commodity based pricing has undergone a lot of rationalisation over the last decade or so. IR used to have a large number of classes for freight tariff. These have been compressed and the range between the lowest charged and the highest charged classes has narrowed considerably. Following are some of the recommendations for freight pricing:

- For loose bulk commodities, the current regime of pricing is a good approximation

Figure 1.24
Increase in Wholesale Price Index and Passenger Fares (1993-2011)



Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar Committee)

and provides the right incentives. Non-price factors are critical for obtaining a better share and in the case of certain commodities the Railways should consider long-term contracts to bring about greater efficiency in investments.

- For bagged bulk commodities and non bulk commodities, the current regime is too centralised and therefore slow to respond to market changes. Service-based pricing to attract traffic in these industries would help.
- For the growing sector of containerised goods, greater research on the method of calculation of efficient haulage charges is required.

Passenger Pricing: As mentioned earlier, the Indian Railways, in addition to their commercial role as a provider of transport services, is also seen to have social/national responsibility to link people and places and facilitate rapid and low cost movement across the country. To meet this objective the Railways provide several services at prices that are below the cost of provision and this has virtually governed most of the policy decisions often away from the most economically sound ones.

The pricing of passenger services is a highly political issue and not dictated entirely by efficiency considerations. These services are heavily under-priced even though their economic costs are high. International comparison with China, Germany, Japan and Russia shows that the pricing of passenger services is a politically and socially sensitive issue not only in India, but even internationally. However, all these countries impose some statutorily-backed fare regulations on their passenger rail services (Box 1.17). All four countries also receive

some form of Government financial support for passenger services (summarised in Annex 1.3).

India's average passenger yield, adjusted for parity of purchasing power, is about 11 per cent of that of Japan, 15 per cent of that of Germany and Russia and 37 per cent of that of China (Box 1.18). In India, the passenger fares have not been increased in last 10 years and their present level is ridiculously low even as compared to the bus fare (Figure 1.24). However, in the context of limited resources available to the Railways, sustainability of the existing subsidy regime needs to be seriously considered. Further, shift in the relative price of passenger rail travel vis-à-vis other modes of travel affects the modal choice of many passengers, and thus inflates demand and creates pressure to add more services.

For the year 2010-11, losses from passenger services are estimated to be around Rs 165 billion, with a total revenue of Rs 258 billion (Figure 1.25). The suburban segment incurred a loss of Rs 23 billion (roughly 125 per cent of its revenues), whereas the non-suburban segment incurred a loss of more than Rs 141 billion (roughly 60 per cent of its revenues). These losses are due to a combination of factors including non-revision of passenger fares for the last 10 years, running of poorly patronised trains, operations of trains on uneconomic loss-making branch lines and running of slow, stopping passenger trains for short distances. Ticket-less travel also contributes to losses to some extent. However, train-wise disaggregated analysis is presently not available.

Looking at the financial situation of IR, with its operating ratio rising to 95 per cent over the last two years, it is imperative that IR designs a realistic

Box 1.17

Tariff Regulation: Government Control in Varying Measures

Germany, Russia, China and Japan all impose some statutorily-backed fare regulations on their passenger rail services. This clearly reflects the high social and political sensitivity of passenger transport fares in all the countries, irrespective of political system.

China lies on one extreme of the fare regulation spectrum, with **highly centralised government control of passenger railway prices.** Under the 1991 Railway Law, passenger fares proposed by the Ministry of Railways must be approved by the State Council via its macro-economic management agency. All China Rail tariffs as well as those of inter-Provincial joint venture and local railways are included in this regulation. Special pricing policies also exist for certain train categories such as high-speed train services.

In Japan, ministerial approval of Japan Rail maximum fares is required and companies are obliged to adopt co-ordinated structures that enable smooth inter-ticketing and travel across Japan. In considering fare proposals the Transport Minister must take into account the level of fares in relation to efficient costs plus ‘appropriate’ profits. The Minister can also order changes if the charges discriminate against certain classes of passenger or if the charges may cause ‘unjust’ competition against another railway. In addition to general co-ordinating mechanisms in setting and administering rail fares, when transfer between companies is required companies are obliged to set fares to take account of the total distance and to taper the fare accordingly.

In Russia, the Federal Tariff Service (FTS) has strong regulatory powers but has granted much greater freedom and now effectively only regulates non-premium tariffs. FTS is responsible for regulating charges and fees for services which involve transport of passengers by long-distance trains on Russian domestic routes, whether by RDZ or private operators.

Even in **Germany**, where there is substantial commercial freedom to set fares, **the government has formal approving authority for general fare increases** (and changes in conditions of carriage) on long-distance routes. The Bundestag (parliament) also regularly scrutinises rail fare proposals. As this is based on the principle of undistorted competition and commercial operations, in practice fares are generally approved as a commercial decision of the companies involved and the practical regulation is very light. The systems are summarised in the table below.

COUNTRY	PASSENGER FARES REGULATION
China	Heavily Regulated. State Council has complete regulatory powers, but has granted more flexibility in recent years to reflect wider range of service qualities.
Russia	Regulated. Federal Tariff Service regulates domestic long-distance fares but since 2009 has granted independence of pricing for premium travel classes and trains.
Japan	Lightly Regulated. Maximum fares must be approved by Minister of Transport, and companies must coordinate fares and ticketing systems to allow smooth transfer between companies at non discriminatory fares.
Germany	Very lightly Regulated. Federal government must approve conditions of carriage including standard fare but policy is that long-distance markets should be regulated by competition. Suburban/regional fare regulation differs by concession.

Source: Passenger Railway Institutions and Financing, Paul F. Amos, 5 September 2011

Box 1.18

India's Unyielding Railways: International Comparisons of Passenger Revenue Yield

Within any railway there are **large variations in cost recovery between the different types of passenger service** and different routes. Unlike the transport of rail freight, the costs of a passenger train movement for which the train-consist has been determined is almost independent of the number of passengers using it. Railway management should therefore attempt to match the size of trains to the general level of demand offering. However, fluctuations in traffic by day of week and time of day mean that there is often much unused capacity even with very efficient operations. Highly peaked regional/suburban services tend to have much lower yields/carriage-km compared to costs, relative to less peaked inter-city services.

When other things are equal, **railways in developing countries face an inherently greater challenge in attaining cost recovery** in passenger rail services. The ratio of rail operating costs between efficient railways in high-income countries to those in low-income countries is relatively small, say 2:1 at most (as the cost of many of the inputs, fuel and spare parts are the same in both cases). However the equivalent ratio for income per head may be up to 10:1 and this income disparity affects the affordability of fares. **Railways in developing countries must therefore attract a healthy proportion of higher income earners within the country into their customer mix.** The economics of rail technology depend on delivering the superior travel benefits the technology can offer to those who can afford it, and pricing accordingly. The more successful a company is in providing an attractive travel product at healthy fares the more scope it has for offering cheaper fare options at the margin. As incomes (and costs) increase, positioning the main role of passenger railways as cheap transport for low income groups is a recipe for mounting financial stress.

India's average passenger yield, adjusting for parity of purchasing power, is about 11 per cent of that of Japan, 15 per cent of that of Germany and Russia and 37 per cent of that of China. When adjusted for parity of purchasing power, Japan (which receives no revenue subsidies) has the highest farebox yield, Germany and Russia have lower yields but of a mutually similar order, while China has the lowest yield of the four countries. The table below provides a comparison.

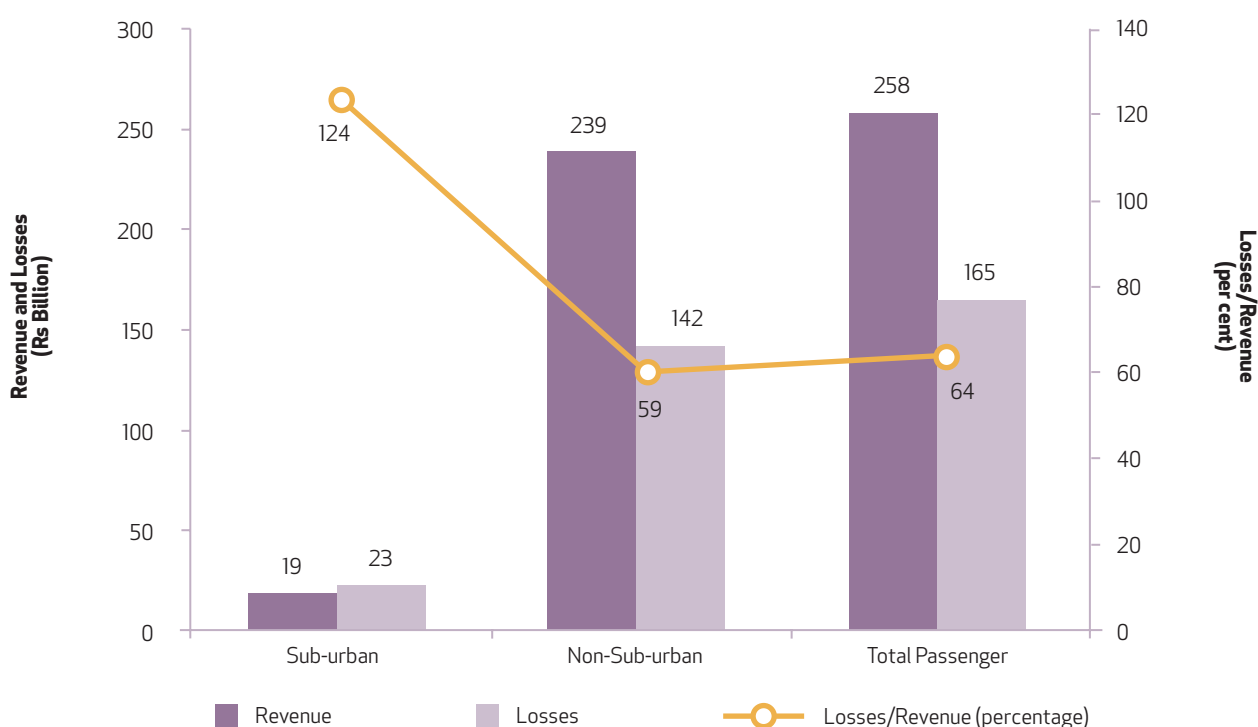
AVERAGE PASSENGER FAREBOX YIELD PER PASSENGER-KM (2010)			
COUNTRY	YIELD/PASS-KM (LOCAL CURRENCY)	YIELD/PASS-KM (USD)	YIELD/PASS-KM (USD PPP)
China	CNY 0.15	0.024	0.038
Germany	EUR 0.09	0.126	0.087
Japan	JNY 14.61	0.190	0.132
Russia	RUR 1.50	0.052	0.094
India	INR 0.26	0.006	0.014

Notes to table:

1. The yields are brought to a common basis of USD rates using currency exchange rates as of 30 August 2010.
2. Because of the disparity in income levels between countries, the results are also shown in USD adjusted for Purchasing Power Parity. Rates used for purchase power parity conversion are as recommended by World Bank for 2010 values.
3. German estimates are for DB long-distance and DB Regional combined but exclude non-fare income from concession contracts.
4. Japanese estimates are for JR companies and private companies combined.
5. Includes both RZD (Russian Railways Corporation) and its subsidiary Federal Passenger Company, plus jointly-owned regional/suburban passenger companies. Excludes revenue shortfall income provided by the Russian Government.

Source: Passenger Railway Institutions and Financing, Paul F. Amos, 5 September 2011

Figure 1.25

Passenger Business: Revenue and Losses (Rs Billion) and Loss Ratio (Per cent)

Source: Ministry of Railways

programme of fare revision to reduce/eliminate the losses on passenger services. The government may subsidise up to 25 per cent of the costs of suburban railways considering that mobility is an important element in the ability of the people to access better economic opportunities and a large number of people use the suburban network on a daily basis. Box 1.19 gives a simplistic programme for fare revision in order to eliminate the losses on passenger services.

Tariff Setting: Under the provision of the Railway Act, 1989, fixation of freight and fares is the prerogative of Ministry of Railways. Railway Rates Tribunal (RRT) and Railway Claims Tribunal are the two dispute settlement bodies on IR. However, their mandates and powers are limited to complaints against Railways relating to discrimination and excess charging, etc. by the freight customers and disputes arising out of claims settlement respectively. Therefore, in the current scenario, **the Ministry of Railways plays the dual role of the provider and the regulator of these services.** In other sectors like power, telecom, major ports, etc. an independent regulator has been established to regulate tariffs.

Efficient prices or non-distortionary prices are typically the outcome of a highly competitive market or an effective regulator. Indian Railways operates in a highly competitive environment in several freight and passenger segments, but in a few others, it faces little or no competition. Further, the externality effects are not reflected in the prices. In the absence of competition, a

regulator is often instituted to set prices based on true costs revealed by the monopolist or near monopolist. **The need for setting up a Rail Tariff Authority has often been stressed in this context.**

It is recommended that an independent Rail Tariff Authority (RTA) should be constituted at the earliest to fix tariffs for both passenger and freight. The Expert Group for Modernisation of Indian Railways, headed by Dr. Sam Pitroda, had also recommended the need for setting up such a Rail Tariff Regulatory Authority in order to provide a level playing field to all stakeholders. Setting up of the RTA could depoliticise the process of setting the passenger fares, which were not raised for close to a decade, until recently, due to populist pressures. It would also help in expansion of the PPP programme of the Railways and could also arbitrate disputes and grievances of freight customers and PPP concessionaires.

Further, an institutional mechanism to gather, analyse and use cost data and market intelligence needs to be established. With computerisation of freight and passenger transactions, Railways now have a huge database. This needs to be used to gain insights on the behavior and preferences of passengers and freight customers. This would need expertise and it is not possible to recruit and retain such expertise within the Railway Board on a sustainable basis. This can perhaps be done through a CRIS project to design and install a decision support system for the rates directorate.

Box 1.19

A Simplistic Programme for Fare Revision

Three alternate scenarios for fare revision have been examined, based on two factors:

(a) Subsidy provided for Suburban railways, and (b) timeframe.

Common Assumptions across the three scenarios:

- Revenue and loss figures for the year 2010-11 have been used as the base to calculate the required revision in fares.
- The proposed fare revision under the three scenarios has not been adjusted for inflation; i.e., it is assumed that in addition to the proposed revision under the three scenarios, the fares will also be adjusted proportionately to change in costs.

	SUBURBAN	NON-SUBURBAN
Revenue (Rs Billion)	18.7	239.2
Loss (Rs Billion)	23.2	141.7
Loss /Revenue (Per cent)	124 Per cent	59 Per cent
SCENARIO I		
Subsidy (on cost)	0 Per cent	0 Per cent
Timeframe for fare revision	10 Years	
Required increase in revenue to incur 'zero loss' ^{**}	124 Per cent	59 Per cent
Fare increase each year (per cent)	8.4 Per cent	4.8 Per cent
SCENARIO II		
Subsidy (on cost)	25 Per cent	0 Per cent
Timeframe for fare revision	10 Years	
Required increase in revenue to incur 'zero loss' ^{**}	68 Per cent	59 Per cent
Fare increase each year (per cent)	5.3 Per cent	4.8 Per cent
SCENARIO III		
Subsidy (on cost)	25 Per cent	0 Per cent
Timeframe for fare revision	15 Years	
Required increase in revenue to incur 'zero loss' ^{**}	68 Per cent	59 Per cent
Fare increase each year (per cent)	3.5 Per cent	3.1 Per cent

* The figure is adjusted based on subsidy provided.

Source: NTDP

With accounting reforms it should be possible for the RTA to determine the costs of operating uneconomic railway lines built on social consideration and losses on passenger services on account of subsidised tariff-setting. The government will have the option of closing operation of such lines or services or raising tariff. Alternatively, the government could decide to provide subsidy as determined by the authority.

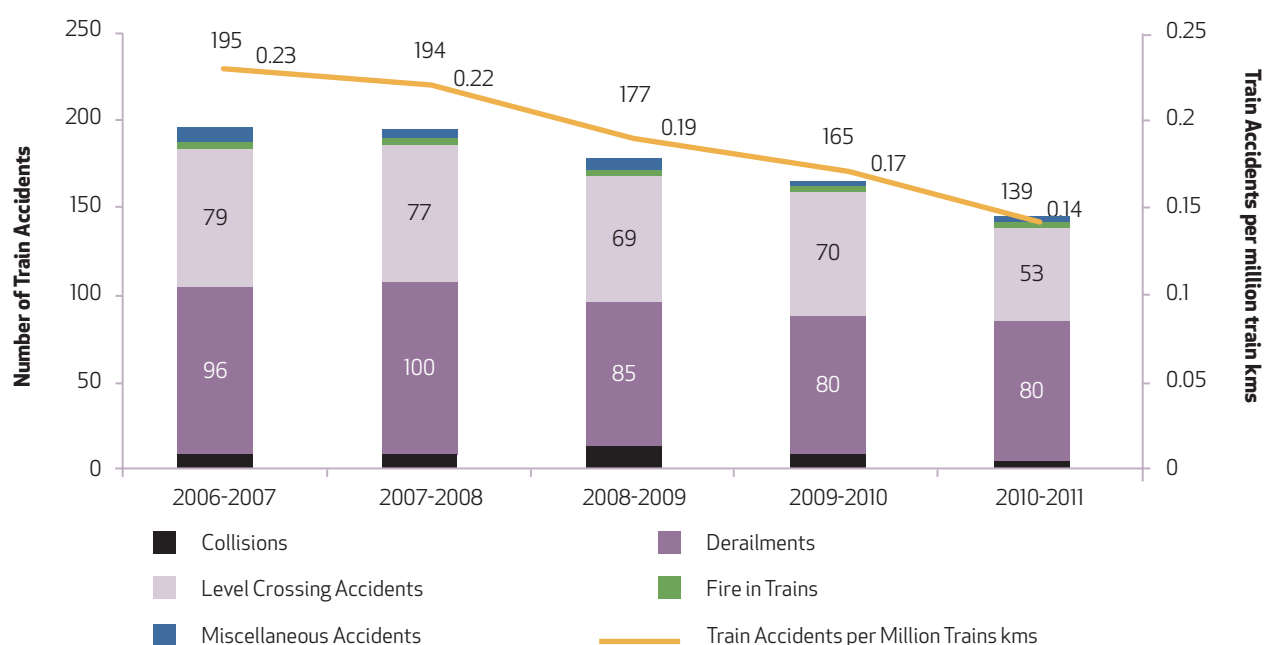
SAFETY

Safety on IR has always remained a pressing issue. Concerned with the high rate of railway accidents in India and to prepare a roadmap for improving safety on IR, the Ministry of Railways appointed a

High Level Safety Review Committee (HLSRC, 2012) under the Chairmanship of Dr. Anil Kakodkar. The Committee examined all technical and technology related aspects in connection with safe running of train services in the country and highlighted many discrepancies in current safety practices caused by poor maintenance of equipment and installations, lack of trained staff, and inability to adapt to new technologies. The Committee submitted its report in February 2012 and noted that:

“There is no practice of independent safety regulation by an independent agency separate from operations. The Railway Board has the unique distinction of being the rule maker, operator and the regulator,

Figure 1.26
Number of Train Accidents and Accidents per Million Train Km



Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar committee)

all wrapped into one. Commissioners of Railway Safety though considered to be the safety watchdogs have negligible role at the operational level. Compliance of safety standards set by Railways for themselves are often flouted for operational exigencies.’

The Commission of Railway Safety, working under the administrative control of the Ministry of Civil Aviation of the GoI, deals with matters pertaining to safety of rail travel and train operation and is charged with certain statutory functions as laid down in the Railways Act (1989), which are of an inspectorial, investigatory & advisory nature. The most important duty of the Commission is to ensure that any new Railway line to be opened for passenger traffic should conform to the standards and specifications prescribed by the Ministry of Railways and the new line is safe in all respects for carrying of passenger traffic. This is also applicable to other works such as gauge conversion, doubling of lines and electrification of existing lines. Commission also conducts statutory inquiry into serious train accidents occurring on the Indian Railways and makes recommendations for improving safety on the Railways in India¹⁸.

A review of the statistics for safety on Indian Railways shows a sustained reduction in number of consequential train accidents per year despite phenomenal increase in volumes of traffic, both passenger and freight. The total consequential train accidents have come down from 195 in 2006-07 to 141 in 2010-11.

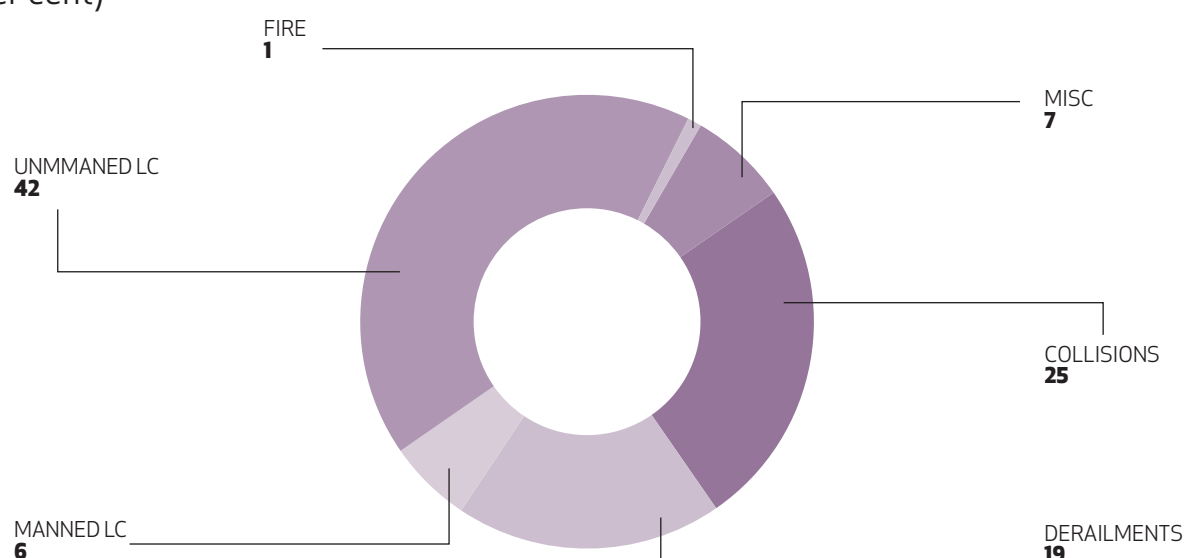
The consequential train accidents per million train kilometre have also shown a steady decline from 0.23 to 0.15 during this five year period (Figure 1.26). Derailments and accidents at level crossings constitute account for roughly 90 per cent of the total accidents. Moreover, roughly 85 per cent of accidents on IR are alleged to be on account of human failure (HLSRC, 2012).

Though the data of consequential train accidents over the years has been showing a declining trend despite phenomenal growth of traffic, safety on IR still remains a matter of great concern as the total casualties have increased from 610 to 844 during the same period. Further, close to 50 per cent of the casualties happen due to accidents at level crossings, while collisions account for about 25 per cent of the casualties (Figure 1.27).

The report of HLSRC also highlighted that the data maintained in the Railway Board office pertains to only those train accidents with apparent consequences. The casualties due to trespassing of railway track, or for other reasons connected with railway infrastructure and casualties of IR’s own staff while on duty, though quite substantial, are not included in the statistics of train accident related casualties. Total deaths and injuries among railway passengers and others on railway property not considered as ‘consequential’, or due to a fault of the Indian Railways, were reported to be around 25,900 for 2011 (National Crimes Record Bureau, 2012). Further, dur-

18. <http://civilaviation.gov.in/CRSS/Commission%20of%20Railway%20Safety.html>. Accessed September 23 2012.

Figure 1.27
Total Casualties in Train Accidents (2006-2011)
 (Per cent)



Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar committee)

ing the period 2007-08 to October, 2011, about 1,600 railway staff were killed and 8,700 injured while on duty (HLSRC, 2012).

The committee also gave detailed recommendations for enhancing safety on IR, some of which are summarised in Box 1.20.

RECOMMENDATIONS:

- **Establish a National Board for Rail Safety** which is independent of the operational agencies to avoid conflict of interest. The CEO of the Board should be of a rank of Secretary to the GoI and should report directly to the railway Minister. The Board should be staffed by professionals who have career opportunities and working conditions similar to professionals working in IITs/CSIR laboratories. It should also have an adequate funding mechanism. The Board will also conduct statutory inquiries into train accidents occurring on the Indian Railways, presently being conducted by the Commissioner of Railway Safety. Further, with the setting up of the proposed Board, the institution of Commissioner of Railway Safety may not be necessary and it may be merged with the Board (an amendment to the Railway Act would be necessary in this regard). The terms of reference can incorporate the recommendations similar to those included in the report submitted by the Dr. Kakodkar Committee (2012) on railway safety.
- Establish/strengthen Safety Departments within operating agencies (at different levels Railway Board, Railway Regional

headquarters) for ensuring day to day compliance with safety standards, studying effectiveness of existing policies and standards, conducting safety audits, collecting relevant data, etc. These departments must employ 50-60 per cent professionals with expertise in the relevant area of safety, and 40-50 per cent of the staff could be on deputation from the field.

- A railway safety policy with measurable indicators for evaluation for a five year and ten year period must be announced before the end of 2015. The policy should cover all injuries and fatalities associated with railway property.
- Reform data collection and analysis procedures for traffic accidents in consonance with international practices at different levels: National broad-based data, detailed survey systems for fatal cases, sampling systems for medical data, etc.
- Establish five to 10 multidisciplinary safety research centres at academic institutions.

INADEQUATE RESEARCH & DEVELOPMENT

Research & Development can be a significant source of competitive advantage. However, Indian Railways has not been on the frontier of developing or innovating railway technology. A comparison of the technologies employed on IR with the best that is available or in use on other railway systems shows that IR has lagged behind its peers the world over. There is a gap of a few decades between state-of-the-art technology adopted (in construction, maintenance and operation, and different kinds of trans-

Select Recommendations of High Level Safety Review Committee

Following are some of the key measures recommended by the Committee to improve safety:

- **Independent Safety Regulation:** There is no practice of independent safety regulation by an independent agency separate from operations. A **Railway Safety Authority (RSA)** should be set up as a statutory body independent of Indian Railway Board under the Government. The Authority shall have a separate budget fully funded by the Ministry of Railways and shall be backed by a full-fledged Secretariat. The Institution of Commissioner of Railway Safety should be merged with RSA and should be strengthened and empowered. Role of Commissioner of Railway safety should be withdrawn from the routine clearance of proposals from the railways such as changes in Plans, Working Rules, etc. which consume lots of his time.
- Financial health of IR has great bearing on the safety standards. Passenger fares have not been increased in the last decade during which many passenger carrying trains were introduced on the existing overloaded infrastructure. This has strained the infrastructure way beyond its limit and all the safety margins have been eaten up pushing Indian Railways to a regime of adhocism in infrastructure maintenance. **The Committee strongly recommended to stop such practice of introduction of new trains without commensurate inputs to the infrastructure.**
- Line capacity has been severely constrained due to introduction of more and more trains over the years. No technical aid is yet available to run trains during foggy weather which adversely affect train operations during winter season of 2 to 3 months in northern India. **The Committee recommended adopting an advanced signalling system based on continuous track circuiting and cab signalling, similar to European train control system Level-II on the entire trunk routes of about 19,000 route kilometres within 5 years.**
- Casualties in accidents at level crossings are a matter of concern. Moreover, level crossings are also a drag on train operation limiting line capacity. **The Committee, therefore, has recommended total elimination of all level crossings (manned and unmanned) within 5 years.** Construction of limited height sub-ways, Road under Bridges (RUB) and Road over Bridges (ROB) should be taken up in mission mode and traffic blocks should be generously granted.
- With the introduction of long formation of trains running at moderately high speed of 110 to 120 kmph, it is recommended to stop production of ICF design coaches and completely switch over to manufacture of LHB design coaches immediately.
- There is a severe shortage of well trained staff. There are several vacancies in critical safety positions. All the vacancies of supervisors and staff in safety category should be filled up in a time bound manner say within 6 months.

Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar committee)

portation solutions such as high-speed, heavy-haul operations) in the developed railway systems and Indian Railways.

At present, Research, Development and Standards Organisation (RDSO), Lucknow, is the sole R&D organisation of Indian Railways. It functions as the technical advisor to the Railway Board, zonal railways and the production units and is entrusted with:

- Development of new and improved designs;
- Development and adoption of new technologies for use on Indian Railways;
- Development of standards for materials and products specifically needed by Indian Railways;
- Technical investigation, statutory clearance, testing and provision of consulting services;
- Inspection of critical and safety items for rolling stock, locomotives, signals, telecommunications equipment and track.

Infrastructure with RDSO: Presently, RDSO has a number of laboratories equipped with research and testing facilities for development, testing and design evaluation of various railway related equipment and materials. **Although these laboratories have achieved their limited purpose, these are not state-of-the-art.** Moreover, facilities for development of model/prototype research work and workshops equipped to support such research work do not exist at RDSO.

Collaboration with Research and Academic Institutions: RDSO has also forged strategic links with premier technical institutions and organisations, such as the IIT at Kanpur, Roorkee, New Delhi and Chennai, the Defence Research and Development Organisation (DRDO), and the Central Scientific Research Organisation (CSIR). A Memorandum of Understanding (MoU) has also been signed with IIT, Kharagpur to set up a Centre for Railway Research

Table 1.12
Staffing Pattern of RDSO

STAFF	SANCTIONED STRENGTH	ACTUAL ON ROLL	MODE OF RECRUITMENT
Group 'A'	212	192	By deputation of officers from Zonal Railways/promotion from Group 'B'
Group 'B'	166	140	By promotion from Group 'C'
Group 'C'	2,101 (Tech-1,553; Non-Tech.548)	1,612 (Tech.1,141; Non-Tech.471)	RRB/Compassionate Ground
Group 'D'	870	505	RRC/NER & Compassionate Ground

Source: Report of the Working Group on Railways (NTDPC)

at Kharagpur for developing next generation railway technology for Indian Railways.

Despite existing laboratories and strategic alliances, RDSO has not been able to fully achieve its objectives and Indian Railways is mostly dependent on imported technology. RDSO's role has largely remained restricted to facilitating adoption of imported technology by Indian Railways, standardisation of design specifications and development of indigenous sources for import substitution. Some of the main factors that have impeded RDSO's emergence as the R&D spearhead of IR are:

- Bright and talented technical personnel with exposure to global technological trends are required for research. Such technical expertise is not available with RDSO. RDSO is mainly manned by railway officers and their knowledge is limited to railway operations as they exist. Railway officers are undoubtedly required to bring relevant domain knowledge and clearly define research areas but beyond that their skills are of limited use for research, development or innovation. Table 1.12 shows the current staffing pattern of RDSO. It shows that the top-echelon of RDSO is manned by officers on deputation from Zonal Railways and most of the staff of RDSO is recruited at relatively low-level.
- RDSO postings are not considered very attractive by many railway officers. Even the railway officers who are sent on deputation to RDSO stay there for short tenures. The limited expertise or exposure gained by them is also lost and no institutional capacity gets built.
- RDSO lacks research labs with state-of-the-art equipment. It is also hamstrung by the government procedures in procurement of research and testing equipment.
- Workload on account of vendor development has increased manifold in the recent past. As a result, registration and approval of vendors consumes a considerable part of the time and

resources at the disposal of RDSO, adversely affecting its R&D work.

The High Level Safety Review Committee (2012) also examined the present state of functioning of RDSO and noted that:

'Research Design and Standards Organisation, which is the present apex technical wing of Indian Railways, is highly constrained due to several reasons. This has hampered the ability of the system to internalise new emerging technologies and indigenous development has not progressed consistent with today's needs.'

Box 1.21 highlights some of the observations of the HSLRC about the present research eco-system on IR. The major recommendations of the HSLRC on the proposed research eco-system on IR are summarised in Box 1.22.

Recognising the role and importance of research and technology in meeting the goals set out for IR, the **Indian Railways Vision 2020** document of Ministry of Railways noted that:

'We must establish one of the worlds' most advanced research and development capabilities for transfer and indigenisation of technology and breakthrough innovations. For meeting these objectives, the Research, Design and Standards Organisation (RDSO), CRIS and other technical bodies of the Indian Railways would be revamped to enable them to work with clear mandates and deliverables. R&D will be integrated with the core of Railways operations.'

It further suggested that:

'A conscious strategy to mitigate the risk of obsolescence and continuously stay ahead in technology race would be put in place. This would be achieved by fostering close linkage between RDSO, functional levels of railway administration and intellectual resources at premier technology institutes like IIT and

Present Research Ecosystem (Observations of High Level Safety Review Committee)

- RDSO, in its present form, is largely discharging its role as a support organisation for operational network of Indian Railways in terms of inspection and testing, coordination between vendors / suppliers and operational units, marginal improvement of systems / sub-systems etc. RDSO also carries out the work of development of design and specifications of systems and sub systems, audit of vendors and their approval and inspection of critical items related to operation and safety. **There is, however, no semblance of any original research or technology development initiative and the general style of functioning is around customisation of designs of vendors to suit the requirements of Indian Railways.**
- **Poor empowerment of RDSO in forwarding the sanctioned area of work within the budgeted amount was also brought to the notice of the committee.** It was informed that RDSO was dependent on zonal railways in awarding the contracts for trial projects of RDSO which cause delay.
- **There is hardly any permanent cadre of scientists or officers at RDSO to carry out the R&D work.** The officers at the senior positions such as EDs, Sr EDs and Directors are drawn from the zonal railways on deputation basis. These officers go back to the zonal railways after completion of their term of 3 to 5 years or on promotion. **RDSO-specific recruitment is done only at the subordinate level on permanent basis.** After converting the status of RDSO as a zonal railway, even this recruitment has come to a halt. These subordinate employees are not able to go beyond JAG level.
- The committee had detailed presentations and interactions on Technology Mission on Indian Railways (TMRS). **It is observed that though this was a good effort on the part of RDSO and IIT Kanpur, the role of industry was very limited.** This was perhaps due to the fact that there was no incentive to the industry. Their efforts in association with IIT Kanpur and RDSO were not going to be rewarded in any way as the procurement of the product was through open tender. **IPR policy of Indian Railways was not conducive for promotion of this academia-industry-railway partnership.** This led to the unwillingness of industry partners to participate actively. **Thus, despite the best intentions and reasonable success on the development front up to trial demonstration stage, the process of technology transfer could not be carried out successfully.**
- **It must be mentioned that a certain element of ownership and independence in railway engineering is necessary in India.** If there is a tendency of over independence on suppliers and vendors and if the equipment procured is in the form of a black-box then certainly the organisation is at the mercy of vendors time and again. This is certainly not a safe scenario. The specifications of the equipment as well as the technological know-how should be owned as well as controlled firmly by Indian Railways. Development of technology as well as indigenous vendors is necessary.
- In order to improve the technology of rolling stock, motive power equipment, track system and other assets, it is essential to invest continuously in applied research and technology development. **This perspective is singularly absent in the present scenario.** In case of nuclear and space agencies, the backbone of research and development is as strong as the operational wings of these agencies. It is because of this that the country is able to achieve a level of independence and excellence in these areas.

Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar committee)

NITs and research laboratories of CSIR and DRDO along with targeted investments in **R&D. In 10 years' time, IR would be transformed from a net technology importer to technology exporter.'**

RECOMMENDATIONS

Establish Railway Research and Development Council: Presently, functioning of RDSO is reviewed

by a Governing Council which is headed by the Minister of Railways; Chairman and Members of the Railway Board are Members of the Council. The Council is required to interact with RDSO at periodic intervals. It has been, by and large, dysfunctional and is not playing the role it was envisaged to. As suggested by the High Level Safety Review Committee, the Governing Council needs to be replaced with an apex body called 'Railway Research and Develop-

Proposed Research Ecosystem (High Level Safety Review Committee)

The High Level Safety Review Committee proposed the establishment of a new architecture of research and development under the overall guidance of an **apex body called Railway Research and Development Council (RRDC)**, which is recommended to be established for this purpose.

Apart from the RRDC, the research eco-system is conceived of the following three wings:

- **Research, Design & Standardisation Organisation (RDSO)**
- **Advanced Railway Research Institute (ARRI)**
- **A set of Railway Research Centres (RRCs)**

Following paragraphs summarise the role of each of these:

- **RRDC:** The RRDC will provide overall guidance as well as resources for the railway research eco-system in India. The council will also provide a perspective plan of research and development in view of the safety considerations on one hand and the technological solutions on the other hand. The RRDC will be chaired by an eminent technologist / scientist of the country reporting to the Railway Minister. It will have three members from the Railway Board and three members, one each from academia, research establishments, and industry associations (CII, FICCI etc). The Director General (DG) of RDSO and the Director General of the proposed ARRI shall also be members of RRDC.
- **RDSO:** Indian Railways should strengthen RDSO and make it more efficient organisation with respect to the work of design standards, inspection, testing and technical support to zonal railways. It should be restructured and empowered to perform the assigned task. It will have linkages with ARRIs and RRCs. Further, the committee recommends enhancing the powers of DG/RDSO to improve its functioning:
 - Full autonomy with financial powers to function within the sanctioned budget.
 - To award consultancy contracts of enhanced value up to Rs 10 million in each case against the present delegation of Rs 3 million in each case. Powers for awarding MOU/Consultancy Contract should also be extended to benchmarked organisations in India and abroad like AAR, TTCI, UIC etc.
 - Full powers to award Consultancy Contract once sanctioned by the Board for values more than Rs 10 million each and there should not be any further need of sending the proposal to the Board.
 - Full powers for placement of developmental order within lump sum Budget Grant of RDSO irrespective of cost. This will expedite prototype and field validation for which RDSO is presently depending on PUs and Railway Board.
- **ARRI:** This organisation should be a high-end, research organisation focusing on engineering challenges in railway specific areas.
- **RRCs:** Indian Railways should establish a string of five or so RRCs. These centers should be co-located on the campuses of Indian technological academic institutions of national importance. Each center should specialise in specific areas like signalling, rolling stock, motive power, track and bridges, operations management, etc.
- **Financial support** up to 2 per cent of yearly revenue of Indian Railways should be available to support the entire research eco-system of railways in India.

Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar committee)

ment Council' (RRDC). RRDC will be chaired by an eminent technologist/scientist, with the Chairman and Technical Members of the Railway Board as its members. The Director General of the proposed RRDI, the Director General of RDSO and 2 Directors of the proposed Academic Centres of Excellence shall also be ex-officio members. It will also have one representative each from the academic world and research organisations. The Chairman of RRDC shall have a reasonably long tenure.

RRDC shall provide the perspective plan stretching over a reasonable period of 10 years for research and development needed for the Railways.

The budgetary provision for research and development should be adequate; 2 per cent suggested by the High Level Safety Review Committee can be a benchmark. This is a must to upgrade the research and testing facilities available presently, as also to provide the resources needed for the new RRDI, the

new Academic Centres of Excellence and the modernisation of the RDSO.

Establish Railway Research and Development Institute (RRDI): This will be multidisciplinary research organisation for applied research on current concerns and future technology development for Railways. This is in line with the recommendations of the Dr. Kakodkar committee to establish an ARRI. The proposed institute should formulate a Master Plan roughly every five years to articulate and lay down the major research areas and activities. The institute should look at establishing independent Research Wings for each of the major areas, e.g. Railway Track & Structure; Locomotives; Rolling Stock; Train Controls, Signalling and Communications; Information Technology; Energy Efficiency; Rail Environmental Research; Safety; Railway Transport and Logistics; Railway Economics, Statistics and Data.

The service conditions at RRDI should be similar to those at CSIR and the Director General of the institute should have rank and facilities similar to those at CSIR laboratories/ Secretary to the Government of India. The Director General will report directly to the Minister of Railways or the CRB. Terms of reference would be similar to those at the IITR (as recommended in Chapter 11 on Research and Human Resource Development), but with greater emphasis for applied work as per needs and requirements of Railways. The institute should target recruiting close to 300 researcher professionals (60-70 per cent permanent employees of the institute and 30-40 per cent on deputation) by the end of the 13th Five Year Plan, with a healthy mix of Ph.D. degree holders, engineers, architects, professors from national and international universities, etc. The institute should also look at organising joint researches in collaboration with various international organisations.

The RRDI should be supported by six or seven Regional Railways Institutes, which focus on the research requirements specific to their region. The head of the Regional Railways Institute should report to the General Manager (GM) of a zone. Each regional institute should target recruiting about 100 researchers within five years of their establishment. Apart from the research requirements specific to their region, these Regional Institutes would also compete among themselves for any Request for Proposal (RFP) floated by the **RRDI** for a research area/project.

Establish Academic Centres of Excellence: The Ministry of Railways and the Ministry of Human Resource Development must set up academic centres of excellence, or the **Railway Research Centres (RRCs)**, in at least 13 technical institutes (IITs, RECs) and at least two IIMs by 2020. It is suggested

that the number of RRCs should be scaled up to 30 by 2030. These should be in the nature of full scale research centres where faculty can interact within a sizeable group. Such centres must be of interdisciplinary nature and be established based on open competition among academic institutions by inviting proposals for the same. Each centre must demonstrate its interdisciplinary nature by ensuring that the participating scientists are drawn from two or more departments and can be established in all academic institutions including medical colleges.

The RRCs should be provided grants in aid for establishment expenses, building, facilities, laboratory, equipment etc. The level of funding would be Rs 30-50 million per year per centre. In addition to equipment, supplies, travel and research funds, the funding must include 5-10 endowed permanent Chairs and 10-20 endowed post-graduate scholarships. Each centre must work in at least 3 research areas. Also each major specialisation/activity of IR should be a focus research area for 2-3 RRCs this will promote interdisciplinary research and minimise academic corruption and monopoly. In order to attract and retain the best of scientists, the RRCs should ensure that their employment and service conditions match the standards of DRDO and CSIR labs. The RRCs should embrace progressive career advancement policies for its staff and provide a platform for the scientists/researchers to rise to the highest level and head the RRCs.

Revamping RDSO: It is recommended that the functions of the RDSO are completely redefined and actions initiated to revitalise and strengthen it. RDSO should involve itself with only technology upgradation, implementation and setting of standards; it should not be responsible for the inspection function. Workload relating to vendor development can be substantially reduced by delegating it to Production Units.

The staffing policies of RDSO need a complete overhaul to induct competent technical personnel required for research. As discussed earlier, currently most of the staff of RDSO is recruited at lower level and the top-echelon of RDSO is manned by officers on deputation from Zonal Railways. In order to build the institutional capacity of RDSO it is important that most of the Group A and B officers should be permanent staff of RDSO. Lateral induction of highly qualified technical personnel at higher levels must be allowed. Further, those from the field who have flair for research should be drawn in and absorbed in RDSO; they shall help bring in domain knowledge too. The target should be to ensure that roughly 50 per cent of the staff of RDSO comprises Group A and B officers. The recruitment of technical officers directly in group 'B' should be started urgently. A well oriented policy for promoting capable and endowed officers to group 'A' on assessing their per-

Box 1.23

Chinese Academy of Railway Sciences (CARS)

CARS is the only comprehensive research institute with multi-disciplines and multi-specialties in China Railway industry. In 2002, it was transformed from a state-owned institute to an enterprise under the direct control of MOR. Grounded in the main field of railway modernization, it has tackled considerable important and critical technological problems and has made a great deal of experimental studies focusing on railway construction and transportation. Therefore, it has gained more than 2300 scientific research achievements and 825 prizes for significant fruits of scientific research. CARS has developed technological innovative ability and core competitiveness in railway transportation over its existence for 60 years, and developed into an industrial group engaging in high and new technologies of rail transport with integration of scientific research, development, production and consultation.

It has 2468 staff and workers, among whom 606 are senior research fellows, and 701 intermediate researchers. As one of the initially approved units granting master's and doctor's degree, it has now developed into a first-level doctorate degree granting institution for Traffic Engineering and Geotechnical Engineering, 2 mobile postdoctoral centers, 6 doctoral degree programmes, and 15 master's degree programmes.

It has built the national railway test center, and has been equipped with over 40 laboratories of all specialties, and 6991 test equipment. Furthermore, it has applied and established in recent years 6 state-level innovation platforms, including

- National Research Centre of System Engineering of Railway Intelligent Transport
- State Key Laboratory for Track Technology of High-Speed Railway
- National Engineering Laboratories for System Test of High-Speed Railway
- Equipment Testing Line of Urban Rail Transit
- State Key Laboratory for Traction and Control System of Locomotive and EMU
- Service Platform for Technological Innovation of High-Speed Train.

CARS is making every effort to build the academy into a first-class research institute and to contribute more to the modernization of China Railways by focusing on research and development, and motivating both experimental tests and commercialization with innovative and enterprising spirits.

Source: <http://www.railway-research.org/Chinese-Academy-of-Railway> accessed on 16th December, 2013

Box 1.24

Korea Railroad Research Institute (KRRI): Korea's Railway Think Tank

KRRI was established in 1996 as a railway research body in Korea aimed at developing railway transportation and enhancing competitiveness in the industry by unfolding strategic R&D activities along with railway policies. KRRI was launched with commitment to shape the nation's railway transport systems while strengthening its competitiveness in the global railway industry. As the nation's backbone research body for the railway technology, KRRI constantly seeks innovative technologies and policies to better serve the people and nation with improved railway systems.

Over the years, KRRI has expanded its international network by signing MOU with related organisations in and outside country, and has been actively engaged in collaborative research activities with its partners. As of November 2008, KRRI had signed MOU with 25 overseas organisations from 15 countries. It is also a member organisation of International Union of Railways (UIC) and International Association of Public Transport (UITP). KRRI hosts annual seminar with Railway Technical Research Institute (RTRI) of Japan and China Academy for Railway Sciences (CARS) of China where related researchers get together to exchange their research expertise and results to develop the railway technology while forming a strong bond between the countries.

(Contd...)

The organisation of KRRI is composed of 270 regular employees, about 84 per cent out of whom consist of researchers in various technology areas. The budget of KRRI for the year 2011 was around 90 million USD.

As an internationally certified testing centre, KRRI is equipped with some 350 units of advanced railway testing facilities in 6 laboratory buildings to conduct highly sophisticated testing and assessment on railway related gears, rolling stock performance and diagnosis to ensure railway safety.

Source: KRRI website (<http://www.krri.re.kr/>); accessed May 03, 2013

formance in field as well as in academics after 7-10 years should be created.

Investments should also be made to upgrade and modernise the lab facilities of RDSO.

Presently, no procedure has been specified for taking over of patent rights from the trade. Where there is design/technology the use of which has considerable importance for IR, taking over of patent rights becomes necessary, to avoid monopoly situation and from consideration of security. A procedure for taking over of patent rights from the trade should be clearly spelt. This is not applicable for rolling stock where while importing, transfer of technology with rights is automatically provided for. However, the issue assumes importance for smaller items such as for track.

Ministry of Railways should set up a Science & Technology wing/department which will act as liaison between the field staff and the Research Institutes/RRCs, and will help in transferring knowledge to the field.

Involvement of manufacturers of railway products in R&D: The upgrade and modernisation of technology on IR can be realised by improvement of in-house R&D work and involvement of the manufacturers of railway products in R&D. Major manufacturers of railway products all over the world invest considerable resources in developing more productive, cost-effective products and systems. They need to be involved in R&D for both new technologies as well as for improvement of existing systems and products.

Setting up of new units with participation of private-sector would also be useful in ensuring technological upgrade.

Result-oriented research teams should be set up to work on specified research projects. Such teams may include participants from outside IR, including from

research/academic institutions and OEMs, contracted for the duration of the project. The research projects core team must not be disturbed till the end of the project and should have strong incentives (financial as well as others) to deliver.

R&D projects need to be identified based on operational needs and potential investment returns. These need to be supported through allocation of adequate resources. Clear-cut accountability for outcome and timely completion would need to be established and monitored through annual performance audit.

An Integrated Energy Management System needs to be set up under a separate directorate in the Railway Board. This needs to be assisted by a multi-disciplinary team at RDSO. Electrification on economic justification, induction of energy-efficient rolling-stock and monitoring of non-traction energy consumption should form part of energy management plan.

HUMAN RESOURCES MANAGEMENT

Indian Railways has the second largest workforce under one government controlled institution anywhere in the world, with nearly 1.3 million employees working under 13 departments, organised in 10 different central Group A services. The current structure encourages excessive departmentalism at the management level and often leads to priorities being set not for the organisation as a whole, but on departmental considerations.

With the continuous technological upgrade, the ratio of Group 'C' to 'D' has changed from 25:75 in 1951 to 82:18 in 2010-11, indicating a shift towards induction of larger number of skilled manpower. However, a sizeable number of unskilled group 'D' staff is still being inducted into the railways. Further, IR recruits about 20,000 staff in Group 'C' & 'D' category annually on a compassionate basis. Such staff are not comparable, skill or merit wise, to those recruited by an open competition. No other department of the GoI

Table 1.13
IR Employees (as on March 2011)

CATEGORY	NUMBER (IN THOUSANDS)	PERCENTAGE
Group 'A' & 'B'	17	1
Group 'C'	1,077	81
Group 'D'	235	18
Total	1,328	100

Source: Indian Railways Yearbook 2010-11, Ministry of Railways

does such massive appointments on compassionate grounds.

HR functions in the Indian Railways have traditionally evolved in the context of its being in the government. HR policies and practices on IR are for the most part attuned to policies of Government of India. There is no flexibility in terms of pay and rewards as these are determined by Pay Commission set up periodically by the government of India.

Recruitment of staff in Groups 'C' & 'D' is done through the Railway Service Commissions located at several centers and to which the zonal railways and production units are attached; the zonal railways and production units too recruit staff such as on compassion grounds and for Group 'D'.

The recruitment to the management cadre (Group A officers) is done through Department of Personnel & Training (DOP&T) and Union Public Service Commission (UPSC). The UPSC as of now holds three different examinations for this purpose viz.:

- **Civil Service Examination** for Indian Railway Traffic Service (IRTS), Indian Railway Accounts Service (IRAS), Indian Railway Personnel Service (IRPS), and Security Service;
- **Central Engineering Services Examination** for Indian Railway Service of Engineers (IRSE), Indian Railway Service of Electrical Engineers (IRSEE), Indian Railway Service of Mechanical Engineers (IRSME), Indian Railway Service of Signal Engineers (IRSSE), and Indian Railway Stores Service (IRSS);
- **Special Class Railway Apprentices Examination** for selecting candidates to the undergraduate programme in Mechanical Engineering at the Jamalpur Institute.

The above does not include recruitment of doctors to the Indian Railway Medical Service for which a separate examination is held by the UPSC. Inclusive of this, there are 10 structured services. Ministry of Railways is the nodal ministry for the Central Engi-

neering Services Examination and the Special Class Railway Apprentices Examination.

What are now 10 structured Group A services were originally 3 to start with in 1926; Gopal Krishna Gokhale raised the issue of Indians being given management positions in the Railways in the Imperial Legislative Assembly in 1910 and his effort fructified 14 years later with the Secretary of State giving sanction during the year 1926-27. In course of time, additional services were created for Accounts, Signal & Telecommunication, Electrical, Stores, Medical, Personnel and Security at different times, taking the total to 10.

Rail Transport has two characteristics a severely guided mode and with controlled access. This, in turn, makes multidisciplinary inputs a must for its output. When the entire organisation is owned and managed by the GoI, proliferation of services is a natural outcome.

This is the root cause of the 'departmentalism' in the IR at the management level.

Presently, the HR function is mostly confined to the traditional role of recruitment, training and establishment matters. Though the Railway Board has the authority and power to attune recruitment and training to job requirements (in terms of skills, performance appraisal, rewards and incentives), there is hardly any effort or interest or institutional mechanism to achieve continuous improvement in HR practices, either at the Ministry's level or at the zonal level. A constant effort to review initial recruitment qualifications and upgrade training modules to reflect the changing needs for Group C staff is totally absent. And, as mentioned above, compassionate appointments done on a large scale make the situation worse. Of the multiple departments and services in IR, some manage these HR activities themselves without involving the Personnel department at Divisional/Zonal or Railway Board level. In an earlier era, Railways could attract talent by

the mere fact that it was one of the few industries in the country and railway jobs offered the security and the prestige of government service. However, to attract, nurture and retain talent in large numbers for growth in future, IR has to take a close look at its HR policies and practices.

This is particularly important in view of the large capacity expansion that is envisaged and the modernisation that is necessary in all aspects of railways' operations.

RECOMMENDATIONS

HR management would be critical to achieving the challenging goals set for IR for 2032. HR reform should proceed hand in hand with the organisational reforms. It is imperative that the 'departmental' character is rectified so as to enable the organisation to deliver on its promises and meet the expectations of the people. The focus should be on building skills and promoting and incentivising excellence at all levels. HR reforms that are carried out will need to be consistent with the proposed future corporate structure envisaged in the organisational reform of Indian Railways.

The NTDPC has discussed the HR reforms of IR extensively and at different times. There is a consensus on the need to significantly rationalise the existing multiple services and cadres of railways. However, as on some other issues, there were some differences in views with regard to how radical the HR reforms should be. The incremental view suggests that the reorganisation may be into seven cadres rather than two as recommended below. This view in favour of seven cadres is provided in full as Annex 1.4 to this chapter.

Following are the recommendations to reform the HR practices of IR:

- The recruitment to the railway cadres of officers should be totally dissociated from the Civil Services and Central Engineering Services exam. The SCRA exam should be upgraded to recruit candidates, who are already graduates, to two streams of Railway Service viz. Indian Railway Technical Service and Indian Railway Logistics Service. This will also facilitate the organisational reforms proposed.
- The age limit for this exam should be 21 to 25 years with three attempts at the competition (at the most).
- On selection, the candidates should be admitted to professional post-graduate level courses of two years duration, on completion of which they should be awarded suitable Masters degree in Railway Engineering, Transport logistics or other relevant disciplines including finance and management. This would help in upgrading the technical capacity of railways staff. This post-graduate training may

be carried out at the proposed Railway Institute/University or other designated reputed academic institutions in India or abroad.

- The Railway Engineering degree will encompass, inter-alia, all aspects of engineering - civil, mechanical, electrical, signalling and telecom, etc. - so that the officers have a holistic approach to the railway related issues.
- The Logistics course will prepare the candidates for railway accounting, railway operations, ratings, human resource development. It could be in the form of an MBA or an MA.
- After successful completion of their course the officers will spend one year as probationers in the field applying their knowledge to actual real-time situations - in a way learning the ropes of managing the day to day working.
- The training institute where the Masters course would be imparted should get converted into a Railway University of international standard, where railway research can be undertaken and PhD degrees awarded. It should become a centre for excellence attracting talent from every nook and corner.
- Once this process of initial recruitment is put in place, we can create a superior managerial cadre of leaders at the time of granting Selection Grade i.e., in the 14th year of service. These officers can be selected by a process of assessment at the UPSC. The leaders so selected will man the posts of Additional Divisional Railway Managers, Divisional Railway Managers, Chief Vigilance Officers, General Managers, etc. In this arrangement the Managers will have long stints unlike today when the DRMs remain in the chair only for two years and the organisation suffers the consequences of frequent changes, lack of direction and cohesion at the divisional level. This will undoubtedly benefit the organisation and a sense of direction, focus will be inculcated. This process will continue for a period of 3 to 5 years, in preparation of the corporatisation and reform of Indian Railways.
- Recruitment of highly qualified PhDs from IIMs/IITs and other science and engineering institutions in India and abroad should be encouraged for specialist functions.
- Lateral recruitment from the market for jobs in R&D, marketing, finance and HR should be considered. IR needs to transform into a smart organisation through a constant process of technological upgrade and stress on customer focused growth. This requires that personnel at all levels are recruited and trained with a view to building skills and attitudes required for attainment of the organisational goals;
- Induction of unskilled staff must be reduced and eventually eliminated altogether.
- The recruitment process has to be supplemented by well researched and meticulously

Box 1.25

Human Resource Management

- Install and operationalise immediately modern Computerised Human Resource Management System with data base and inventory/Resume of all present employees and skills required to meet modernisation plan.
- Reduce and gradually eliminate induction of unskilled staff
- Create and impart specialised courses in partnership with academic institutions and others especially for Vocational Education, Supervisors and Management
- Launch a series of in-service training programmes immediately
- Rationalise and consolidate multiple services and cadres without sacrificing the benefit of specialisation and business capabilities
- Offer graduate programmes in Railway technology at IITs and Railway management at IIMs
- Enable lateral recruitment from market for specialist functions
- Upgrade ICT skills of present officers and employees substantially
- Review and Restructure existing training institutions for improving ecosystem and Modernisation
- Review Railway Health System separately to meet aspirations of Railway Families and Modernisation plans
- Create a system of reward for collective performance and variable pay linked to incremental surplus generated by various units

Source: Report of the Expert Group for Modernisation of Indian Railways, Ministry of Railways, 2012

developed induction and in service training to constantly upgrade the skills of employees. The National Academy of Indian Railways (formerly known as the Railway Staff College) should be upgraded the property and its facilities should be expanded to thrice its current size. IR needs to work closely with academic institutions to devise and impart specialised courses, curricula and diplomas. Skilled workers and supervisors, recruited and trained this way would be able to meet the challenges of absorbing new technology and business orientation as IR rapidly modernises and upgrades its systems.

Modernisation of HR practices must happen and some principles regarding necessary changes have been laid down by Expert Group for Modernisation of Indian Railways (Box 1.25).

OPTIMISATION OF LAND USE

Land is a critical and scarce resource and is getting scarcer as demands on the available land mounts due to the pressure of population and development. A proper policy framework is required to preserve the land already available with railways and to minimise the requirement of land in future.

Roughly 10 per cent of the total land under the possession of Indian Railways is vacant (estimated at approximately 4,300 hectares). These are mostly alongside the track in longitudinal strips but there

are some pockets around railway stations and railway colonies also. To keep a proper account of the land resources, an exercise for identification of the vacant land and systematisation of records has been undertaken. Vacant land is primarily meant to meet developmental needs such as doubling, yard modeling, traffic facility works and manufacturing facilities (for various rolling stock and other components required by railways). If the land is not required for operational needs, it can be developed commercially by Railway Land Development Authority (RLDA) created specifically by an Act of Parliament, to generate additional non-tariff revenue for railways.

In future, railways would need to use its existing vacant land scrupulously. It would also need to acquire land for various developmental projects such dedicated freight corridors, high speed passenger corridors, new lines and doubling projects as well as for major manufacturing units and multi-modal logistics hubs. In most cases, the requirement of land would be to connect places in a linear fashion and there would be little flexibility to vary the alignment due to technical constraints like the radius of curvature, gradients, soil characteristics, river crossing etc. It may always not be possible to avoid agricultural land, forest land or tribal land. However, as construction of railway lines requires only small strips of land, the hardship and physical dislocation to the land-losers can be minimised. Wherever possible, a detour could be taken or alignment changed and taken through tunnels. At some places, retaining walls and breast walls can also minimise the land

As construction of railway lines requires only small strips of land, the hardships and physical dislocation of the land losers can be minimised. Wherever possible, a detour could be taken or alignment changed and taken through tunnels

requirements. This would also help the environment as higher earthwork fillings and deeper cuttings not only use more land, but also disturb the environment through increased earthwork by borrowing or dumping.

Acquisition of the minimum land required for railway projects would be inevitable. In order to speed up the process, Ministry of Railways had enacted Railway (Amendment) Act, 2008 through an Act of Parliament. This Act provides for speedy acquisition of land for 'special railway projects' by nominating a 'Competent Authority' by Railways without resorting to Land Acquisition Act under which acquisition is done through land acquisition officers of State Governments. Provisions of NRRP 2007 for rehabilitation and resettlement of affected persons in a fair and equitable manner have been embodied in the new Act. However, for speedier implementation of infrastructure projects, the land acquisition process has to be based on fair compensation and consent of land-losers to the maximum extent. This, however, lies in the realm of amendment to the Land Acquisition Act for the country as a whole.

RECOMMENDATIONS

Infrastructure Corridors: Several countries have followed the concept of infrastructure corridors to optimise use of land and avoid haphazard development along these corridors. In our country also, no development is permitted within 67 metres on either side of the national highways or 30 metres of the railway alignment. Similar restrictions exist for high-tension lines and petroleum pipelines also. It is suggested that suitable directives be established whereby whenever a new transport infrastructure - rail or highway - is built, the corridor must provide for segments of the infrastructure, i.e., if a new port comes up, the rail connectivity must be in a corridor that also provides for highway, power lines, combined terminals etc.

Schedule of Dimension (SOD) and Maximum Moving Dimension (MMD) improvement: Appropriate investments in track structure and SOD/MMD improvement (by systematically identifying constraining structures and standards and improving them) can potentially enhance the carrying capacity of existing lines and obviate the need for multiple lines and thereby conserve and economise

the use of land. Adequate research and cost benefit analysis need to be carried out on these aspects.

Redesign and redevelopment of suburban stations: Suburban stations provide an excellent opportunity for management of the precious land resources of Railways in urban areas. A standard template can be developed for redesign and redevelopment of the stations that maximises the comfort for commuters and create space for premium retail in station premises.

It must be ensured that the resources mobilised through commercial exploitation of land should not be utilised for non-remunerative/unecological social projects. These resources may be parked in a special fund to be utilised for modernisation initiatives of IR (e.g. modernisation fund as proposed by the Expert Group for Modernisation of Indian Railways, headed by Dr. Sam Pitroda).

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

Indian Railways is one of the country's earliest pioneers in leveraging the power of information technology. Passenger Reservation System (PRS) is a highly successful example of use of information technology. Over the years, information technology also has been used for other passenger and customer related services such as Unreserved Ticketing System (UTS) and Freight Operations and Information System (FOIS).

However, system-wide use of IT has remained partial and incomplete. There is a sizeable amount of work needed to enable IT based solutions across business units. The development of compatible interfaces with the regional railway networks and major transport generating entities like ports, mines, etc., and the issues of uniformity of data formats, development of ICT standards and protocols also need attention. Use of information technology (IT) can play an increasingly important role in managing IR's huge network, infrastructure and assets. It will not only help improve efficiency and customer services, thereby contribute towards the goal of enhancing rail's share in the total transport, but also can play a transformative role in railways.

In order to reap the benefits of a single uniform IT solution that runs across Indian Railways, we must look at structural/organisational needs along with business processes and the currently available technology to create a holistic system. Currently, the Computer and Information Systems (C&IS) Directorate in the Railway Board plays the role of a CIO within the Railways. The Directorate is supported by a specialised institution called Centre for Railway Information Systems (CRIS) which is responsible for developing, implementing and maintaining ICT applications under a dynamic operational

environment. At the zonal railway level, there is an exclusive organisational arrangement for implementing and maintaining ICT applications in operational and commercial areas. There is a need to strengthen the C&I S Directorate at the Railway Board to prepare an enterprise-wide Master Plan for ICT application.

There is also room for improving the way the IT projects are conceived, prioritised and executed. Most of the IT projects are driven by the respective departments. Different IT solutions developed by different departments or divisions function as islands of information and do not interact with each other because there is no common platform or set of standards for information exchange. This is, therefore, a fragmented process without a single, strategic, and overarching roadmap driven by business objectives. Ideally, IR's business strategy should be the starting-point for identifying the focus areas to be IT-enabled. This approach would ensure that there is built-in synchronisation and cohesions among different respective project teams which function with a clearly defined purpose. Enterprise-wide integration will provide additional benefits because there will be greater uniformity in data formats which will permit greater interoperability and facilitate seamless exchange of information.

RECOMMENDATIONS

Given that there will be large benefits from introducing ICT solutions, we recommend that there be intensive implementation of ICT as soon as possible. A summary of the major recommendations for enablement of ICT in Indian Railways is provided below. These recommendations have been discussed in detail in Chapter 10 (Potential of Information and Communication Technology to Enhance Transport Efficiency).

a. Institutional and Capacity Building

- Computer and Information Systems (C&IS) directorate at the Railway Board be greatly enhanced as to encompass the entire gamut of ICT applications on the network;
- Centre for Railway Information Systems (CRIS) be converted from a society to a non-profit company with much greater freedom;
- Organisation(s) for operationalising ICT applications at field level be converted into autonomous bodies;
- IR Institute of Transport Management (IRITM) be entrusted with the task of human resource development

b. ICT solutions/interventions:

- ICT solutions/interventions should be developed for Demand Forecasting, Scheduling, Procurement and Contract Handling, and Office Automation.

Ideally, IR's business strategy should be the starting point for identifying the focus areas to be IT-enabled to ensure synchronisation and cohesion among project teams

- A comprehensive HR management system should be developed to better manage HR processes and costs as well as to allow proper tracking of skills and to gain improved efficiencies by assigning the right people to the right jobs. Such a system should also maintain an updated record of leave and entitlements, making HR management efficient and effective.

c. Long Range Decision Support System (LRDSS) Project:

- LRDSS has become obsolete and the new version has not yet been developed. CRIS has the capability to develop the required software, dovetailing the same with the operational data available with them. This tool can then be gainfully used both for long range decision making as also for operational decision support on a day-to-day basis. As such, the LRDSS project should be housed with CRIS.

d. A Comprehensive IT security framework should be developed.

INTERNATIONAL RAIL LINKAGE

Integrated transport systems at the regional level are considered crucial to facilitate regional integration and sustain the pace of economic growth in the region. Rail connectivity with neighbouring countries will foster increased economic cooperation among them and will yield not only economic but also social, political and diplomatic dividends.

In the Indian context, rail connectivity to the neighbouring countries in the SAARC region and Myanmar is important both from the economic and strategic standpoints. India is the largest member of the SAARC with 51 per cent of the surface area and 71 per cent of population. It accounts for an even bigger share of the rail network. Of the eight SAARC countries, Maldives and Afghanistan have not been considered for direct rail connectivity with India at this stage due to geographical and political reasons.

Present state of rail connectivity with neighbours: Table 1.14 summarises the current country-wise status for SAARC and Myanmar (refer Annex 1.5 for details). Historically, the rail network of the region prior to independence and partition constituted an organic system. However, in the post-independence and post-partition period, rail systems of

Table 1.14
Summary of Present Status of Rail Connectivity

COUNTRY	STATUS OF RAIL CONNECTIVITY
Bangladesh	<ul style="list-style-type: none"> At present, railway systems of India and Bangladesh are linked to each other at five points. Three BG links are currently open for freight trains. The other two links, though in existence, lie dormant at present. A bi-weekly passenger train also runs between Kolkata and Dhaka.
Pakistan	<ul style="list-style-type: none"> Two BG links (Attari-Wagha and Munabao-Khokhrapar) are operational. Attari-Wagha route is used to run both freight and passenger services. A weekly passenger service runs through Munabao-Khokhrapar.
Nepal	<ul style="list-style-type: none"> In 2004, an ICD which also serves as a rail terminal for bulk traffic was operationalised at Birgunj and connected to Raxaul on the IR network through a new 6-km long BG line. It deals with both inbound and outbound bilateral traffic from and to India and third country traffic through Kolkata and Haldia ports. Survey for five other rail connections between the two countries has been conducted. Ministry of External Affairs has decided to fund two of these (Jaynagar-Bardibas and the Biratnagar-Jogbani lines). These have been sanctioned and taken up by IR for execution.
Bhutan	<ul style="list-style-type: none"> Bhutan does not have a railhead and is dependent on the stations on New Jalpaiguri-Guwahati BG line for its rail transportation. Gol has commissioned studies for five connections to Bhutan. Of the five, Hasimara-Phuentsoling line which will connect Bhutan to the India Railways BG network has been proposed for construction.
Myanmar	<ul style="list-style-type: none"> Myanmar constitutes the crucial missing link or land-bridge between India and South-East Asia. Rail linkages envisaged in the Trans Asian Railway project includes connections to Moreh in Myanmar from Jiribam in Manipur via Imphal. At present, work is progressing on the construction of a new line between Jiribam and Imphal.
Sri Lanka	<ul style="list-style-type: none"> India and Sri Lanka are separated by sea and there is no physical connection between the two railway systems.

Source: Report of the Working Group on Railways (NTDPC)

South Asia have developed in the national context with little consideration for cross-border connectivity and interoperability or compatibility/uniformity of standards in infrastructure and equipment.

Regional and multilateral initiatives for cross border rail connectivity: Present state of rail connectivity with neighbours: Both SAARC and United Nations Economic and Social Commission for Asia and Pacific (UN-ESCAP) have attempted to draw a roadmap for regional and international rail connectivity in the context of SAARC and Asian region respectively. These are summarised in Annex 1.6.

Trans-continental rail connectivity as a strategic tool is being deployed to great effect by China. It has already developed transport links to the Korean peninsula, South-east Asia, Myanmar, Pakistan and Afghanistan. It is developing extensive multi-modal connectivity in India's neighborhood which is perceived in strategic circles as an act of encirclement. It has established a presence in Pakistan with a new port at Gwadar and strategic linkages through Pakistan, Iran and Central Asia. China's initiatives in expanding its rail connectivity beyond its own geographical borders have been discussed in detail in Annex 1.7 because of its overarching strategic as well as political significance for our country. In order to secure our strategic interests in the region, looking at rail linkages beyond the country's borders is not merely an option but a compulsion. Our long-term transport policy, therefore, has to take note of

and provide for solutions to the challenges posed by the Chinese initiatives in the region.

RECOMMENDATIONS

a) It is recommended that Indian Railways should give top-most priority to the projects to be taken up with Nepal and Bangladesh (Table 1.15). Annex 1.8 provides the details of the railway projects that need to be taken up with other neighboring countries. Further, India should take lead in operationalising the southern corridor of the Trans Asian Railway (TAR) project:

- Connection from Jiribam in Manipur to Tamu in Myanmar via Imphal and Moreh should be expedited.
- The existing 201-km MG line from Lumding in Assam to Jiribam needs to be converted to Broad Gauge at the earliest (this is a sanctioned work at a cost of Rs 41 billion; work on formation, etc. is in progress and the work is likely to be completed in 2015).
- The line from Imphal to Jiribam (97.9 km) sanctioned at a cost of Rs 25 billion needs to be completed in a fixed time schedule. Jiribam and Moreh need to be linked to Imphal.
- Connection from Imphal to Tamu (85 km) also needs to be taken up.
- Mahishasan (India)-Shahbazpur (Bangladesh) rail link needs to be rehabilitated and restored.

Table 1.15

Rail Connectivity Projects to be Taken Up with Nepal and Bangladesh

COUNTRY	STATUS OF RAIL CONNECTIVITY
Bangladesh	<ul style="list-style-type: none"> The old links between the two countries need to be restored for the sake of the development of India's north-eastern states as well as for the sake of better relations with our most populous neighbour. These would include: Haldibari (India) - Chilahati (Bangladesh), Gitaldaha (India)-Mughalhat (Bangladesh), Agartala (India)-Akhaura (Bangladesh) and Shahbazzpur (Bangladesh)-Mahishasan (India). Radhikapur (India) - Birol (Bangladesh) line needs to be reopened to facilitate transit trade between Bangladesh and Nepal through India. Haldibari-Chilahati link needs to be restored for trade between Bangladesh and Bhutan through the Indian Territory. Agartala (India)-Akhaura (Bangladesh) connection needs to be re-established to provide the much-needed direct rail link to states like Tripura, Mizoram and Manipur to Chittagong port.
Nepal	<ul style="list-style-type: none"> Jaynagar-Bardibas (69.10 km) and Jogbani-Biratnagar (18.6 km) lines costing Rs 4.7 billion and Rs 2.1 billion respectively and being entirely funded by the government of India should be expedited. Nepalgunj Road-Nepalgunj (12.11 km), Nautanwa-Bhairahwaha (15.30 km) and New Jalpaiguri-Kakrabita (46.30 km), which have also been surveyed, should be taken up by the Government of India. Rail connectivity with Nepal assumes special importance in view of the China factor discussed earlier. China is planning a rail line between Lhasa and Kathmandu. Strategically, it would be in India's interest to construct the Birganj-Kathmandu line (160 km). The cost of this line as estimated by Pipavav Rail Corporation Ltd. (PRCL) is Rs 12.85 billion (2006). This project admittedly will not be financially viable but it will be in India's strategic interest to undertake the project at its cost if it has to preserve its preeminence in Nepal.

Source: Report of the Working Group on Railways (NTDPC)

b) Improvements in rail connectivity with neighbouring countries required on diplomatic and political considerations should be fully funded by the exchequer.

c) Customs and border-crossing: Facilitation Aspects

- In order to reap full benefits of the rail connectivity across countries, in addition to integration of physical infrastructure such as roads, railway lines, and agreed routes, etc., a mutually agreed regulatory framework for harmonisation of documentation and customs procedures and the harmonised use of electronic data interchange (EDI) is also required. Electronic data exchange under a synchronised system needs to be evolved to enable expeditious clearance at the border.
- Inter-country connectivity for trade, transit and trans-shipment should be able to seamlessly use more than one means of transportation: air, water (sea and/or river), rail or road. Simplified procedures like through-bill-of-lading or combined-transport-bill-of-lading can be introduced to facilitate this.
- Inter-change of rail traffic between India, Pakistan, Bangladesh, and Nepal is governed under the bilateral agreements. Bilateral agreements need to be reviewed for operationalising all such intra-regional corridors that would carry third country traffic and transit across another country on its rail network. The current bilateral agreements have to be revised

to a trilateral or multilateral agreement for such through intra-regional rail movements.

- Measures like visa-free travel between countries, single-point customs and immigration checks, etc. are also required to usher in a regime that will facilitate seamless transportation across countries.

ENERGY CONSERVATION

Energy constitutes roughly 24 per cent of the working expenses of Indian Railways. IR accounts for close to 2.3 per cent of the country's total electricity consumption (for example, IR utilised more than 16 billion kilowatt-hour (kWhr) electricity in 2010-11 out of the total estimated electricity consumption of 694 billion kWhr¹⁹). Therefore, it is imperative that IR follows a proactive energy management and energy efficiency policy to reduce its energy consumption in both the traction and non-traction systems.

IR's energy consumption has been increasing over the years. During the period 2004-09, electricity consumption for traction and non-traction has increased by 21 per cent and 14 per cent respectively. In the same period, total GTKMs hauled by electric locomotives increased by 29 per cent. Increase in electricity consumption can be attributed to increase in traffic and general services electrical loads. Similarly, diesel consumption for traction and non-traction purposes has increased by 11 per cent and 35 per cent respectively during the same period, while the total GTKMs hauled by diesel locomotives increased by 16 per cent. The high growth rate of diesel consump-

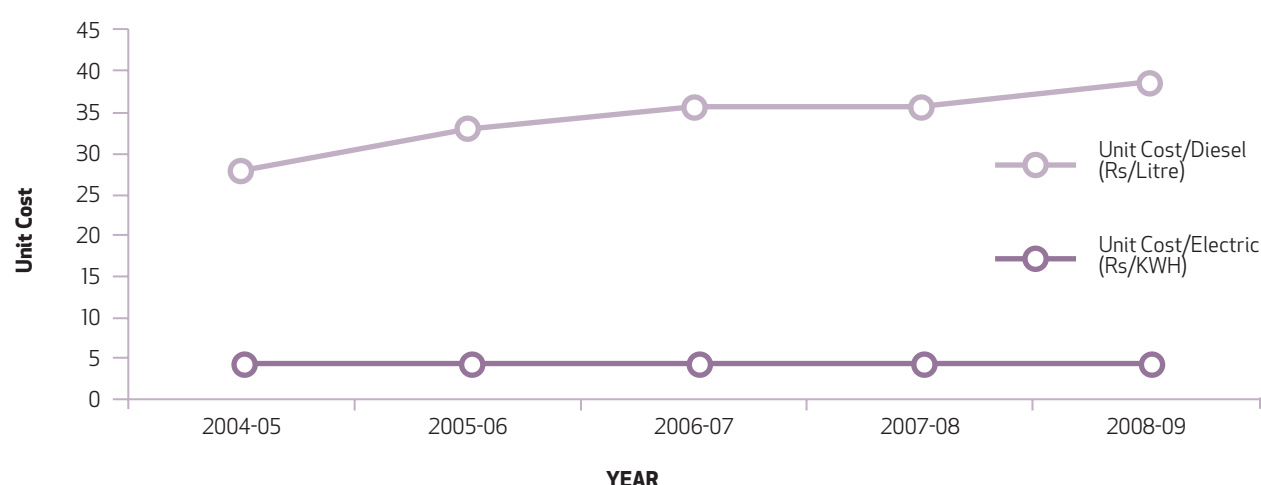
19. Energy statistics 2012, MOSPI, GoI

Table 1.16
Quantity of Fuel/Energy Consumed (2010-11)

	FOR TRACTION	FOR OTHER THAN TRACTION PURPOSES (INCLUDING MANUFACTURING UNITS)
Electricity (Million kWhr)	13,621	2,484
HSD Oil (Million litres)	2,523	44
Coal (Million tonnes)	0.001	0.001

Source: Indian Railways Year Book (2010-11), Ministry of Railways

Figure 1.28
Comparison of Unit Cost for Electricity and Diesel (2004-05 to 2008-09)



Source: Ministry of Railways

tion for non-traction purposes indicates the scope for substituting diesel generators with renewable energy sources.

Table 1.16 shows the quantity of fuel and energy consumed by IR for traction and non-traction purposes for the year 2010-11. The electricity consumption for traction and non-traction stood at 13.6 billion kWhr and 2.5 billion kWhr respectively at a total estimated cost of Rs 65 billion. The diesel oil consumption for traction and non-traction purposes was 2,523 and 44 million litres respectively.

Figure 1.28 shows the growth in unit cost of electric energy and diesel oil during the period 2004-09. While electricity prices have remained stable, the diesel prices have risen steeply. The unit cost of diesel has increased by 44 per cent and the total diesel oil bill by 61 per cent during the period. Electricity tariff, on the other hand, has remained fairly stable and increased by only 4.4 per cent during the period 2004-09. The steep rise in unit cost of diesel is expected to continue in future.

ANALYSIS OF ENERGY CONSUMPTION STATISTICS FOR TRACTION

On the IR, electric traction accounts for a larger share of freight traffic while for passenger traffic the share of diesel traction is slightly higher than electric traction. During the period 2004-09, electric locomotives hauled approximately 63 per cent of the total freight traffic and 46 per cent of the passenger traffic. During the same period, passenger and freight GTKMs carried by electric locomotives increased by 27 per cent and 29 per cent respectively, while the passenger and freight GTKMs carried by diesel locomotives increased by 17 per cent and 15 per cent respectively. The larger share of traffic movement by electric traction is on account of addition of electrified routes and a higher traffic growth rate on the existing electrified sections, which are mostly the dense traffic routes of IR. As of March 2011, more than 30 per cent of total route km and 41 per cent of total running track km, have been electrified (Railways Yearbook 2010-11, Ministry of Railways). Diesel traction covers routes with relatively lighter density of traffic.

Table 1.17
Average Energy Consumption (in Kilowatt-hour) per 1,000 GTKM

TYPE OF TRAFFIC	2004-05	2005-06	2006-07	2007-08	2008-09
Passenger	19.2	18.6	19.2	18.9	19.4
Freight	8.5	8.2	7.9	7.7	7.3
Suburban	37.4	37.7	37.9	38.1	36.9
Kolkata Metro	74.1	75.3	74.0	73.5	73.5

Source: ASS (2004-09); Indian Railways Year Book (2004-09)

Table 1.18
Average Diesel Fuel Consumed (in Litres) per 1,000 GTKM

TYPE OF TRAFFIC	2004-05	2005-06	2006-07	2007-08	2008-09
Passenger	4.5	4.3	4.2	4.0	4.0
Freight	2.6	2.6	2.6	2.5	2.4
Suburban	5.4	5.4	5.3	4.9	5.0

Source: Indian Railways Year Book (2004-09)

TRENDS IN TRACTION ENERGY EFFICIENCY

Energy efficiency of electric and diesel traction has been summarised in Tables 1.17 and 1.18. Energy efficiency in traction is expressed as: (a) electric energy consumed per 1,000 GTKM for electric traction, i.e., specific energy consumption (SEC); and (b) quantity of diesel consumed per 1,000 GTKM for diesel traction, i.e. specific fuel consumption (SFC). The noteworthy trends are a 14 per cent cumulative SEC reduction in freight and 11 per cent cumulative SFC reduction in passenger operations during 2004-09. Table 1.16 shows the need for upgrading the coaches of the Kolkata Metro to the technology level obtained elsewhere.

Figure 1.29 shows a comparison of cost of electric energy with fuel cost (per 1,000 freight GTKM), by integrating the energy/fuel tariff data and the SEC/SFC data.

STEPS UNDERTAKEN FOR ENERGY CONSERVATION

IR has constantly endeavoured to improve the energy and environment aspects of rail transport and has undertaken various energy conservation measures over the years which have helped bring down its carbon footprint. Some of the energy saving measures implemented by IR are detailed below:

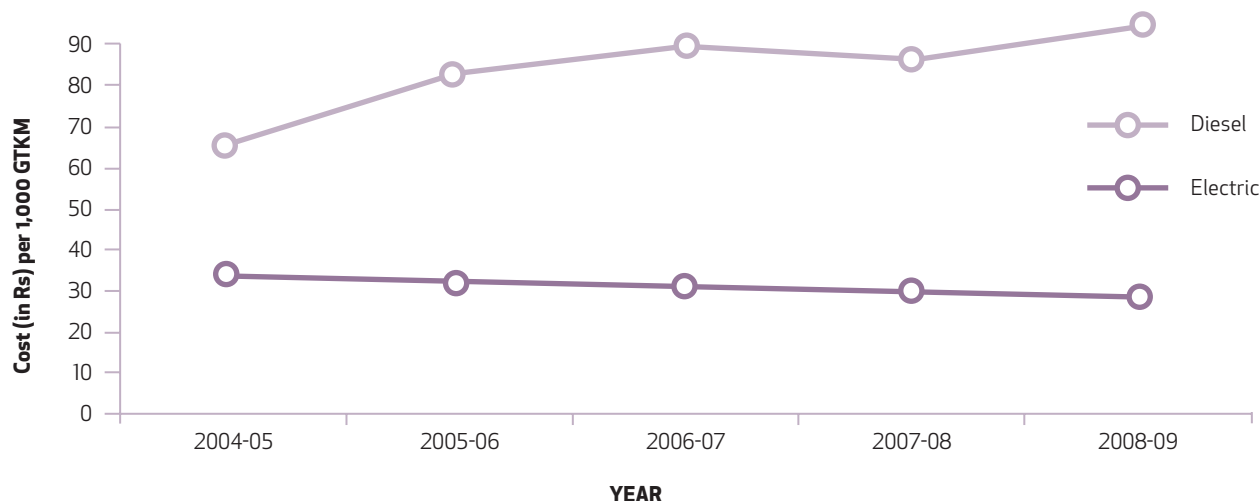
a. Energy saving measures in traction

- **Energy efficient EMUs:** The new three-phase EMUs provided on Mumbai suburban sections are capable of regenerative braking and have an aerodynamic profile. **Regenera-**

tive braking has enabled energy savings in the range of 35-40 per cent. The project is expected to result in annual reduction of approximately 100,000 tonnes of CO₂ emissions and has been developed in association with World Bank for registration under Clean Development Mechanism (CDM) to claim carbon credits.

- **Energy efficient electric locos:** The production of three-phase electric locomotives is being stepped up progressively and all electric locomotives to be manufactured from 2012-13 onwards will be three-phase. These locomotives operate at near unity power factor and are capable of regenerative braking which enables an energy saving of 15 per cent in freight and 20 per cent in passenger operations. Besides, WAP7 locos are being provided with 2 x 500 KVA hotel load converter to take care of train power supply. This system, referred to as Head On Generation (HOG), offers 92 per cent efficiency and is superior to the 60 per cent efficiency in self-generation and 81 per cent in end-on-generation. The HOG system will eliminate the need for power cars and their replacement by passenger carrying coaches. Further, several improvements have been implemented on conventional electric locomotives for achieving reliability as well as energy conservation.
- **Adoption of 2x25kV system for heavy traffic density routes:** 2x25kV system was implemented on the South Eastern and West Cen-

Figure 1.29
Energy/ Fuel Cost per 1,000 GTKM for Freight Services



Source: Ministry of Railways

tral Railway as a pilot project. This technology has now been accepted as the only option for hauling heavier trailing loads at higher speeds. It offers several advantages, such as increased Traction Sub Station spacing and reduced EMI. The cost of rail transportation is reduced due to the economy afforded by the system in railway electrification. The reduction in number of TSSs also results in lowering of cumulative maximum demand charges.

- **Fuel efficient diesel locos:** In order to reduce the consumption of fuel in diesel traction several new projects have been taken up, e.g. distributed power system to eliminate the need for reversal; HOG; CNG powered DEMUs; and use of B10 blend of bio-diesel on diesel locos. IR has also taken a number of direct measures to reduce the SFC. Through continuous design improvements, SFC of locomotives has been brought down from the initial value of 3.3 to 2.5, i.e., a reduction of 25 per cent (it is expected to be brought down to 2.25 by 2015). Further, new features such as intelligent low idle, automatic engine start-stop (AESS) and auxiliary power unit (APU) are being tried out. Besides, the production of fuel-efficient EMD locomotives has been stepped up with plans for a complete switchover to this class of locomotive in the near future.
- **Energy efficient wagons and coaches:** IR has improved the payload-to-tare weight ratio of wagons by using lighter weight materials such as stainless steel and aluminum. Light-weight stainless steel coaches with enhanced passenger carrying capacity have been inducted. Further, the use of the maximum moving dimensions is being studied to permit the introduction of larger-sized wagons and coaches. This involves a study of the kinematic profile and adoption of best available know-

how so that maximum usable dimensions in terms of double-decker coaches or optimally designed wagons can be pressed into service, with minimum investment on infrastructure.

- **Energy-efficient practices in operations and maintenance:** Introduction of improved operation and maintenance policies/practices has helped to conserve energy and fuel. Some of the notable steps in this regard include: increased interval of schedule inspections of locos; centralised monitoring of light engine working; enforcement of instructions that locos which are idling or are expected to idle for more than 30 minutes to be shut down; near elimination of movement of dead electric locomotives; loco pilots being provided with detailed guidance on energy/fuel efficient driving as the potential for energy saving in this area is 5-8 per cent; reduction of empty wagon movements; extension of the maintenance interval of freight stock; movement of double stack containers on the western corridor; and popular passenger services with high demand augmented to 24 coaches after upgrading the requisite facilities at platforms and terminals en-route. In addition, there are plans to make feeder routes of DFCs and other identified routes on the network fit for 25-tonne axle load. This would improve the load per train from the existing level of less than 5,000 tonnes to 6,000 tonnes in future.
- b. **Energy saving measures in non-traction**
 - **Introduction of energy efficient luminaires such as CFL, T-5, etc.:** IR is about to complete a project which will achieve an annual reduction of 0.14 million tonnes of CO₂ emissions through the free distribution of 26 million CFLs to railway employees (four CFLs per family), in replacement of energy inefficient incandescent lamps. The project

is entirely financed with the carbon credits earned under the CDM framework. Besides, railways are installing T-5 lamps and LED luminaires to save energy.

- **Use of renewable energy in electrical general services:** As per the Vision 2020 document, 10 per cent of IR's energy needs are to be sourced from renewable energy sources. IR is in various stages of implementing projects that aim to harness solar energy. It has also successfully commissioned a 10.5 MW wind power plant at ICF and more are under consideration.

RECOMMENDATIONS

- **Set up a Special Directorate:** It is recommended that IR sets up a separate directorate to deal with all aspects of energy consumption and management. The directorate will be multi-disciplinary and will coordinate with other directorates, apart from monitoring implementation of works/projects that result in reduction in energy consumption or enhancement of efficiency. A concomitant need is for an institutional arrangement to provide adequate funding in the annual budgets by a policy directive - to implement approved projects/works that reduce energy consumption and bring in efficiencies, some of which have been discussed above.
- **Update system of monitoring and reporting energy consumption:** IR should update the present system of monitoring and reporting energy consumption. It is important to note that SEC/SFC data is not maintained on the basis of type of rolling stock, passenger service or class of locomotive. The Annual Statistical Statements (ASS), Annual Report & Accounts (ARA), and the Year Book (YB) provide consumption of electricity and diesel figures in absolute terms and in terms of 1,000 GTKM. This is not a very satisfactory situation.

All electric locomotives/EMUs are now fitted with energy meters, but the consumption data is not yet used for calculation of SEC. It is possible to transmit electric consumption data from the electric locomotives/EMUs to a central server which can then accurately compute the SEC for each passenger/freight train operated and/or for any class of locomotive or service at desired periodicity. It is noted from literature that German Railways has already implemented such a system and Norwegian Railways (NSB) is in the process of implementing a similar system. NSB expects that the web-based energy management system will enable 6 per cent energy savings. IR should also, on a priority basis set up a nation-wide Internet-based Electric Energy Management System. This will make key electric energy data of IR available on real-time basis and enable approximately 6 per cent

energy savings, i.e., nearly Rs 4 billion per annum. Computerisation of diesel sheds can similarly help considerably in the processing, retrieval and monitoring of SFC data (service wise).

- **Electrification as a means to reduce fuel consumption:** Railway electrification should be taken up on a priority basis. Bottlenecks in progress of electrification projects should be tackled systematically. Electrification should be viewed as a means of making rail transport independent of imported fossil energy, while also providing a choice in sourcing energy. Moreover, electric traction allows regeneration of power while braking/coasting and feeding the network, thereby reducing overall consumption of energy and carbon emissions. This is not possible with diesel traction.
- **Setting up of captive power plants:** As mentioned earlier, cost of diesel fuel for transportation is much higher than the corresponding energy cost incurred in electric traction. IR incurs more expenditure on diesel than on electric energy. For 2008-09, the ratio of expenditure on diesel vs. electricity was 55:45. With progressive electrification and increasing traffic on the existing electrified sections, the requirement of electric energy will continue to increase. At present, IR is primarily dependent on SEBs, though at some locations energy is being purchased directly from National Thermal Power Corporation (NTPC).

For availing electric power at lower tariff, IR has set up a 1,000 MW power plant at Nabi Nagar through a JV with NTPC. This plant will supply 90 per cent of generated power to 164 substations of IR located in Eastern and Western regions and will result in a saving of Rs 4-6 billion per year to the Railways due to lower tariff. Another 1,000 MW captive power plant is being set up at Adra through a JV with NTPC (12th Five Year Plan, Volume II, Planning Commission).

In view of the increasing energy requirement for traction, IR will need to set up more such power plants at strategic locations and wheel the power to its distributed network with the help of Power Grid Corporation as a long-term policy.

- **Greater use of renewable energy sources:** As per Vision 2020 document of IR, 10 per cent energy needs are to be met from renewable sources of energy. It is important that IR monitors the consumption of diesel for non-traction purposes, given its upward trend. IR must encourage greater use of renewable energy sources, particularly for production units and workshops, which are at one location and not spread out and thus well-suited for this changeover. These units must annually report energy consumption per unit of pro-

Box 1.26

New Generation Locomotives

Ministry of Railways (MoR) is planning to set up a factory with a foreign partner selected through international competitive bidding for supply of 12000 HP Electric Locomotives. This will be a major jump over the current 6000 HP locomotives. During the ten-year period of supply programme, the proposed factory at Madhepura will supply 800 electric locomotives with performance guarantees based on international best practices. **This locomotive will have very high energy efficiency and will constitute a part of India's response towards mitigation of the emission of green-house gases.** Successful execution of this project by the JV route will usher Indian Railways into a new era of reforms and will provide impetus to PPP funding of railway projects.

MoR is also procuring 200 number, 9000 HP electric locomotives under the JICA loan for Western DFC. These locomotives would be mainly used for container train operations on the Western DFC.

A factory is also planned at Marowhra for manufacture of diesel locomotives with a capacity of 5000 HP as against current usage of 4000–4500 HP by the Indian Railways. The Madhepura and Marowhra factories are likely to be awarded during 2012-13.

Source: Report of the Expert Group for Modernisation of Indian Railways, Ministry of Railways, 2012

duction/performance, as is the case for companies. Further, the government may consider grant of special financial incentives to IR for adopting renewable energy in large measure. It may also initiate a policy for supporting the introduction of CO₂ free passenger and freight transportation in a phased manner.

- **New generation locomotives:** IR must switch to new generation locomotives/EMUs/coaches within an agreed time frame and assured funding. In this regard, the replacement of Kolkata Metro coaches merits attention due to high energy consumption in metro operation and the planned expansion of the network. Development of energy efficient wagons and their introduction should be a priority area. Box 1.26 provides an overview of some of the initiatives planned by Ministry of Railways to introduce higher horsepower and more fuel efficient locomotives.
- **Linking tariff to the actual energy consumed in transportation:** A wagon's payload-to-tare ratio is an important factor in energy consumption. Additionally, the shape of the wagon is also important as it determines the air resistance (this aspect is equally applicable for EMUs and coaches). The results of a simulation to evaluate the energy consumption with different types of wagons show that hauling of BTPN is more energy intensive as compared to BOXN. And yet, IR levies a higher tariff on coal, than on POL. Therefore, it is important that IR links tariffs to the actual energy consumed in transportation of a commodity. The same principle applies for passenger fares. It must be stated here that rationalising the tariffs for coal and POL would remove

the distortion inherent in pricing of electric energy. This would bring down the cost of electric energy to its true level, thereby significantly benefiting IR and other intensive users of electricity.

- **Diesel traction in electrified sections:** After implementation of the Railway Safety Committee's recommendation that in an electrified section, 20 per cent of the total holding of locomotives should be diesel, it is now quite normal to see diesel locomotives hauling trains under OHE. The cases of diesel under wire have further increased in order to avoid traction change and the detention involved in traction change. Since diesel operation under OHE results in higher energy costs, it is worthwhile to review this order and modify/fine tune the instructions, taking into account the experience gained.
- Government of India should set up a department in a selected institution to take up strategic studies on environmental, energy and energy security issues related to railway and other modes of transportation.
- IR representatives should be included in national energy policy committees.

INTERNATIONAL EXPERIENCE IN RAILWAY REFORM: LESSONS FOR INDIAN RAILWAYS

The reform measures undertaken in major railway systems such as Japan National Railways, Russian Railways, Chinese Railways, British Railways and German Railways have been reviewed to draw lessons for Indian Railways. Though the factors and circumstances leading to reforms in different railway

systems vary, however, key drivers for reforms may be summarised as follows:

- Financial crisis and over-indebtedness brought about by rapid expansion of network, operation of non-remunerative lines, and inflexible organisational structure exacerbated by powerful trade unions and erosion of market share;
- Need for rapid expansion and improvement of operational performance;
- Control of public subsidy;
- Need to usher in competition and attract private investment; and
- Ideological inclination of the government.

The railway reforms carried out in Japan, Germany, Russia, China and Britain have been summarised at Annex 1.9.

Key elements of reforms: Broadly, the reforms comprised one or more of the following elements:

- a. Separation of public policy and rail provider roles
- b. Separation of infrastructure and operation: including institutional and regulatory reforms covering rationalisation of tariff determination, investment decisions, freedom of operating companies and establishment of independent regulators.
- c. Labour reforms

Separation of public policy and rail provider roles: Most of the countries reviewed, have implemented the principle that public policy roles should be separate from the role of service provider (for both rail freight and passenger transport). For example, in Germany, Japan and Russia, Ministries of Transport determine national public interest policies in passenger rail transport, supplemented in all three countries by significant roles for the relevant local government transport administrations for specific suburban/regional systems. China has also recently (March 2013) decided to restructure its railway sector by dissolving the Ministry of Railways and separating railway policy and regulation from commercial operations (Box 1.27). Most of the countries have also separated the public policy roles of the Ministry in transport integration and sub-sectoral policy making from either the economic regulation and/or safety regulation roles (Box 1.28).

SEPARATION OF INFRASTRUCTURE AND OPERATION

The degree of separation between infrastructure and operation has varied across railway systems where reforms have been carried out. Traditionally, railway systems have been **vertically integrated** (single entity controls both infrastructure and services and performs policy and regulatory roles). The objective of reform has been to bring about either

In view of the increasing energy requirements for traction, IR will need to set up more power plants at strategic locations and wheel the power to its network with the help of Power Grid Corporation as a long-term policy

a vertical separation (ownership of facilities being separate from entities controlling operations: accounting separation or through organisational unbundling) or a system to allow **competitive access** (a single entity may control infrastructure and operation but the usage of infrastructure by other operators is allowed on payment of transparently determined access charges). Some examples of the countries following the three systems are shown below (Figure 1.30).

Once the railway systems moved away from vertical integration to either vertical separation or competitive access, the focus of further reforms has been to reorganise infrastructure and operation. The re-organisation is generally based on the following principles:

- Core and non-core business,
- Geographical separation,
- Line of business separation (freight, urban, long distance, etc),
- Functional separation (creation of profit centres and use of transfer pricing), and
- Traffic density (light density vs. high density to identify to commercial services and social service obligations)

Administrative separation (separate administrative set-up) under an umbrella organisation allows individual accounting, evaluation of units as separate profit or cost centres and charging for usage of assets by another unit on the principle of transfer pricing. Functional division also allows for bidding out of some of the core activities like maintenance of tracks and locomotives on a competitive basis. Alternatively, the reorganisation may take the form of separate geographical organisations (e.g. Japan) or unbundling the current organisation and privatisation of several activities (e.g. U.K.). As summarised in Annex 1.9, extreme unbundling also led to coordination failure and cost of managing the same increased drastically.

Once the asset restructuring is completed, the operation of the railway can be governed through haulage agreement, exclusive or multiple access agreements, reciprocal operating agreement, as the case may be. In the case of haulage agreement, track owner may allow any operator to use the track based on fixed haulage charges. American President Line (APL), and CSX Corp are examples for these. In the case of access agreement with one or multiple operators, operator pays for the tonnage it carries e.g. Canadian National (CN) operating over CSX. Annex 1.10

Box 1.27

Reform of Railway Sector in China

China has been restructuring and reforming various sectors of the economy for several years now. The objective was to enable them to respond effectively to market economy and rapid economic growth and function effectively in the best national interest. These initiatives included reform of several Ministries of the Government in Beijing.

In March 2013, China decided to restructure its railway sector by dissolving the Ministry of Railways (MoR) and separating railway policy and regulation from commercial operations. As a result, MoR's railway planning and policy making functions have been assigned to the Ministry of Transport (MoT), while its other administrative functions such as establishing and monitoring technical standards, safety standards and service quality have been assigned to a new organisation, the State Railways Administration (SRA). In future, MoT would also establish policy for railways. It would develop a unified policy for all transport modes aiming at modal integration and optimal use of resources. It is expected that only a handful of MoR staff would move to MoT. The responsibility for the enterprise (commercial operations of railways) has been assigned to the newly formed China Railway Corporation (CRC) that is manned virtually by all the staff and managers of MoR except a few that will move to MoT.

CRC is fully owned by Ministry of Finance (MoF) and will have its own Board of Directors. **The Minister of Railways has been appointed as the CEO of CRC. The mandate of CRC is to operate the railway on commercial lines. It is understood that in line with this policy, CRC would be compensated financially if it is required to provide services that are financially not viable.** There is no change, for the present, in the organisation structure and the existing railway administrations will continue to function as before. This ensures that there is no disruption in railway services as a result of restructuring of MoR. However, it is suggested that competition will be introduced and the private sector will be encouraged to invest in commercial railways in the future.

Broad objectives of recent changes include:

- Coordinated development of policy, macro level planning and allocation of resources for the transport sector
- Independent supervision of the performance of CRC
- Independent safety regulation of rail sector
- Regulation of technical standards for railways
- Improving efficiency of railway management and operations i.e. CRC
- Create competition in railway sector
- Encourage non-government investment in rail sector

Source: NTDPC

Box 1.28

Main Responsibility for Public Interest Roles

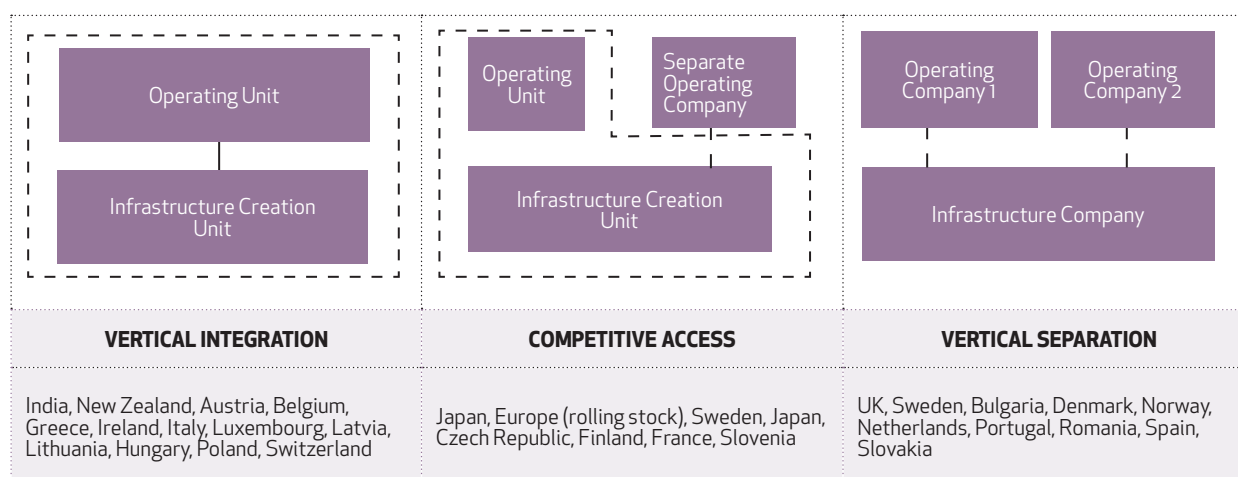
Australia, Brazil, Canada, China, Germany, Japan, Russia and the United States, all have unitary transport ministries at the central government level whose role is to develop and administer policies to protect and promote public interests across the transport sector. This is to establish integrated national transport policies that transcend or augment individual modal interests. China was a partial exception, although it has recently enhanced the role of Ministry of Transport to establish policy for railways along with national highways, ports and waterways, shipping, airports, aviation and transport integration.

(Contd...)

COUNTRIES	MAIN RESPONSIBILITY FOR PUBLIC INTEREST ROLES			
	INTEGRATED TRANSPORT POLICIES	RAILWAY SECTOR STRATEGY/ POLICIES	ECONOMIC REGULATION	SAFETY REGULATION
Australia	Department of Transport		Australian Competition Commission	Departments of Transport or Independent regulators varies by State)
Brazil	Ministry of Transport		National Agency for Land Transport	
Canada	Department of transport		Canadian Transportation Agency	Transportation Safety Board
Germany	Ministry of Transport		Federal Cartel Office	Federal Rail Agency
Japan	Ministry of Transport			Japan Transport Safety Board
Russia	Ministry of Transport		MOT & Ministry of Economic Development and Trade (MEDT)	Ministry of Transport
USA	Department of Transport (DOT)		DOT-Surface Transportation Board	National Transport Safety Board/ DOT-FRA

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Page 9, Paul Amos, July 2011

Figure 1.30
Separation of Infrastructure and Operation



Source: Report of the Working Group on Railways (NTDPC)

summarises the track access tariff principles and/ or formulae used in three countries (Australia, US and Canada).

LABOUR REFORMS

Labour reform is another important dimension of reforms as railways are traditionally one of the largest employers and therefore, the impact of any structural change on labour needs to be taken into account. For example, in Sweden, high level of unionisation existed among both blue-collar and white-collar employees and management was obliged to share strategic information with the employees and allow employee representation on the company board. Railway reorganisation entailed negotiation with the unions on productivity issues through productivity incentivisation, multi-task assignment,

and performance compensation. The restructuring had to work within the existing framework.

Japan grappled with labour issues through reactivation of railway management consultation system. This enabled direct discussion on issues such as work conditions and organisational needs. Japan National Railway (JNR) also had to deal with issues of seniority versus skill-based wages, determination of retirement and social benefits. After restructuring, the labour cost as a percentage of revenue showed a substantial improvement in Japan and Sweden from 70 per cent and 83 per cent to 33 per cent and 70 per cent respectively.

LESSONS FOR INDIAN RAILWAYS

A review of the reform measures undertaken in major railway systems shows that most of the coun-

tries have separated the public policy role from the role of service provider (for both rail freight and passenger transport). The Chinese example is of particular relevance to India, as the railway sector in China until recently was supervised by the Ministry of Railways (MOR), a body which was responsible for strategy, policy and regulatory functions as well as administration of operational entities that delivered the Chinese Railways network and rail transport services (similar to India).

However, as discussed earlier, in March 2013, China also decided to restructure its railway sector by dissolving the Ministry of Railways and separating railway policy and regulation from commercial operations. The big decision to dismantle MOR in China has only started the process of reform of railway sector and it will be fully effective in a few years. The aim is that this major step does not cause any disruption in railway services in the near future and planned expansion of railways materialises. It is expected that several well-considered steps shall be taken over a period of two to three years in order to achieve the long-term benefits of the reform process. Some of the important issues that need to be addressed are discussed in Box 1.29. In the Indian context too, any profound change in the organisational structure may actually distract the railways from the enormous task of building infrastructure and improving services. Some of the key elements of the reform would be accounting reform, reform in investment planning, regulatory structure, reorganisation on business lines, hiving off of activities.

ORGANISATIONAL REFORMS

CURRENT ORGANISATIONAL STRUCTURE AND ISSUES

The highest level of management in the Ministry of Railways, headed by the Hon'ble Minister of Railways and one or two Hon'ble Ministers of State, is the Indian Railway Board. The Railway Board is headed by a Chairman and comprises six other members from specific departmental areas. Indian Railways is divided into 17 zones, each headed by its own General Manager (GM) and assisted by Principal Heads drawn on departmental lines. As a result, the entire organisation gets divided into departmental lines based on different specialisations. This organisational structure of the railways results in over-differentiation and there is a lack of a coherent vision to guide the Indian Railways.

Some of the problems afflicting the IR's organisations at present are:

- a. Centralisation of decision making on many operational issues at the level of members of Railway Board - as the roles of policy making, regulation and operations are today combined

in the Railway Board. It leaves little time for strategic thinking and interferes with policy-making role of the Board.

- b. Duality of role— commercial as well social, without any clear demarcation.
- c. Overly differentiated and departmental organisation structure and lack of a coherent vision to guide the organisation.
- d. Production-centric approach to business and lack of commercial and customer- orientation.
- e. Bureaucratic decision- making processes and procedures.
- f. Inadequate empowerment at Zonal Railway level coupled with absence or diffusion of accountability.
- g. Short tenure at the top.
- h. Politicisation of tariff-setting and investment planning.
- i. Poor project management and inadequacies in project delivery system resulting in enormous time and cost overrun.
- j. Lack of capacity and policy for attracting private investment.
- k. Accounting system inconsistent with business accounting, which does not help as a decision making tool for management.
- l. Absence of a system to track trends in technological developments, induct new technology and develop indigenous technology.

NEED FOR REFORMS

This report has emphasised the need to reverse the shift that has been taking place of both freight and passenger transport from the railways to other modes, especially to roads. This is essential to ensure the kind of high growth that is envisaged for the economy as a whole. The kind of investment that is being projected in the Indian Railways over the next 20 years is unprecedented in the history of the railways. For this kind of change to take place, it is essential that the Indian Railways must reinvent itself and expand so that it can play the kind of strategic role envisaged for it to meet the expanding transport requirements of the country. It must rapidly expand its network, augment capacity, modernise and improve services so as to meet the goal of carrying 50 per cent of the freight transport by 2032 and meet the passenger demand in full. By 2032, railways will have to carry close to 6,500 billion tonnes km in freight compared to 626 billion tonnes km in 2011 while it must keep pace with growing passenger demand due to GDP growth.

The technology gap must be bridged and rail speed must be increased to 160-200 kmph along with a zero accident and failure rate. The railways must also change its perception to a more customer-oriented proposition offering best value against

Reform of Railway Sector in China: Impact and Issues

Railway sector in China is very large and plays a vital role in supporting its economic performance. The changes that impact railway operations would be implemented over time so that there is no disruption in rail services. Since China's economy shall continue to grow fairly rapidly, it is also imperative that, over the next two decades, railways develop sufficient capacity to service increase in demand for passenger as well as freight railway transport. It also needs to respond to demands for superior services as average incomes increase and more sophisticated commodities are transported.

The important issues that would need to be addressed are discussed below:

- **Debt:** For the present all the debt of MoR (RMB 2.6 trillion-USD 400 billion) has been transferred to CRC. This is likely to increase to about USD 600 billion as all the planned railway projects are implemented over the next few years. It is accepted that investments made in High Speed Railway network are not likely to be profitable for several years. A decision will need to be taken in respect of debt. It is possible that some of it would be transferred to the Central government to enable CRC to operate as a viable financial entity.
- **Planned investments in railways:** It is expected that the recent reform will not slow down the investment programme of railways and CRC would implement all planned projects included in the Medium Term Plan till 2020.
- **Pricing:** A clear policy needs to be articulated in respect of the authority of CRC for pricing of services. It is possible that CRC may not be given total freedom in pricing.
- **Financial Management System for CRC:** CRC will need to develop a financial management system that is aligned to commercial accounting standards. This system should be able to segregate costs by business and service so that informed decisions about pricing and cost control could be taken.
- **Salary structure for CRC staff:** Decision on staff salaries will need to be taken since company salary structure is significantly higher than that for Ministry employees.
- **Criteria for Monitoring Performance of CRC:** Developing criteria for monitoring performance of CRC and defining improvement in productivity of CRC assets and staff and financial performance for the next five years or so.
- **Encouraging PPP:** Long term aim is to encourage investment in railway sector by private sector and non-government entities. Policy initiatives that promote such investment would need to be identified and implemented.

Source: NTDP

competition. The currently existing capacity constraints will require the railways to carry out major capacity augmentation - close to 10,000 km of DFCs, 40,000 km of doubling/quadrupling/multiple lines etc.

It is clear that the task being attempted is stupendous by any measure, especially judged against the pace of capacity augmentation and growth achieved in the past. For example, the doubling/multiple lines being attempted (at the rate of 1,500-2,000 km per annum), is four times as large as the best that has been achieved by railways in the Five Year Plans in the past. Achievement of such targets will not be possible given the current organisation structure and there is need for organisational reforms to address the above lacunae.

RECOMMENDATIONS FOR RAILWAY REFORMS IN PAST STUDIES

A common feature of most railway reforms in countries we have studied is the separation of the

policy making apparatus from the operation of the railways themselves. Most countries have now set up their operating railway systems in some kind of corporate form, although in most countries, government ownership of the railway systems remains the norm, except in the United States. Policy making is of course retained in a government Ministry, usually a unified Ministry of Transport, but sometimes a dedicated Ministry of Railways. The organisational structure of Indian Railways is not very different from the kind of structure that existed prior to these reforms in countries such as Russia and China. Unlike Indian Railways, however, these countries have undertaken wide ranging reforms in recent times where they have also separated out policy making functions from operation of their respective railways.

Thus, the key issue to be addressed in reform of Indian Railways is the institutional separation of roles into policy, regulatory and management functions. Currently, these roles are blurred with

Box 1.30

Recommendations of the Prakash Tandon Committee (1994)

- a Restructure the Railway Board with Members responsible for:
 - i. Bulk freight, passenger and inter-modal services;
 - ii. Infrastructure;
 - iii. Moving assets;
 - iv. Finance and Planning;
 - v. HR, R&D, Quality.
- b Railway Board to focus on policy, planning, performance evaluation, major projects and appointments and not day-to-day supervision/sanction/control.
- c Similar restructuring at Zonal Railways with six AGMs.
- d Minimum tenure of 3 years for Board Members and GMs.
- e Unified cadre for railways through cross-disciplinary rotation and selection for general management positions.
- f Recruitment of qualified finance professionals.
- g Shedding of off-line activities-corporatisation of Production Units.
- h Induction of specialists as advisers.
- i JV with state governments and private entities.
- j Decision support system for investment planning.

Source: Report of the Working Group on Railways (NTDPC)

the Railway Board essentially performing all the three roles put together. This causes confusion about the underlying vision and mission of the Indian Railways.

If such an institutional separation of roles takes place, it would mean that policy makers are limited to setting policies; regulators to fix competition rules in general and pricing in particular; and the railways operations are done by a corporate or corporate like entity or entities.

Within India, many committees have reviewed the organisational structure of the Indian Railways and have recommended the need to undertake reforms. Key recommendations of some of the Committees are summarised below (Figure 1.31 and Boxes 1.30 to 1.32).

This section provides a review of the recommendations made by these various committees over the last 20 years. While the Prakash Tandon Committee of 1994 and the Expert Group for Modernisation of Indian Railways (2012) suggested organisational reforms while keeping the Railways within a government setup, the Expert Group on Indian Railways 2001 visualised the setting up of an Indian Railways Corporation governed by an Indian Railways Executive Board (IREB). In the proposal of the 2001 Expert Group, the Indian Railways Corporation would thus work under the Government of India like any other corporate body with the government laying down vision, objective and policy directives. This is not very different from the kind of reforms that have been undertaken in other infrastructure sectors. The 2001 Expert Group also suggested the setting up of a Railways Regulatory Authority whose func-

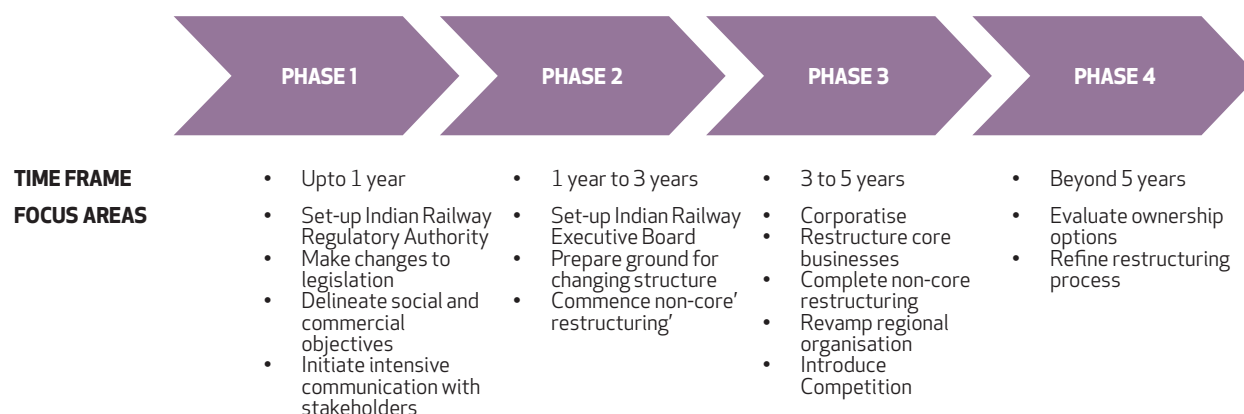
tions would relate to the setting of freight tariffs and passenger fares as also resolution of disputes. These functions would then be delinked from the Ministry by setting up a Railways Regulatory Authority.

The suggested Railways Regulatory Authority would be guided by the vision and policies laid down by the Government, and not the Railway Ministry alone. It would thus deal with issues relating to subsidies and cross subsidies, as broadly laid down by the government, and help reduce the duality of role syndrome commercial as well as social now afflicting the railways. The Regulator's basic duty would be the protection of consumer interests, providing a level playing field and also ensuring fairness in dealings between Indian Railways and PPP participants in projects. Once such a Railways Regulatory Authority is set up, it would become possible to separate out the commercial operations of the Indian Railways from those operations that are done for socio-objectives at the behest of the government. We note that the Government has already approved the setting up of a Rail Tariff Authority, but which is yet to be implemented.

For this to become possible, the implementation of accounting reforms is an essential feature of the overall reforms that is envisaged. As mentioned in Section 5, the accounting system of the Indian Railways is still organised in a governmental accounting framework and does not follow the accounting standards as prescribed in the Companies Act. Any reform of the railway system, so that it is run on business line in the future, will be difficult to achieve unless accounting reform is undertaken.

Figure 1.31

Roadmap for Railway Restructuring as Recommended by The Expert Group on Indian Railways (2001)



Source: The Indian Railways Report 2001: Expert Group on Indian Railways

Box 1.31

The Expert Group on Indian Railways (2001): Key Recommendations

The Report of the Expert Group on Indian Railways (2001), noted that 'Indian Railways is an institution embedded with contradictions. Management knows that the combination of unremunerative investments coupled to massive under pricing of passenger fares is the path to financial catastrophe, yet it is not able to take any effective action to reverse the situation'. The Expert Group recommended that three areas in particular will need to be fundamentally redesigned: Governance, Structure and Portfolio.

(a) Governance: Separate Institutions for Separate Roles: Policy, Regulatory and Management Governance defines the roles and institutional relationships associated with policy, regulation and management. These roles are currently blurred and need to be clarified and institutionalised. **Indian Railways must aim to be corporatised into the 'Indian Railways Corporation' (IRC) or Bharat Rail Nigam (BRaiN). The Government of India should be in charge of defining the key thrusts of policy direction.** It would also need to set up an **Indian Rail Regulatory Authority (IRRA)**, which would be necessary to regulate IRC's activities as a monopoly supplier of rail services to begin with, particularly related to tariff setting. **The Indian Railways Corporation (IRC) would be governed by a reconstituted Indian Railways Executive Board (IREB).**

(b) Structure: Structure relates to the internal organisational design of IR. **The underlying design principle is to create an outward looking, business oriented, customer driven institution.** This will involve **reorganising the core transportation network into its key component parts:** freight, passenger, suburban, shared infrastructure: fixed, and shared infrastructure: others. These business units will operate with a large degree of autonomy yet be held accountable for a balanced scorecard of commercial performance measures. Further, adopting commercial systems is an essential pre-requisite for a modern railway. The corporatisation of IR into IRC will **necessitate the recasting of IR's accounts into company format.** The Government will therefore need to initiate the process of restructuring the financial accounts of IR in accordance with the Company's Act 1956.

(c) Portfolio: Portfolio relates to the breadth of business IRC will incorporate under its umbrella of holdings. The view of the Expert Group is that less is more. In other words, IRC should be engaged in only those businesses directly related to its core activity of rail based logistics and passenger transport. Non-core businesses should be spun off on an arms length basis. The eventual ownership of these entities is not an issue that concerned the Expert Group. Difficult though it may be, **the Expert Group anticipates that priority candidates for accelerated spin off would be all the manufacturing units which should be done within a specified time limit.**

Source: The Indian Railways Report 2001: Expert Group on Indian Railways

Box 1.32

Recommendations of the Expert Group for Modernisation of Indian Railways (2012)

- a Re-organise Railway Board along business discipline to reflect Chairman as Chief Executive Officer and Members for the following:
 - Safety
 - Business development/ Commercial
 - Technology/ ICT & Signalling
 - Freight
 - Passenger Services
 - Infrastructure
 - Finance
 - HR and PPP
- b Create commodity-wise Key Account Directors under Member Freight for major commodities like coal, iron ore, steel, food grain, fertiliser etc. Coal is 45 per cent for total freight traffic and needs special attention.
- c Create Key Account Directors of suburban, long distance passenger etc. under Member Passenger.
- d Ensure autonomy, flexibility and accountability at all levels with clear P&L responsibilities
- e Make provisions for handling of all parliamentary functions (liaison functions with government, including handling of Parliament questions) by a Joint Secretary level officer in the Ministry, which would set the RB free to focus exclusively on business issues.
- f Empower Zonal Railways along with accountability:
 - The present system of seeking sanction for Capital investment to be included in the Works and Rolling Stock Programmes of railways from the Railway Board/ Ministry should give way to a more decentralised decision-making in critical areas like safety, traffic facility, passenger amenity and other areas, by delegation of powers at the zonal level.
 - GMs of Zonal Railways to be empowered to take decisions, within a framework of rules and investment limits. The Zonal Railways should also be made accountable for return on capital, transport output, profitability and safety.
- g Review the existing PPP policy framework in the light of hitherto poor response and PPP experience.
- h Establish a separate Authority/SPV/Organisation for implementation of Major Projects such as development of high speed corridors, redevelopment of railway stations etc.
- i Build capacity for the officers at the Zonal railways to manage PPP projects. A PPP cell should be constituted in each zone to identify, develop, implement and monitor projects at the zonal level.

Source: Report of the Expert Group for Modernisation of Indian Railways, Ministry of Railways, 2012

Adopting commercial systems is an essential prerequisite for a modern railway system. The financial accounts of Indian Railways therefore need to be restructured in accordance with the Companies Act. The objective is to develop financial statements that can be understood by the financial community and the public at large. Unless this is done, it is difficult to comprehend and assess the financial performance of Indian Railways and to separate out its commercial functions from social functions.

PROPOSED ORGANISATIONAL REFORMS

SEPARATION OF POLICY MAKING AND OPERATIONAL RESPONSIBILITIES AT THE RAILWAY BOARD LEVEL:

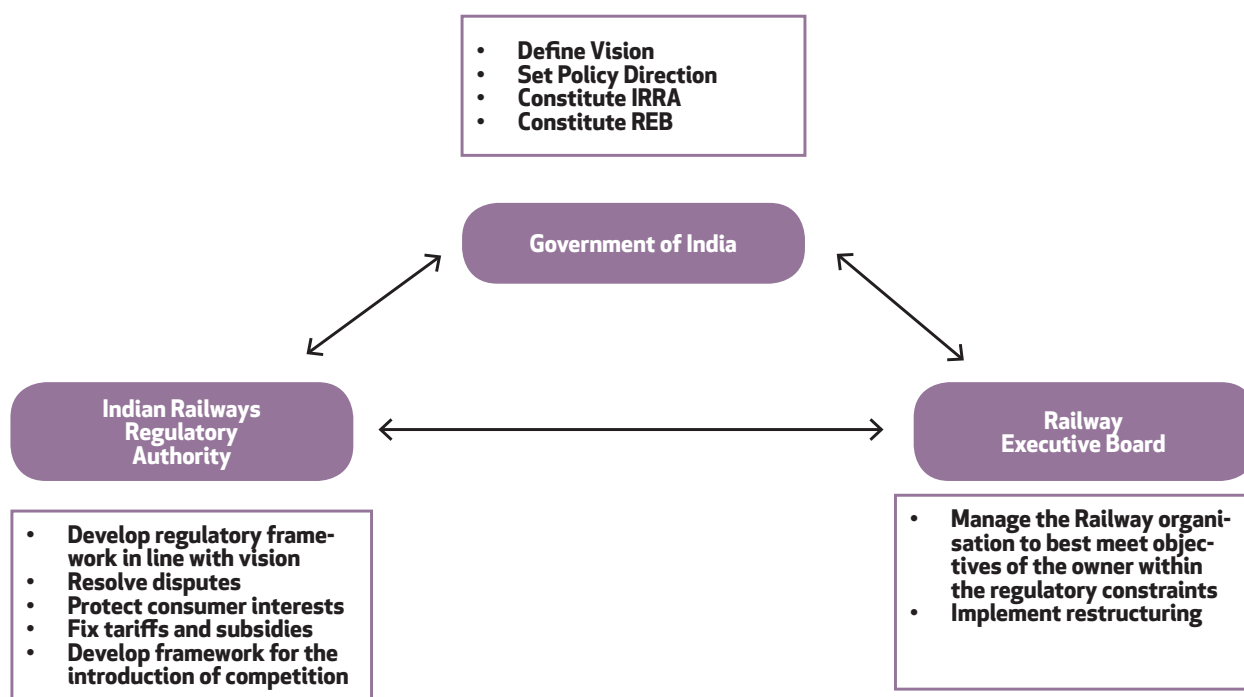
The High Level Safety Review Committee, chaired by Dr. Kakodkar noted in its report that: 'Ever since

Railway Board was first constituted in 1905, its size, functions and responsibilities have gone on widening. Today Railway Board presents itself as all encompassing monolithic structure where it has become all in one - policy framer, operator of train services and regulator'. Similar observations have been made by other committees in the past.

As discussed earlier, the Report of the Expert Group on Indian Railways (2001), recommended a complete separation of roles of policy making, legislation and management of operations with the GoI being responsible for setting the broad parameters in which policy is to be formulated, as well as constituting the Indian Railway Regulatory Authority (IRRA) and the Indian Railways Executive Board (IREB) (Figure 1.32). It recommended that the exist-

Figure 1.32

Separate Institutions for Separate Roles: The Expert Group on Indian Railways (2001)



Source: The Indian Railways Report 2001: Expert Group on Indian Railways

ing Railway Board should be phased out and the **Indian Railways Corporation (IRC) should be governed by the newly constituted IREB.**

The Pitroda Committee (the Expert Group for Modernisation of Indian Railways, 2012) also recommended reorganising the Railway Board along business disciplines. Table 1.19 shows the recommendations of the two committees regarding reconstituting the Railway Board.

The reform of the railway sector in China, announced in March 2013 is on the similar lines and proposes to separate railway policy and regulation from commercial operations (Box 1.27).

ORGANISATIONAL REFORMS: KEY RECOMMENDATIONS

Both the 2001 & 2012 Expert Groups have suggested the re-organisation of the Indian Railways into business lines such as freight, passenger services, infrastructure, finance and the like as illustrated in Table 1.19. The difference between the 2001 Expert Group and most of the other committees lies in their recommendation to corporatise the operations of the Indian Railways as has been done with other sectors in India, subsequent to economic reforms. Other committees including the 2012 Expert Group have gone along with the retention of the current framework of railways being run as a Government department, while reorganising the Railway Board along business discipline lines. The objective of

making the Railways more commercially oriented is common to all the Committees. There is also relative unanimity in setting up a Rail Tariff Regulatory Authority.

The NTDPC has debated this issue at different times. It is clear that the Indian Railways is now an outlier in being run as government department, and the kind of strategic change needed in its operations and magnitude of investments required over the next 20 years would suggest that a more radical reform be carried out as suggested in the 2001 Expert Group report. While recognising the lack of consensus on this issue in the Government, in the Railways, and in the country at large, the NTDPC feels that we have now an opportunity to draw up a vision for the Indian Railways in 2030 and that it is incumbent on us to suggest a structure that would provide for the most efficient and sustainable delivery of rail transport.

We are therefore proposing that it is now time for the government to reconsider the recommendations of the 2001 Expert Group to set up an Indian Railways Corporation in a manner that it is able to meet the challenges for overall transport strategy as it evolves over the next 20 years.

It may be noted that in other infrastructure sectors, such a reform has already been carried out. In the power sector, for example, the Ministry of Power

Table 1.19
Reorganising the Railway Board

THE EXPERT GROUP ON INDIAN RAILWAYS (2001)	THE EXPERT GROUP FOR MODERNISATION OF INDIAN RAILWAYS (2012)
<ul style="list-style-type: none"> Existing Railway Board to be phased out and the Indian Railway Executive Board to be constituted by the Government. Executive Board to have 15 members: Operations Office (On-going management) - Permanent position to have a minimum tenure of 5 years <ul style="list-style-type: none"> Chairperson COO freight COO passenger COO suburban COO Infrastructure - fixed COO Infrastructure - other VP Finance and Planning VP HR External office for Strategy (transition management) - Temporary positions - initial tenure of 3 years to be extended if necessary <ul style="list-style-type: none"> COOs— non-core businesses (2) Executive Directors (5) (Traffic -3, Infrastructure -2) 	<ul style="list-style-type: none"> Re-organise Railway Board along business discipline to reflect Chairman as Chief Executive Officer and Members for the following: <ul style="list-style-type: none"> Safety Business Development/ Commercial Technology/ ICT & Signalling Freight Passenger Services Infrastructure Finance HR and PPP

Source: The Indian Railways Report 2001: Expert Group on Indian Railways; Report of the Expert Group for Modernisation of Indian Railways, Ministry of Railways, 2012

sets overall policies and priorities; the regulation is done by the Central Electricity Regulatory Commission along with a network of State level regulatory commissions; the delivery of power is overseen by the central Ministry of Power, but implemented through large public sector corporations, such as National Thermal Power Corporation (NTPC), the National Hydro-electric Power Corporation (NHPC), Power Grid Corporation, Power Finance Corporation and others at the state level. Within the same framework, there are also now an increasing number of private sector corporations that generate and distribute power. Similarly, in the telecom sector, the Ministry of Communications oversees policies and priorities in the sector, the Telecom Regulatory Authority of India (TRAI) does overall regulation including that of tariff, while both public sector corporations, such as Bharat Sanchar Nigam Ltd (BSNL), and Mahanagar Telecom Nigam Ltd (MTNL), a plethora of private sector corporations deliver the services. Thus, the kind of reform proposed by the 2001 Expert Group for Railways, and implemented by most of the countries, is similar to what has already been done in other infrastructure sectors in India.

Therefore, the NTDPC recommends that it is time that a similar reform be carried out in the railways. There is a clear need to separate the different roles. Policy should be with the government, regulation including tariff regulation should be with a regulatory authority, and operations should be run by a corporate entity or entities. The Railways already operate a number of corporations, such as the Container Corporation of India Ltd (CONCOR), the new Dedicated Freight Corridor Corporation of India Ltd (DFCCIL), Konkan Railway Corporation (KRC), the Indian Railways Finance Corporation (IRFC)

among others. With the increasing resort to public-private-partnership, it is likely that there will be a continuing creation of other railways corporations, public or private, to undertake railways operations. It is therefore desirable that the railway system itself as a whole be corporatised in a more organised manner now.

The NTDPC is not providing detailed recommendations in this regard, since it recognises that this requires further discussion and detailed study on what may be the best form of corporate reorganisation that would be in the interest of the Indian Railways. Furthermore, such a reform will also entail amendment of the Railways Act, 1989, and the Indian Railways Board Act, 1905. Once an in principle decision is taken to undertake such a reform, a more detailed process of transformation will have to be designed. However, there would appear to be near unanimity among various committees that Indian Railways be reorganised into business lines. We can envisage an Indian Railways Corporation (IRC) to be headed by an Indian Railways Executive Board (IREB) with the Chairman as Chief Executive Officer (CEO) and Members in charge of different business lines. Decisions will also have to be taken on the relationship between this apex Indian Railways Corporation and other Railways companies that currently exist and those that may come up in the future. One possibility is that such corporations could all be subsidiaries of the IRC or joint ventures of the IRC with other private or public entities.

It is recommended that the IREB itself would limit its involvement to strategic planning, policy-making and the usual functions of the Board of such an entity. It should function like the board of a com-

pany with clear focus on business, bottom-line and other clearly defined objectives. Day-to-day operations, monitoring and decision making could be delegated to the Zonal Railways and project organisations or companies. The IREB would, however, continue to monitor the performance periodically to ensure that the strategic plans and the policies are implemented.

Governmental functions affecting the Railways would, as is done in other parts of the Government, be carried out by a compact Ministry of Railways in the first instance, and perhaps move later to the unified Ministry of Transport, as is recommended elsewhere in this report. Such a phased reform has also been carried out in similar fashion in other countries that have undertaken similar transformation of their respective Railways. The Railways Regulatory Authority and the IRC would then be responsible to the Ministry as other similar entities are to their respective Ministries. The staffing of the Ministry of Railways should be done by the assignment of Railways officers from the existing set up and from IRC and other Railways entities in the future. Careful consideration would have to be given to the delineation of functions that remain with the Government, and those to be exercised by the IRC.

We may note that the IRC should not be set up under the Companies Act. In fact, it would be advisable to set it up as a statutory Railways Corporation for which a new Act would have to be legislated providing clearly the functions and powers of such an entity. It is important that the IRC be set up as a statutory corporation since the current Railways Act endows Indian Railways with many quasi-governmental powers which will have to be retained by the IRC. However, it would need to be ensured that such a statutory corporation is essentially run on business lines, while exercising other functions of a social and strategic nature which are essential to the functioning of Railways in India.

The NTDPC is fully aware that the kind of transformation proposed above is contentious and does need further discussion among the main stakeholders in the country, including Railways staff and the unions. It is essential that a full understanding is reached that such a transformation would be undertaken in order to empower the Indian Railways system to modernise, to expand, to become more efficient, and serve the needs of the people of the country at large and the country's overall transport strategic needs. As has been made clear in the earlier sections, what is envisaged is an unprecedented significant expansion of the Railways system in India to meet the transport needs of the future in India. It would perhaps be correct to say that if such an expansion in Railways was not needed in the

There is a clear need to separate the different roles involved in running the railways. Policy should be with the government, regulation including tariff regulation should be with a regulatory authority, and operations should be run by a corporate entity or entities

country, there would then, perhaps, be little need for such a transformation as has been proposed.

Corporatisation, as envisaged, will not only allow better use of Railway assets along with higher quality of service and greater emphasis on profitability but also be able to compensate the Railway employees adequately for the increased profits that they are able to bring for the organisation, as noted by the Sixth Central Pay Commission in its report (Box 1.33). Moreover, as a corporate entity IRC would be able to access capital from external sources for funding its significant expansion plan, thereby reducing the stress on government borrowings and facilitating the attainment of fiscal deficit targets set under FRBMA.

The 2001 Expert Group had given a more detailed timeline for Railways reforms; in that timeline, it was suggested that it will take at least five years of preparation for the formation of an Indian Railways Corporation and associated other changes in the system. In the meantime, it would be essential to begin the process of change within the current organisational framework.

There is already in-principle agreement in the Indian Railways that accounting reform be undertaken so that Railways accounting is done in a business oriented fashion. This must be implemented forthwith. Second, the Government has already approved the formation of a new Rail Tariff Authority. Hence, this Authority should be set up as soon as possible in order to provide rationality in the setting of both passenger and freight tariffs. Third, a reorganisation of the Railway Board may be undertaken on the lines of the recommendations of the 2012 Expert Group (Chairman: Sam Pitroda) so that it is organised into the kind of business lines proposed. If these interim reforms are undertaken, it would then become much easier to transform the current system into a corporatised system as proposed. The recommendations in the rest of this section may be seen as the short term reforms that are needed to make the Indian Railways commercially oriented that would ultimately result in the kind of corporate structure as proposed.

SHORT- TO MEDIUM-TERM REFORMS:

Reorganisation on business lines: Indian Railways is presently organised in terms of several functional

Box 1.33

Corporatisation of Indian Railways: Sixth Central Pay Commission Report (Excerpts)

Various Railway Federations have demanded a special dispensation for Railway employees keeping in view the profitability of their organisation. The demand is not without substance especially as employees have to be rewarded for efficient performance of the entire organisation that has yielded continuous profits without resorting to any substantial increase in the passenger/freight fares in the recent years. A separate dispensation in terms of pay scales and allowances is not, however, possible, as long as the organisation continues to be a Ministry in the Central Government because it will then need to be governed by the common pay scales and allowances for the entire Central Government. In such a scenario, the optimal solution would be corporatisation of Indian Railways as a Public Sector Enterprise. This would allow the Railways flexibility in determining its own compensation package. While privatization of Railways cannot be an option as Railways is and will continue to be a public utility service providing crucial infrastructure support for balanced economic growth of the country, corporatisation of Railways as a Central Government PSE is a viable option that will not only allow better use of Railway assets along with higher quality of service and greater emphasis on profitability but also be able to compensate the Railway employees adequately for the increased profits that they are able to bring for the organisation.

The only argument that can be used against corporatization is that it may lead the Railways to go for profitability as its primary object without catering to the benefit of the general public. Another negative point of such corporatisation usually projected is that in times of national Emergency like external aggression etc. the Government may no longer be assured of full cooperation from Railways in case it is corporatised. There is not much substance in these arguments because even as a public sector undertaking, the railways would still belong to the public domain with the only difference that the Government then would need to provide upfront compensation to Railways for any social project taken up by Railways in advancement of Governmental policies.

Corporatisation would raise the productivity of services provided by the Railways as it would then be relatively free from governmental control. The Workers, Managers and Executives in Railway organization would then be free to raise the productivity of their organisation and participate in its increased profitability. The Commission, accordingly, recommends that corporatisation of Railways as a Central Public Sector Enterprise should be considered in right earnest by the Government. This will not only benefit the employees in Railways but also the common citizens as increased productivity of Railways will ensure better services to the common citizen.

Source: Report of the Sixth Central Pay Commission

departments like Civil Engineering, Mechanical Engineering, Electrical Engineering, Signal and Telecom, etc. While in theory, such a structure promotes functional specialisation, each department being manned by separate cadres has led to lack of unity and strategic coherence. From recruitment to retirement, officers spend their service years almost entirely in the department getting deeply steeped in departmental thinking. A great deal of organisational energy is expended in inter-departmental competition for resources.

The Report of the Expert Group on Indian Railways (2001) noted that:

‘Indian Railways remains an integrated, functionally oriented institution that is organised around its cadres instead of around its businesses or customers.’

‘Historically, IR was forced to be an integrator of activities in order to be successful it had both to provide cradle-to-grave care for its employees, and also to produce everything from meals to wheels in order to operate. Indian Railways today is a complex conglomerate. It runs major businesses as diverse as hospitals, schools, catering, manufacturing, real estate and maintenance. To manage these diverse businesses, however, it has created a monolithic organisational structure based on function first and geography second. This makes life more complex than it should be. It makes it hard to answer important questions and it makes unimportant issues very important.’

Table 1.20 summarises the major recommendations of the Expert Group of 2001 (Dr Rakesh Mohan) and Dr Pitroda committee (2012) regarding reorganisation on business lines. Several railways internationally have reorganised their operations in terms of

Table 1.20
Reorganisation on Business Lines

THE EXPERT GROUP ON INDIAN RAILWAYS (2001)	THE EXPERT GROUP FOR MODERNISATION OF INDIAN RAILWAYS (2012)
<ul style="list-style-type: none"> The core transportation business of Indian Railways should be organised into five strategic business units (SBUs) comprising: <ul style="list-style-type: none"> Freight transportation Passenger transportation Suburban transportation Fixed infrastructure Other infrastructure The Freight, Passenger and Suburban divisions will be organised as profit centres. All sub-divisions to be treated as profit centres. The two infrastructure divisions— Fixed and other will be organised as cost centres. All non-core businesses will need to be separated into a sixth division. A Board headed by a chief operating officer (COO) will manage each of the SBUs. The COO will also represent the division on the IREB. 	<ul style="list-style-type: none"> Create commodity wise Key Account Directors under Member Freight for major commodities like coal, iron ore, steel, food grain, fertiliser etc. Coal is 45 per cent for total freight traffic and needs special attention. Create Key Account Directors of suburban, long distance passenger, etc. under Member Passenger. Ensure autonomy, flexibility and accountability at all levels with clear P&L responsibilities. Make provisions for handling of all parliamentary functions (liaison functions with government, including handling of Parliament questions) by a Joint Secretary level officer in the Ministry, which would set the RB free to focus exclusively on business issues.

Source: The Indian Railways Report 2001: Expert Group on Indian Railways; Report of the Expert Group for Modernisation of Indian Railways, Ministry of Railways, 2012

business lines (Box 1.34). Annex 1.11 shows several different forms of Line of business management structures.

RECOMMENDATIONS

Infrastructure management, freight transportation, passenger transportation and miscellaneous activities should similarly be organised as separate profit-centres by the new IRC. These businesses could be further subdivided in terms of different activities. For instance, freight transportation could be reorganised in terms of bulk transport and non-bulk transport comprising of parcels and containers; and passenger transport in terms of high-speed, intercity, suburban and regional services. IR should concentrate on providing cost-efficient solutions in each activity by doing its part efficiently and taking the assistance of private partners or special created SPVs for other activities such as for movement of containers and parcels, development and management of terminals, marketing, road bridging, etc. In the suburban passenger transport, the attempt should be to achieve physical separation of the long-distance network and the suburban network, and its organisational separation later. Modern accounting practices would ensure that infrastructure and rolling-stock resources used by these lines of business can be properly charged after appropriate and correct costing.

It is important to mention here that addressing the capacity constraint on IR (discussed in Section 5)

is a concomitant need, in the absence of which the proposed accounting reforms and the reorganisation on business lines will not yield the desired results.

Non-transportation tasks: Production Units: A review of the railway restructuring experience across the globe shows that in order to become more focused, the Railways in most countries decided to spin off their non-core activities and concentrate on the core business (Box 1.35). For example, railways in Europe and Japan have long outsourced activities like rolling stock manufacturing. Even the Chinese Railways has reorganised its rolling stock manufacturing operations into separate companies - China South Locomotive and Rolling Stock (CSR) and China North Locomotive and Rolling Stock (CNR) (established in 2001 from the former China National Railway Locomotive & Rolling Stock Industry Corporation (LORIC)). Considering the serious competition faced by IR in the core transportation business (and the resulting decline in rail modal share of freight), it is imperative that IR critically reviews its presence in all the areas falling outside the core transportation operations. As mentioned earlier, the Expert Group on Indian Railways (2001) had also made a similar recommendation in its report and noted that:

‘To provide adequate focus on the core business as well as improve flexibility and cost competitiveness, the non-core activities of the railways will be fully divested over time, say five years.’

Box 1.34

Freight as A Business Distinct from Passenger Transport

In seven of the eight countries, rail freight is treated as a separate business from passenger transport. It was not always so; in most countries, the major railway companies once had common business management of passenger and freight business. Because freight trains and passenger trains run on the same tracks, railways historically treated them as different parts of the same business, which they conceived as the business of running trains. Traditional management structures reflected the functional divisions that underpin a ‘train’ business (e.g. track, signaling, locomotives, traffic operations etc.) and (in larger countries) regional management divisions, similarly organised, as well.

COUNTRY	FREIGHT AS A DISTINCT BUSINESS ACTIVITY	BUSINESS SEPARATION
Australia	Both in federal and all state contexts (other than in Queensland) the operation of rail freight is managed by entities that do not operate passenger services. In Queensland freight is managed as separate division of Queensland Railways.	Mainly 1990s.
Brazil	Freight Concessions predominate (passenger services are mainly in city areas and are run by separate concessions)	1990s
Canada	Freight companies and passenger company (Via Rail) are separately owned. Via Rail is a publicly-owned passenger TOC that pays the freight private freight companies for access	1978
China	Still combined: Regional Railway Administrations deliver both freight and passenger services	N/A
Germany	The main freight rail operator, DB Schenker is a separate company within the State-owned DB holding structure and purchases network access from DB Netz, also in the group.	1991
Japan	The Japanese Freight railway Company is a free-standing freight TOC separate from the 6 passenger companies from whom it hires track access.	1987
Russia	The Russian Railways Corporation has progressively split Intercity Rail away from freight. Passenger Branch established 2006. Currently accounting separation only, but Passenger Branch structured to permit it being split into 5-7 regionally based passenger companies. Within the freight sector several private freight-only companies have been established, mainly with trains hauled by RZD.	2006
United States	Freight companies and passenger company (Amtrak) are separately managed and owned. Amtrak is a publicly-owned passenger TOC and pays the private freight companies for access (at regulated charges).	1970

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Paul Amos, July 2011

The Expert Group further recommended that:

‘...that priority candidates for accelerated spin off would be all the manufacturing units which should be done within a specified time limit.’

Given the massive investment requirement for rolling stock, it is imperative that IR should encourage participation of private players (both domestic and international) in setting up manufacturing facilities for rolling stock and components. Despite the recommendations available on this issue for quite some now, IR continues to set up new departmental production units, as also attempt setting them up under the PPP model. Leasing of rolling stock, especially wagons, under the PPP format is another policy enunciated. Joint ventures are also being planned. There is thus no coherent unified approach. Developing the private rail equipment ownership and leasing market can help in bringing substantial private investment to the railway sector (Box 1.37). Private equipment operators in Russia have invested over US\$20 billion in railway freight

equipment²⁰. As a result, the Russian railway no longer has to finance these investments, old rolling stock is replaced promptly, and new equipment technologies have been introduced that reduce maintenance costs and out-of-service time.

Globally, there has been a trend towards consolidation through mergers and acquisitions. Since the 1990s, a series of mergers and restructurings in Europe and North America led to the emergence of three dominant global manufacturers: Bombardier of Canada, Alstom of France, and Siemens of Germany. However, over the last decade, while Bombardier and Alstom have maintained their leading positions, the two Chinese manufacturers, CSR and CNR, have moved into third and fourth place in the list of leading global rail equipment manufacturers (by sales in 2009)²¹.

Recommendations on Production Units: The magnitude of the capacity expansion that is being

20. Source: Railway Reform: Toolkit for improving rail sector performance, The World Bank, 2011

21. Source: Global Competitiveness in the Rail and Transit Industry, World Watch Institute, September 2010.

Box 1.35

Focus on Core Business

In all eight countries—Australia, Brazil, Canada, China, Germany, Japan, Russia, and the United States, the major railway operators have withdrawn from most non-core activities. ‘Core’ is generally taken to mean the market focus that differentiates a business from its competitors. For freight railways the core business is delivering competitive transport services through efficient use of railway technology. In all the countries in the group, railways, both public and private, once encompassed a range of activities from which they have now withdrawn.

Three main types were social and recreational services for employees (e.g. housing, schools and hospitals); materials supply and manufacturing (e.g. loco and wagon manufacture, quarries and forests for track materials); and business support services (e.g. vehicle cleaning, printing, building maintenance). The imperatives of transport competition in the motor age have led the railways to devolve social services to specialist organisations and ministries and concentrate on sourcing and procuring railway equipment and support services in the way that will best support the core transport business, that is, by competitive tendering among suppliers. North American railways are ‘leanest’ in this regard. China’s railway still retains ownership of various ancillary companies, though it has divested most of its social services and major construction and manufacturing activities.

China’s refocusing on core business began in 1998 with reorganisation of several engineering and rolling stock manufacturing units to create limited liability companies. This was then followed in 2000 by the establishment of six major non-rail companies as independent enterprises, and their transfer to the supervision of the State Large Enterprises Working Committee. Also in 2000, MOR began transferring the schools, colleges and universities run by Regional Railway Administrations to local governments and to the Ministry of Education, although it still retained railway management institutes and colleges to provide occupational qualifications and training for railway staff. This process was completed in about 2005 when nearly 900 schools, 400 hospitals as well as kindergartens had been transferred. In 2004, the China Railway Communications Co. Ltd. (CRCC) (which had been established in 2000 and is responsible for providing railway telecommunications) and China Rail Materials and Supplies Co. Ltd. (CRMSC) (established in 1988 as the supply and trading agency for the RRAs) were transferred from MOR to the supervision of the State-owned Assets Supervision and Administration Commission (SASAC).

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Paul Amos, July 2011

Box 1.36

Restructuring the Production Units (PUs)

IR’s production units (PUs) were set up at a time when it had become necessary to develop indigenous manufacturing capacity. In order to meet the twin objectives that of developing indigenous capabilities and conserving scarce foreign exchange the IR were entrusted with task of setting up and managing their own production facilities. Five production units (PUs) were set up during the period 1950-90: Chittaranjan Locomotive Works (CLW), Chittaranjan, 1950; Integral Coach Factory (ICF), Perambur, 1955; Diesel Locomotive Works (DLW), Varanasi, 1961; Wheel & Axle Plant, Bangalore, 1984; Rail Coach Factory (RCF), Kapurthala, 1985. These units are managed as departmental undertakings of the Ministry of Railways (MoR), unlike public sector undertakings, which, though owned by the government, are autonomous corporate entities. The MoR provides the funds through the railway budget and the accounts are audited by the Comptroller and Auditor General of India.

The units have to follow the policies laid down by the Railway Board (RB) in the matter of procurement of materials, plant and machinery leaving them with no autonomy in decision making. The RB also decides on the number and types of locomotives, coaches and wheels & axles to be manufactured each year, and the PUs formulate their production programmes accordingly. The products manufactured at

(Contd...)

PUs are supplied to the Indian railways at, what is termed as the 'transfer price'. This price is worked out on actual cost basis. It, however, does not include the cost of capital, the profit element and share of administrative charges.

At present, both IR and its production units are at the crossroads. Because of its weak financial position, IR has not been able to make even essential investments in plant and machinery. No wonder, 49 per cent of the ICF's plant and machinery has outlived its economic life; 16 per cent of the machinery is over 40 years old. Overage and obsolete equipment require frequent maintenance and additional staff. Similarly, at the Wheel & Axle Plant, most of the machines have outlived their economic life, causing heavy down time and low quality output.

Over the years, the production units have also developed their own types of vertical integration. For example, the older plants continue to produce components, which could be easily outsourced and that too at competitive rates. The result is high cost of production and low levels of productivity. **The availability of capital without a price tag has blurred the PUs' cost consciousness and financial accountability.** In addition, the sheltered market for their products and absence of competition do not provide them any motivation for improving quality and upgrading technology, which is way behind international standards. The production units, by and large, have continued with the technology and designs initially procured only with some incremental improvements. **In the bargain, they have suffered from technology stagnation for prolonged periods which affected their export potential.**

The world over, major industries including rail equipment industry have been undergoing structural changes as a result of domestic market developments and globalisation. **The process has been largely driven by three factors: technology, capital and competitive pressure.** The structural changes have resulted in the rationalisation and consolidation of the manufacturing activities. All national railways have hived off their production units into independent enterprises. The initial binds, which were the *raison d'être* for setting up these units, have since lost their validity. The industrial base in the country has acquired the capability for producing high quality equipment. The ancillary industry has significantly developed to produce quality products at competitive prices. The private sector that was earlier reluctant to invest in capital-intensive industries is now willing to do so. It has also developed managerial and entrepreneurial skills. **Time is both ripe and opportune to hive them off into independent enterprises under a corporate structure. Here it may be clarified that corporatisation of PUs would just be an interim phase.** It would subsequently lead to disinvestment and adoption of some suitable model for restructuring in the follow-up phase. Indeed, there are several models that have been adopted in different countries.

Source: Improvement of Railway Finances, Hiving off non-core activities, P.K. Malik for ADB

recommended by the NTDPCC and the modernisation required in all forms of Railways rolling stock suggests that there needs to be a corresponding enhancement and modernisation of the production units producing such rolling stock in the country. As Indian incomes increase and there is a continuing change in the composition of demand towards more comfortable passenger coaches, there will be need for widespread replacement of the existing passenger coaches in the Indian Railways. In addition, with the kind of passenger shift toward Railways that is envisaged, there will be enhancement in demand for new coaches. On the freight side, as Dedicated Freight Corridors are rolled out, there will be new demand for freight rolling stock on a continuing basis. Furthermore, as freight transport becomes more specialised, greater integration takes place in freight transportation. As suggested in Chapter 4 (Integrated Transport: Strategy and Logistics), there will also be much increased demand for modern and

specialised freight wagons, which make intermodal transfers easier and more efficient. As mentioned above, we are witnessing the emergence of a few dominant global manufacturers in the advanced economies along with the rise of couple of Chinese manufacturers of railways rolling stock. In view of the expansion expected, India should also envisage the emergence of competitive Indian manufacturers for the railways sector.

The first step in this regard should be the corporatisation of the existing public sector railways production units. One possibility could be the setting up of a holding company like the Steel Authority of India Ltd (SAIL) with each of the production units as they currently exist as subsidiaries of this holding company. In order to modernise and expand these production units, an organised programme should be designed through a PPP framework to transform them into possible joint ventures in the

Box 1.37

Equipment Ownership and Leasing

Railway rolling stock comprises a major proportion of most railways' investment portfolio. Reforms that permit or encourage private investors to purchase railway equipment and lease it to users can bring substantial private investment to the railway sector. If the railway has insufficient equipment to meet customer needs, shippers can benefit from purchasing their own freight cars, especially if owning specialised equipment reduces costs or gains a market advantage. Usually, railways offer discounts on tariffs or transport charges for shippers that invest in rolling stock. The discount level is a determining factor in shippers' incentives to invest in rolling stock.

Equipment leasing is a natural extension of private equipment ownership. For railways, equipment leasing is normally a short-term - between one and seven years - exclusive-use agreement between equipment investors and customers. Usually longer-term leases, referred to as 'financial leases,' are a mechanism to finance rolling stock. With financial leases, international accounting standards require that the equipment value is accounted for on the shippers' books rather than the investors' books.

To grow and flourish, leasing requires a market ecosystem. Railway tariffs or transport price discounts must be sufficient to provide investors and shippers with incentives to purchase or lease rolling stock. Private owner-investors must be able to spread equipment ownership risk across multiple potential customers - shippers, rail operators or forwarders, or other railways - not just the state owned railway.

The railway benefits from private investment in equipment since it need not secure financing for rolling stock. This frees scarce railway capital for use in other areas, such as infrastructure improvement, where it may be harder to attract private investors. Privately owned equipment reduces the need for railway rolling stock maintenance facilities, and all the cost and capital they require to operate and renew. Privately owned equipment can yield more transport volume for the railway because it tends to lock shippers to rail transport and private equipment usually has higher utilisation. Moreover, the equipment may be newer, more reliable, and provide a better net: tare ratio and suitability for shipper needs than railway-provided equipment, which is likely more generic.

Shippers benefit from private investment in equipment because the equipment better suits their needs and its supply is more reliable. The equipment may reduce their overall logistics costs - either because it is easier to load and unload, or because it has higher capacity than generic railway equipment. Shippers may also benefit from the ability to assemble enough equipment to ship entire train loads in dedicated service. This not only improves equipment utilisation but also may make the shipper eligible for even more economical pricing.

Investors benefit from owning equipment by earning good returns. In a market of multiple shipper/customers, investors can spread their risks. Moreover, higher equipment productivity permits shippers to move higher volumes, which reduces overall costs for equipment investment - compared to full railway pricing or to equipment-lease payments.

Source: Railway Reform: Toolkit for improving rail sector performance, The World Bank, 2011

first instance. As expertise is developed in these production units, we can expect a trend of consolidation through mergers and acquisitions of these joint sector units or public sector units along with any other private sector companies that may emerge in this area. Given the size of Indian Railways system and its envisaged expansion, there is no reason why Indian production of railways rolling stock should not be among the most competitive in the world.

In summary, the NTDPCC recommends that all the production units of the Railways be corporatised

within a holding company structure, such as SAIL, and the plans drawn up for their expansion and modernisation to emerge as globally competitive players.

Recommendations on Other Service Activities:

All activities falling outside the core transportation and manufacturing operations should be critically reviewed from the perspective of either retention or outsourcing. Outsourcing would be a solution for the activities that are required for transportation service but can be done by another agency more

efficiently and at lesser cost (e.g. cleaning of coaches, provision of linen in trains, etc.).

There are also activities that are amenable and eminently suited to commercialisation and yet suffer from loss of focus being confined to a small part of the railway's operations at present. In the past, railways have benefited from corporatisation of such activities as project/technical consultancy, construction, container transportation, telecom services, etc. Going forward, parcel service management would be an ideal candidate for corporatisation. Other activities of similar nature could also be considered. In several railways, for instance Chinese Railways and Japanese Railways, transportation of special cargo (container, special freight and parcel), construction of railway infrastructure and management of stations have been successfully implemented to facilitate quick upgrade of technology, independent R&D and sharpen focus on upgrade of passenger facilities and revenue generation.

Railways have been experimenting with outsourcing a number of activities. Examples are: onboard cleaning, supply of linen in trains, station cleaning, etc. The results have not always been satisfactory. In fact, some of the outsourcing activities have given rise to a large number of complaints from customers. This, however, does not make a case against outsourcing. However, it demonstrates the need for seeking professional help and guidance in designing outsourcing modules and monitoring performance post-outsourcing.

Chapter 4 (Integrated Transport: Strategy and Logistics) details the kind of logistics systems that we can expect in the transport sector. The outsourcing activities mentioned above need to take cognizance of the emergence of these integrated logistics companies and take advantage of the kind of services that they provide.

Empowerment of Zonal Railways: It is essential that the organisational reforms be extended to the Regional/Zonal level. The recommendations of the Expert Group on Railways (2001) and the HLSRC (2012), with respect to empowerment at working level have been summarised below (Boxes 1.38 and 1.39).

Recommendations for Zonal Railways: GMs of Zonal Railways could be empowered to take decisions that enhance the revenue, reduce costs or build platforms for higher growth in future. For example, if a freight bye-pass or traffic facility work or a signalling change can increase capacity or remove a bottleneck, GMs could have the power to take such decisions without reference to Railway Board within a framework of rules and investment limits. The present system of seeking sanction for

investment to be included in the Works and Rolling Stock Programmes irrespective of the size of investment should give way to a more decentralised decision making at the zonal level. Simultaneously, the Zonal Railways would be made accountable for return on capital, transport output, profitability and safety. An enabling framework can be created to stimulate internal competition among Zonal Railways with incentives and bonuses for high performers. Box 1.40 shows the improvement in financial performance achieved as a result of managerial decentralisation undertaken in China.

The proposals above on the empowerment of Zonal Railways should be implemented as preparation for their functioning within an overall corporate framework is carried out as proposed above for Railways re-organisation.

Public Private Partnership (PPP): Investment in infrastructure in India is increasingly being done through public private partnerships (PPP). The concept is now also being extended to railways infrastructural investments. As noted earlier, most railways in the world are run as government owned corporations, with the exception of the United States. Thus, extension of the PPP concept to the railways while desirable, has to be done carefully.

A thorough review of the experience of PPP projects so far needs to be undertaken. Organisational and institutional deficiencies inhibiting PPP need to be identified and addressed. Clear-cut empowerment and accountability for PPP projects need to be established. Decision-making for PPP projects needs to be streamlined. Capacity building for officers handling PPP projects both at the ministry and the field level needs to be taken up with help of professional bodies. Standardised documents balancing risks and interests of private partners must be prepared in advance to avoid delay in decision making in the course of the bidding/award process. The existing PPP policy framework should be reviewed in the light of hitherto poor response and PPP experience.

The recommendations of the Dr. Pitroda Committee with regard to improving the environment for PPPs should be implemented (Box 1.41).

SUMMARY OF RECOMMENDATIONS

The Indian Railways, with its network of about 65,000 route km, plays a crucial role in integrating the social, political and economic life of the country. IR forms the backbone of India's transport infrastructure; facilitating industrial and economic development by transporting about 33 per cent of the total freight traffic (NTKMs), while simultaneously meeting the transportation

Box 1.38

Revamp Regions/Zones: The Expert Group on Indian Railways (2001)

The restructuring process will be extended to the Regional/Zonal level. A Zonal Management Committee comprising 4 General Managers (GMs) one each from the Freight, Passenger and Infrastructure Fixed and Infrastructure other Strategic Business Units (SBUs), will have the responsibility of managing the zone. The Zonal GM will report directly to the COO of their respective SBUs. Greater powers will be given to the Zonal GMs to allow them to take independent decisions regarding their own SBUs. Decisions regarding sharing of common facilities, infrastructure will be taken jointly by the Zonal Management Committee. Guidelines to facilitate decision making by the Zonal Management Committee will be laid down in line with the principles established by the Railway Executive Board.

Source: The Indian Railways Report 2001: Expert Group on Indian Railways

Box 1.39

Recommendations of HLSRC Regarding Empowerment at Working Level

Enhanced powers should be delegated to GMs and DRMs in regard to safety matters as under:

- Powers of General Managers to be enhanced to 3 times for sanction of works under all Plan Heads except New Lines and M & P items. These should also be applicable under out-of-turn basis, depending on the urgency. Powers of DRMs also to be accordingly enhanced to 3 times.
- General Managers to be given full powers for re-appropriation of funds from one work to another under the same Plan Head and source of funds under all the Plan Heads, except New Lines.
- General Managers to have full powers to re-appropriate funds under Revenue under the same Demand from one PU to another within the overall budget allotment.
- DRMs to be fully empowered to decide the process/procedure such as Spot Purchase Committee, Single/Limited Tenders, etc.
- DRMs to have full powers:
 - To accept tenders floated by the division
 - To enter into repair or Annual Maintenance Contracts through OEM or otherwise
 - To purchase stock items in case of shortages and non-stock items upto Rs 0.3 million per case but without any monthly ceiling
- DRMs to be empowered to award works of essential nature related to operation and maintenance assets on quotation basis for 3 months as a stop gap arrangement.
- DRMs to have full powers for hiring of resources including utility vehicles.
- DRMs to have full powers to sanction construction of RUBs, limited height subways and ROB under Road Safety works.
- Powers those vested with DRMs of the Division to be enjoyed by the Chief Workshop Managers in respect of their workshops.
- Powers to sanction cash awards for good performance in safety related matters should be enhanced to three times.
- Enhanced delegation of powers to the divisions should be directly mandated by the Railway Board as a onetime measure.

Source: Report of High Level Safety Review Committee, Ministry of Railways, 2012 (Kakodkar committee)

needs of the people across the length and breadth of the country.

However, Indian Railways has suffered from the absence of a comprehensive framework for capacity expansion over the last 60 years. Consequently, only incremental changes have taken place through gauge conversion, doubling of lines, some modernisation of signalling, etc.; along with

continuous addition of new lines on uneconomic routes. Presently, the network of IR is plagued by infrastructure and carrying capacity constraints and most of the routes on the high density network (HDN) have already reached saturation in line capacity utilisation. **The expenditure on railways as a percentage of total transport sector expenditure has declined considerably over the last two decades.** Moreover, while IR has been suf-

Box 1.40

Managerial Decentralisation in China

China has increasingly tried to commercialise its Regional Railway Authorities but without establishing them as corporations. The introduction of Assets Operation Liability System (AOLS) in 1999 was a key step in managerial decentralisation by making Regional Railway Administration managements responsible for managing and increasing the value of the assets assigned to them. AOLS sets bonuses in relation to three targets and two commitments. The three targets are: to increase the net worth of the RRA; to make profits, expressed as a percentage of the RRA's gross operating assets; and to return dividends to MOR, expressed as a percentage of MOR's capital investment. The two commitments made by RRAs are: to operate safely; and to achieve a specified minimum increase in RRA profits or reduction in RRA losses. Under AOLS, each member of RRA management (as far down as stationmaster) puts up an incentive deposit, the size of which depends on rank. The deposit is forfeited if the targets and commitments are not met. For target-beating performance, the manager gets the deposit back, plus a bonus equal to up to twice the deposit. During the eight years that ALOS has been in place, there has been a steady improvement in the financial performance of the RRAs (and of CR as a whole) as well as a significant improvement in safety, with the number of accidents reducing. Most RRAs now achieve the higher levels of bonus.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Page 13, Paul Amos, July 2011

Box 1.41

Organisation for PPP: Recommendations of the Expert Group for Modernisation of Indian Railways (2012)

- Create a post of Member (PPP) responsible for project development and processing of all PPP projects to facilitate their speedy sanction by the Government and award of concession. The Member should have a multi disciplinary team of officers, including finance, to deal with various railway projects.
- Establish a Committee for approval of PPP projects to be headed by Chairman Railway Board with Financial Commissioner, Member (PPP) and the concerned member to whose area of responsibility the project belongs. The process and procedure followed should be similar to that of PPPAC followed in Government of India. The Board should decide and approve the projects and they should not be examined or referred back by the members to their respective directorates. The projects thereafter should follow the normal procedure of approval by PPPAC and CCI.
- Appoint a 'PPP Ombudsman' to resolve any disputes that may arise between the private sector and the government in interpretation and enforcement of provisions of the agreements. The Ombudsman should be a quasi judicial authority and should have the authority to give directions which are binding on all parties.
- Constitute a Railways Tariff Regulatory Authority in order to provide a level playing field to all stakeholders.
- Build capacity for the officers at the Zonal railways to manage PPP projects. A PPP cell should be constituted in each zone to identify, develop, implement and monitor projects at the zonal level.

Source: Report of the Expert Group for Modernisation of Indian Railways, Ministry of Railways, 2012

fering from severe capacity constraints and remains underinvested, the road sector has witnessed a surge in investments (both public and private). The launch of the ambitious National Highways Development Project (NHDP) brought about a phenomenal improvement in the national highways.

As a result of the severe capacity constraints and distortions in relative allocation of resources, IR has seen a fall in the share of both passengers and

goods transported over the last 60 years. **The non-optimal intermodal distribution is estimated to cause a loss of about 4.5 per cent of GDP to the nation's economy. It is essential that an attempt is made to reverse this declining trend in railway's share or, at a minimum, to arrest it.** If this is not done, the progressive achievements of the NHDP will only accelerate the loss in the railways' transport share leading to greater pollution and environmental degradation.

Thus, the key issue facing the country relates to the desired strategy for capacity expansion of the railways over the next 20 years. All projections for the growth in demand for both freight and long distance passenger services suggest that overall economic growth could be stymied if appropriate strategic choices are not made now to facilitate significant capacity expansion of the railways. If consistent economic growth of 7-10 per cent per annum is to be achieved over the next 20 years, there is a pressing need for unprecedented capacity expansion of the railways for both freight and passenger traffic in a manner that has not taken place since independence.

The massive capacity expansion, as envisaged, will not take place in a business as usual scenario. Hence it is of the utmost importance that a vision similar to that of NHDP is laid down for railways so that we may expect a transformed railway network by 2032. This will have to be supported by (a) **the required organisational changes, and** (b) **certain strategic decisions in terms of the relative allocation of resources between rail and road.**

Choices will need to be made on the priorities to be placed on different investments. This implies some judgment on the normative modal shares that are desired for rail, road, air, shipping, and inland waterway traffic. At present, this prioritisation and decision-making are disjointed. A coordinated approach needs to be taken focusing on significant augmentation of technical capacity, investments in capacity building and R&D, executing the required organisational reforms and accounting reforms, setting up of the rail tariff authority, among other things. The important recommendations for each of these areas are summarised below:

ORGANISATIONAL REFORMS

The key issue to be addressed in the reform of Indian Railways is the institutional separation of roles into policy, regulatory and management functions. Currently, these roles are blurred with the Railway Board essentially performing all the three roles put together. This causes confusion about the underlying vision and mission of the Indian Railways. Consistent with Railways reforms in other major countries and with those in other infrastructure sectors in India, the NTDP recommends the separation of Railways management and operations from the Government. The Ministry of Railways (or the unified Ministry of Transport) in the future should be limited to setting policies; a new Railways Regulatory Authority would be responsible for overall regulation, including the setting of tariffs; and the management and operations should be carried out by a corporatised entity, the Indian Railways Corporation

(IRC) to be set up as a statutory corporation, which would retain many of the quasi governmental powers endowed to the Railways under the current Act. Existing railways corporations such as CONCOR, DFCCIL, and the like will become subsidiaries or joint ventures of the IRC.

For these reforms to be implemented, the Railways Act, 1989, and the Indian Railway Board Act, 1905, will have to be amended accordingly.

These reforms will be very complex and the NTDP recommends widespread consultation with major stakeholders including the staff and unions of the railways system. This process may take upto 5 years. During this period, the Railway Board should be reorganised along business lines consistent with the recommendations of the 2001 Expert Group on Indian Railways and those of the 2012 Expert Group for Modernisation of Indian Railways.

The NTDP also recommends the corporatisation of the existing public sector Railways Production Units. Each of the production units could be set up as a corporate subsidiary of a holding company that oversees all the production units. Plan should be drawn for their expansion and modernisation to emerge as globally competitive players.

To facilitate these reforms, the NTDP recommends that the Railways should undertake recasting of its accounts in a company account format consistent with accounting norms under the Indian GAAP. This is feasible to do since it has already been on a pilot basis twice: first by the Railways Capital Restructuring Committee of 1994 and the Expert Group of 2001.

Furthermore, in preparation of the overall corporatisation of the railways system, the existing organisation of the Railways needs to be reorganised on business lines. Indian Railways is presently organised in terms of several functional departments like Civil Engineering, Mechanical Engineering, Electrical Engineering, Signal and Telecom. It should be reorganised in terms of business lines such as infrastructure management, freight transportation, passenger transportation, parcel and miscellaneous activities should similarly be organised as separate profit-centres by IR.

All activities falling outside the core transportation operations should be critically reviewed from the perspective of either retention or outsourcing.

GMs of Zonal Railways to be empowered to take decisions that enhance revenue, reduce costs or build platform for higher growth in future. GMs should have the power to take such decisions without reference to Railway Board within a framework of rules and investment limits. Simultaneously, the Zonal

The existing Railways Production Units should be corporatised. Each could be set up as a corporate subsidiary of a holding company that oversees all the units

Railways would be made accountable for return on capital, transport output, profitability and safety.

Organisational and institutional deficiencies inhibiting PPP need to be identified and addressed. Decision-making for PPP projects needs to be streamlined. Capacity building for officers handling PPP projects both at the ministry and the field level needs to be taken up with help of professional bodies. The existing PPP policy framework should be reviewed in the light of hitherto poor response and PPP experience

GOALS FOR 2032, STRATEGIC PLAN AND BUSINESS STRATEGY

Optimal market share in freight: Aim to attain 50 per cent market share in inter-regional freight traffic by 2032, up from the current level of about 33 per cent.

Indian Railways to satisfy passenger service demand in full.

A shift of long-distance (500 km and above) transport of parcels - essentially non-bulk packaged items - to rail is a must.

Indian Railways to institutionalise a strategic planning process taking a forward view over the next 20 years. The strategic plan has to be necessarily prepared involving the Zonal Railways and key stakeholders and will clearly lay down the goals to be aimed at and attained and the path to be traversed. A multi-year investment plan fully supported by a credible funding plan will form the bedrock of the strategic plan.

FREIGHT AND PARCEL BUSINESS STRATEGY:

- Indian Railways to capture a significant share of the fast-growing FMCG, Consumer Durable and Information Technology (CDIT), containerised cargo and other segments like automobiles, etc., where its presence is negligible. In this regard an organised intermodal transport system which will combine the advantages of rail with that of road is needed.
- Setting up of a focused business organisation for multimodal transport of non-bulk commodities (e.g. parcels) under the PPP mode, combining the efficiency and advantages of rail and road.
- Development of a few selected corridors for heavy-haul operations.

- Development of last mile connectivity on PPP in a time-bound manner
- Running of freight trains at 100 km per hour.
- Running of premium freight services with differential pricing and assured deliveries.
- Supply of rakes on demand with differential pricing for different demand lead times.
- Running of trains on schedule with guaranteed transit time.
- Running of automobile, hazardous material trains, movement of bulk cement, etc by private train operators.
- Reduction in cargo parcel size to 1,000 tonnes and aggregation mechanism for even smaller parcel-sizes.
- Indian Railways to work closely with state and city authorities to set up rail-based multi-modal logistics parks to attract increasing volumes of miscellaneous cargo to rail.

PASSENGER BUSINESS STRATEGY:

- Upgrade speed to 160-200 kmph on select corridors.
- Shift of focus to long-distance and inter-city transport and suburban corridors involving dense passenger movements.
- Redevelopment of stations for smooth flow and comfortable experience of passengers as also to ensure clean and hygienic environment.
- Redesign of coaches to enhance travel comfort.
- Conversion of all stopping passenger trains to EMUs/DMUs or railcars; invitation to state governments to manage uneconomic and unpatronised services.
- Augmentation of supply (more trains and longer trains) to ensure full satisfaction of demand.

CAPACITY CREATION

Construction of 6 Dedicated Freight Corridors on top priority. The Eastern DFC must be given the highest priority among the DFCs, and should be completed within the 12th Five Year Plan. Further, construction of Eastern, East-West and East Coast DFCs must start from the eastern end. Private sector participation should be encouraged for development and operations of the DFCs.

Eight critical feeder routes for coal with a combined length of about 600 km and several other critical links for the steel industry with a combined length of about 2,340 km must be completed on the highest priority within the 12th FYP.

Improved connectivity to industry clusters as well as significant ports (major and non-major), based on

their current and projected traffic volumes. Development of last-mile connectivity should be encouraged through PPPs.

Development of 15 to 20 logistics parks as the main network hubs viz. Mumbai Bangalore, Cochin, Hyderabad, Kolkata, Delhi NCR, Ahmedabad, Nagpur, Vishakhapatnam, Siliguri, etc.

Given the massive investment requirement for rolling stock, the capacity for manufacturing rolling stock and components must be increased substantially.

Upgrade wagons and track to 25-tonne axle load.

Upgrade rail wagons (higher axle load, better tare-to-payload by shifting away from carbon steel to stainless steel and aluminium/ other light-weight bodies, increased payload of covered wagons (BCN) through use of well wagons, better maintenance cycles, etc).

Expand partnership with private sector to facilitate development of private freight terminals, operation of container, automobile and special freight trains and third-party leasing of wagons.

IR should achieve physical separation of the long distance network and the suburban network. The segregation of suburban and long distance passenger/freight traffic is necessary for efficient provision of commuter service. A separate organisation should be created for suburban services with freedom to coordinate with state governments for connectivity/integration.

Development of select High Speed Corridors (speed potential 350 Km/h) on a pilot basis, if and when deemed to be economically viable.

INVESTMENT PLANNING

IR needs to shift to a programme approach from the current project-oriented approach.

Quick pay-off projects that can ease the capacity constraint the fastest should be prioritised.

Investment should be focused on total capacity creation including rolling stock, asset renewal, technology induction, information technology, identified investments in modernisation, etc.

A more integrated approach is required to be taken of transport as a whole and choices will need to be made on the priorities to be placed on different investments. Priority should be given to projects such as DFCs which are self financing and critical to achieve the target of 50 per cent share of railways in freight

IR should physical separate the long-distance and suburban networks. A separate organisation should be created for suburban services with freedom to coordinate with state governments for connectivity/integration

transport, as compared to projects such as HSR network which require continuous fiscal support.

A programme for raising speed to 160-200 km/h on selected existing routes should be undertaken, till the time the HSR projects are found commercially justified or operationally required to cater to the country's growth and mobility needs.

IR should encourage participation of private players (both domestic and international) in setting up manufacturing facilities for rolling stock and components. This would facilitate induction of world-class technology, besides being a source of capital for the resource constrained IR.

Replacement and renewal of assets should be ensured. The ad hoc approach presently followed in respect of appropriation to Depreciation Reserve Fund needs to be overhauled and a rule-based approach needs to be put in place.

PROJECT EXECUTION

Considering the need for massive capacity augmentation over the next 20 years, a separate body/organisation, partially independent of the Ministry of Railways should be set up to expedite the delivery of projects. All works having a budget outlay of more than Rs 5 billion (or may be Rs 10 billion) should be entrusted to an 'Authority', which may be called the 'National Railway Construction Authority' (NRCA). The NRCA would be an umbrella organisation having a national level presence, fully autonomous, and having extensive powers for award of works. It will award contracts for construction, supervise quality of construction and would ensure smooth flow of funds for the works to continue unimpeded. Repayment of loans, tax-free bonds, etc. would be channelised through it.

All capacity enhancement projects should be taken up after ensuring that funding is earmarked for each project. The concept of financial close may be introduced for each project.

Project teams to be held accountable for timely completion of the projects. Project managers to continue in their positions till project completion. Performance-linked incentives should be provided and penalties for failure should also be imposed.

A comprehensive railway safety policy with measurable indicators for evaluation for a five-year and 10-year period must be announced before the end of 2015

TARIFF

As has already been approved by the Government, independent Rail Tariff Authority should be set up with the mandate of fixation of rates and fares.

As the overall railways reform proceeds, this Authority can be changed into an overall Railways Regulatory Authority which would encompass tariff setting, along with other regulatory functions. Service-based pricing to attract traffic for bagged bulk commodities and non-bulk commodities.

A realistic programme of fare revision should be designed to reduce/eliminate the losses on passenger services. The government may subsidise up to 25 per cent of the costs of Suburban railways and no subsidy should be provided for non-suburban railways.

SAFETY

Establish a National Board for Rail Safety which is independent of the operational agencies to avoid conflict of interest. The CEO of the Board should be of a rank of Secretary to the government of India and should report directly to the Railway Minister. The Board will also conduct statutory inquiries into train accidents occurring on the Indian Railways, presently being conducted by the Commissioner of Railway Safety.

Establish/strengthen Safety Department within operating agencies (at different levels—Railway Board, Railway Regional headquarters) for ensuring day-to-day compliance with safety standards, studying effectiveness of existing policies and standards, conducting safety audits, collecting relevant data, etc.

A railway safety policy with measurable indicators for evaluation for a five-year and 10-year period must be announced before the end of 2015.

Reform data collection and analysis procedures for traffic accidents in consonance with international practices at different levels: National broad-based data, detailed survey systems for fatal cases, sampling systems for medical data, etc.

RESEARCH AND DEVELOPMENT (R&D)

Establish **Railway Research and Development Council (RRDC)**, an apex body that will replace the

Governing Council and will be chaired by an eminent technologist/scientist, with the Chairman and Technical Members of the Railway Board as its members. RRDC shall provide the perspective plan stretching over a reasonable period of 10 years for research and development needed for the Railways. The Director General of the proposed RRDI, the Director General of RDSO and 2 Directors of the proposed Academic Centres of Excellence shall also be ex-officio members. It will also have one representative each from the academic world and research organisations.

Establish **Railway Research and Development Institute (RRDI)**, a multidisciplinary research organisation for applied research on current concerns and future technology development for Railways. The RRDI should be supported by six or seven Regional Railways Institutes, which focus on the research requirements specific to their region. The head of the RRDI should report directly to the Minister of Railways or the CRB. It should target recruiting close to 300 researcher professionals by the end of the 13th Plan, with a healthy mix of Ph.D. degree holders, engineers, architects, professors from national and international universities etc.

Establish **Academic Centres of Excellence or the Railway Research Centres (RRCs)** in at least 13 technical institutes and at least two IIMs by 2020. These should be in the nature of full scale research centres where faculty can interact within a sizeable group. The RRCs should be provided grants in aid for establishment expenses, building, facilities, laboratory, equipment etc. In addition to equipment, supplies, travel and research funds, the funding must include 5-10 endowed permanent Chairs and 10-20 endowed post-graduate scholarships.

The functions of the RDSO should be completely redefined and actions should be initiated to revitalise and strengthen it. RDSO should involve itself with only technology upgradation, implementation and setting of standards; it should not be responsible for inspection.

Manufacturers of railway products to be involved in R&D for both new technologies as well as for improvement of existing systems and products. Setting up of new units with participation of private sector would also be useful in ensuring technological upgradation.

Result-oriented research teams should be set up to work on specified research projects. Such teams may include participants from outside IR, including from research/academic institutions and OEMs, contracted for the duration of the project.

An Integrated Energy Management System (IEMS) need to be set up under a separate directorate in the Railway Board.

INTERNATIONAL RAIL LINKAGE

IR should exhibit greater urgency and expedite the execution and operationalisation of identified inter-country connectivity projects as well as the execution of bilateral agreements, for smooth and seamless movement of intra-regional traffic among neighbouring countries. It is recommended that IR should give top-most priority to the projects to be taken up with Nepal and Bangladesh

Improvements in rail connectivity with neighbouring countries required on diplomatic and political considerations should be fully funded by the exchequer.

OPTIMISATION OF LAND USE

Infrastructure Corridors: suitable directives to be established whereby whenever a new transport infrastructure - rail or highway - is built, the corridor must provide for segments of the infrastructure, i.e. if a new port comes up, the rail connectivity must be in a corridor that also provides for highway, power lines, combined terminals, etc.

Schedule of Dimension (SOD) and Maximum Moving Dimension (MMD) improvement should be undertaken.

A standard template can be developed for redesign and redevelopment of the stations that maximises comfort for commuters and create space for premium retail in station premises.

INFORMATION TECHNOLOGY

Computer and Information Systems (C&IS) directorate at the Railway Board should be greatly enhanced as to encompass the entire gamut of ICT applications on the network.

Centre for Railway Information Systems (CRIS) should be converted from a society to a non-profit company with much greater freedom.

Organisation(s) for operationalising ICT applications at field level should be converted into autonomous bodies.

IR Institute of Transport Management (IRITM) should be entrusted with the task of human resource development.

HUMAN RESOURCES

Multiple services and cadres of Railways at the management level need to be rationalised and coalesced into fewer services in preparation of and to be consistent with the overall railways reform being proposed. The recruitment to the railway cadres of

officers should be totally dissociated from the Civil Services and Central Engineering Services exams. The SCRA exam should be upgraded to recruit candidates, who are already graduates, to two streams of Railway Service viz. Indian Railway Technical Service and Indian Railway Logistics Service, while overall reform is undertaken.

Induction of unskilled staff to be reduced and gradually done away with.

The recruitment processes to be supplemented by well researched and meticulously developed induction and in service training to constantly upgrade the skills of employees.

Recruitment of highly qualified PhDs from IIMs/IITs and lateral recruitment from market would be considered for specialist functions with suitable compensation.

A system of reward for collective performance and variable pay linked to incremental surplus generated by various units to be implemented.

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Annex 1.1

International Comparison of Modal Share of Domestic Freight

The modal share of rail freight ranges from only 3 per cent in Japan to around 65 per cent in Russia. Although the range of traffic types carried by railways in each country is similar, the overall contribution to the domestic freight task differs in each country. The proportion is influenced by management performance and also by (a) the actual freight markets offering and whether they are suited to railways; and (b) the existence and extent of domestic waterborne transport (coastal shipping and/or inland waterways). Since railways and these waterway services target many of the same market segments a large commercial waterway sector will significantly constrain railway modal share. The table below summarises some of the country specific factors involved:

COUNTRY	MODAL SHARE* OF DOMESTIC FREIGHT (EXCLUDING PIPELINES)
Australia	Railways carry about 44 per cent of domestic freight. Because of concentration of population and industry around the coast, the coastal shipping industry carries a substantial 20 per cent.
Canada	Railways carry about 66 per cent of domestic freight. The high market share is influenced by Canada's long east-west distances, but water transport (coastal shipping and St Lawrence/ Lakes transport) is significant with about 12 per cent modal share.
China	Railways carry about 51 per cent of domestic freight. Waterways (including both coastal shipping and over 24,000km of commercially significant inland waterways) perform a very large role in China carrying about 27 per cent of traffic.
Germany	Railways carry about 19 per cent of domestic freight. Germany has little bulk traffic and faces rather short rail distances; it also has an extensive inland waterway network consisting of the Rhine River and its tributaries, and a solid canal network, which together carry about 18 per cent of freight.
Japan	Railways carry about 3 per cent of domestic freight; because of its island geography, coastal shipping is the overwhelmingly dominant carrier with 58 per cent modal share.
Russia	Railways carry about 65 per cent of total freight. Russia's main waterways are south-north (which is contrary to main traffic flows); also the long east-west distances and relatively poor east-west road system contribute to the very high railway modal share.
United States	Railways carry about 44 per cent of total domestic freight. The USA has important coastal shipping links and about 12,000 km of commercially significant inland waterways (dominated by the Mississippi-Missouri river systems), which together carry about 25 per cent of freight.

China, Germany, Japan and Russia are, like India, mixed-use railways with significant freight volume but also heavy passenger train use of the network. By contrast, Australia, Brazil, Canada and the USA have only marginal passenger train activity outside the cities. Not having to share the network with a substantial passenger rail service affords both institutional and operational freedom on rail freight service. Nevertheless, the freight railways in those countries contain some of the most efficient land-based freight operations in the world and much of this experience is equally valid for mixed-use rail systems.

* Modal share does not equate to market share. Different modes can only 'share' markets where they exist as viable alternatives in those markets. The market reach of road networks is much greater than of railway systems, and that of rail systems exceeds that of waterway networks.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Paul Amos, July 2011

Annex 1.2

Routes Suggested for Increasing Maximum Permissible Speed to 160-200 kmph



Annex 1.3

Forms of Government Financial Support of Railway Passenger Services

TYPE	CHINA	GERMANY	JAPAN	RUSSIA
Compensation for carriage of specific user groups	No	Minor (less than 2 per cent of second class revenue on long-distance services)	No	Yes
Specific operating subsidies	No	Contract payments from regional administrations for public service contracts	No	Contributions towards regional companies from corresponding regional administrations
General operating subsidies	No	No	No	Deficit support of passenger revenue shortfalls during reform process.
Specific capital support	Grants for building new lines to remote areas	Replacement infrastructure investments, set out in a performance agreement with govt. Interest free loans and grants towards projects included in the federal transport infrastructure plan	The fees for rail company use of many high speed lines are set at less than full commercial rates on some lines.	For projects contained in the federal target programme. For 'special' projects (currently dominated by Olympic projects)
General capital support	No	No	No	Equity injections for maintenance repair and rehab.
Support from freight services	Freight services pay disproportionate share network costs	No	No	Freight services pay disproportionate share of network costs

Source: Passenger Railway Institutions and Financing: China, Germany, Japan and the Russian Federation, Paul F. Amos, 5 September 2011

Japan's Funding System

Japan's passenger railway sector is operated by private companies according to commercial principles. The three major, privately-owned, JR companies must fully cover the train operating and network infrastructure costs of their operations with commercial revenues, and finance their own capital programmes. They receive no revenue subsidies from the Japanese Government and must finance their own infrastructure development programmes, though special provisions apply to the development of the Shinkansen Network.

Most of the companies have diversified into a wider range of non-railway (and non-transport) businesses. These include businesses based on use of railway property and air-rights. The many non-JR companies generally earn an even greater share of revenue from non-transport businesses. The financial performance of the largest JR passenger company, the East Japan Railway Company (EJRC), is illustrative of the financial structure of the passenger railway industry in Japan. Of its operating income around two-thirds is earned from transport (mainly railways but including bus services and the Tokyo monorail), 9 percent from commercial exploitation of its own stations, 18 percent from other shopping and office centres, and 9 percent from various ancillary businesses. The company has 75 subsidiaries in all (each of its 25 shopping malls is managed by a separate subsidiary).

Although commercially independent, the Japanese Government imposes a number of general obligations on the JR passenger railway companies, including appropriate setting of passenger fares and rates structure; facilitation of smooth inter-company transfers by passengers; maintenance of the currently operated railway routes with due notification and process if line closure is envisaged or stations and other railway facilities are to be developed; and consideration of the impact of company diversification plans on small and medium-sized enterprises engaged in similar business in the same areas to avoid unfair impact.

The government is involved in financing the Shinkansen (bullet train) network. The Tokaido Shinkansen, a 515 km high-speed passenger-dedicated line opened in 1964. **This first route was a financial success** and by 1967 revenue exceeded operating costs, including interest and depreciation. The succeeding Shinkansen lines, while generally earning sufficient to cover operating and maintenance costs, have generally required government subsidies.

(Contd...)

nance costs, were less heavily used and able to contribute little towards capital recovery. Shinkansen-related debt was JPY 5.7 trillion by 1987 and Japanese National Railways were wound up with a significant portion of this debt relieved.

The capital cost of new Shinkansen railway construction projects is now shared by the national government (two-thirds) and local governments (one-third) along the railway lines. The railways are constructed and owned by a government corporation but managed and operated by the companies. Passenger railway companies pay a levy for the use of this infrastructure. The maximum charge is equal to the profits from the new Shinkansen operations. Therefore decisions to build new lines involve a detailed appraisal of the impact on the profitability of the railway company. A little more than half of the national government funding comes from the payments received from companies for use of existing Shinkansen lines while the remainder comes from Japan's General Account.

Source: Passenger Railway Institutions and Financing: China, Germany, Japan and the Russian Federation, Paul F. Amos, 5 September 2011

Russia's Railways Funding Structures

The Russian passenger railway sector has undergone reforms over a period of 10 years from 2001 to convert the railway sector from the wholly vertically and horizontally integrated structure inherited from the Soviet Union to one based on commercial, corporatised structures focused on specific business activities and private sector participation in train operations. Prior to the 2010 reforms, passenger services were run directly by Joint Stock Company Russian Railways (RZD – a defined 'strategic' company whose shares were owned by the Russian Federation). As part of reforms RZD transferred staff and assets to the newly formed Federal Passenger Company, which manages long-distance rail passenger services. Their aim is **transparency of financial performance, eventual elimination of cross-subsidies, and the ability to set locally economically justified tariffs.**

RZD passenger services receive several forms of financial support from the Russian Federal Government and modest contributions from regional administrations. Revenue support of various kinds appears to have been about RUR 41 billion (US\$1.3 billion as of November 2012) or just over 15 percent of the total income of the RZD companies and subsidiaries. There is also capital support of passenger railway links in preparation for the 2014 Sochi Winter Olympics and for a new airport link in Vladivostok (these categories of support are clearly of a special and short-term nature). Passenger services have also benefited from federal support of around RUR 39 billion to rail network infrastructure in 2010, although rail freight, which constitutes around 90 percent of traffic-kms in Russia, is likely to have been the main beneficiary.

RZD raises debt for its own funded investments through loans and bonds. As at the end of 2010 total debt is reported as RUR 297.6 billion consisting of RUR denominated bonds (63 percent), Euro-denominated bonds (15 percent), project finance (11 percent), syndicated loans (8 percent) and bilateral loans (3 percent).

Russian passenger services earned accounting losses in 2011, but long-distance services as a whole probably contributed positively to network infrastructure costs. Long-distance services cover about 80 percent of their fully allocated expenses and suburban/regional services about 56 percent of fully allocated expenses. This implies that long-distance services cover their train operating costs (which are expected to be less than 80 percent of the total costs) and make a modest positive contribution to infrastructure network costs, while suburban services as a group do not even cover train operating costs.

Source: Passenger Railway Institutions and Financing: China, Germany, Japan and the Russian Federation, Paul F. Amos, 5 September 2011

Germany's Funding System

Germany's two main state-owned rail passenger service providers, DB Long-distance and DB Regional, both benefit significantly from government financial support from two main sources. DB and its subsidiary passenger and infrastructure companies are responsible for financing their operations, management and maintenance expenses entirely from revenues.

However, a major portion of the revenue earned from regional passenger services (whether run by DB Regional or private contractors) is from government funded **passenger public service contracts between the regional company and the administrations** on whose behalf specific services are run at agreed fare schedules and structures. This support represents about 56 percent of DB Regional's total revenue.

Moreover, while track access charges paid by operators to DB Netz are sufficient to cover the expenses of track operation and maintenance, access income only finances a small part of the capital costs of renewal, upgrading or of new rail infrastructure. **Most of the capital cost is funded by government grants and non-interest bearing loans**, which partly come from petroleum taxes and the EU. DB contributes funds of its own towards such projects insofar as they are in its own business interests (it has contributed around 15-20 per cent of the total). Over the last few years, the Federal government has contributed an average of EUR 1.2 billion/year to new-build and upgrading projects.

A third, source of federal government funding is **payment to providers for trips made by certain community groups** such as severely disabled passengers, and military (or alternative) national service travellers. This constitutes a minor portion of passenger revenue (less than 2 percent of second class revenue on long-distance services).

The German model of concessioning of suburban/regional networks through competitive tender has provided good value for money. According to DB, the Federal Länder (states) now have to spend less public funds to obtain a far higher level of traffic performance in regional rail service than at the start of the rail reform (According to the DB Annual Competition Report 2011, after adjustment for inflation, the Länder received 37 percent more performance for each euro in 2009 than they did in 1996).

Additional government support to DB companies is also given through borrowing guarantees. This includes explicit sovereign guarantees for loans from Eurofima, a company set up by a number of European railways to finance purchase of railway rolling stock. Because DB is 100 percent owned by the German Federal Government, the raising of capital by the DB Group is also assisted by market perception of an implicit government guarantee on bonds issued by the DB Group's financing company, DB Finance.

Source: Passenger Railway Institutions and Financing: China, Germany, Japan and the Russian Federation, Paul F. Amos, 5 September 2011

ANNEX 1.4 REORGANISATION INTO 7 CADRES

[ALTERNATIVE VIEW ON HUMAN RESOURCE MANAGEMENT]

- While the recruitment to the Indian Railway Medical Service, the Security Service and the Indian Railway Stores Service can continue as hitherto, the balance 7 railway cadres may be reduced to 4 as under:
 - i. Indian Railway Traffic Service, recruitment done through the Civil Services Examination as now.
 - ii. Indian Railway Service of Engineers, recruitment done through the Combined Engineering Services. This service will be responsible for the maintenance of fixed infrastructure (track, formation including bridges, buildings, signaling, over head electrical traction system etc). The initial qualification may be prescribed as a graduate in Civil or Electrical Engineering and no other branch. It may be mentioned that till the 1950s, Signaling Cadre was a part of the Indian Railway Service of Engineers.
 - iii. Indian Railway Service of Mechanical & Electrical Engineers, recruitment done

through the Combined Engineering Services. This service shall be responsible for the 'rolling' infrastructure, that is, locomotives, coaches, wagons etc. The initial qualification will be a graduate in mechanical or electrical engineering.

The SCRA exam would be done away with; it is a historical legacy of 1926; and when graduate engineers are available, the need for SCRA does not exist. In fact, the Ministry had stopped recruitment for two years due to the reluctance of UPSC to conduct such a recruitment and it was restarted more for sentimental reasons. Qualifications as now prescribed by UPSC do not prohibit an electrical engineer joining the IRSE cadre or a mechanical engineer joining the IRSEE cadre. And, the Railways have had such examples.

- iv. Indian Railway Accounts Service, recruitment done through the Civil Services Examination as now.
- Recruitment to the Indian Railway Personnel Service, now done through the Civil Services Examination, may be discontinued. This service was the last to be added in the 1970s. While it is not anybody's argument that a specialised service dealing with human resources is not required- all corporate organisations have this distinctive group to assist- the situation in IR is different. Being a part of the GoI, the role a HR manager plays is limited. All establishment policies and emoluments are uniform for the civil services. The posts of 'personnel officers' can be filled by officers from the four services mentioned above, as was the case earlier, if necessary after a short course on HR and establishment at Vadodra.
- On selection to the Indian Railway Service of Engineers, the candidates should be admitted to a preselected Institute of Technology such as an IIT or NIT for professional training of one year's duration. This training will enable a graduate in one discipline of engineering to learn basic aspects of engineering in other disciplines; thus one with civil engineering qualification will have adequate coverage of basic electrical engineering subjects and vice versa so that the officers have a holistic approach to the railway related issues. The training modules will thus be specific for graduates of any one specific discipline. Similarly, candidates selected for the Indian Railway Mechanical & Electrical Service will undergo a year's course in each other's discipline for a good grounding of the basics of the discipline. After successful completion of their course, the officers of these two services will spend their further probationary period as now, except that they will also be trained in the Institutes at Nasik, Secunderabad and

Jamalapur as the case may be. The impact of combining the existing services is a prolongation of the probationary period by one year. However, we would have initiated a process of reducing the number of services and thereby limit the problem of departmentalism in the organisation and attuned with the organisational reforms proposed.

- Officers of the two cadres— Indian Railway Service of Engineers and the Indian Railway Service of Mechanical & Electrical Service should be put through cross-disciplinary rotation; one concomitant requirement would be to increase the proportion of Group B officers in the cadre and reduce Group A cadre correspondingly. A better qualified and trained Group C cadre— the supervisory cadre - is a *sin qua non* for this proposal as it is this cadre that deals with day to day operations and management. Cross disciplinary rotation was a recommendation of the Prakash Tandon Committee too.
- The candidates selected for the Indian Railway Accounts Service and Indian Railway Stores Service will undergo training as hitherto and of the same duration. Similar will be the case with the Indian Railway Traffic Service. The Prakash Tandon Committee had recommended that those joining the Indian Railway Accounts Service should have a financial background; this can be achieved either by prescribing an initial qualification while applying to the UPSC or suitably including the subject in the training modules.
- Once this process of change in the initial recruitment is put in place, we can create a superior managerial cadre of leaders after 14 to 16 years of service from out of three services IRTS, IRSE and IRSM&E. These officers can be selected by a process of assessment by a Committee of Members of the Board and with participation by UPSC. The present practice of basing the selection only on annual confidential reports would be given up. The process of selection will have well developed criteria such as leadership quality, decision making capacity, proven performance, ability to work with a diverse group, analytical ability etc. A batch so chosen will be relatively small in number and with their inter-se seniority fixed. The batch will receive training in a management institute which will include logistics, supply chain management, multimodal transport, PPP, finance as relevant for a corporate body including issues related to investment and its appraisal, etc. They will man the posts of Additional Divisional Railway Managers, Divisional Railway Managers, Chief Vigilance Officers, Chief Personnel Officers, General Managers etc. In this arrangement, the Managers will have long stints unlike today

- when the DRMs remain in the chair only for 2 years and the organisation suffers the consequences of frequent changes, lack of direction and cohesion at the divisional level. This will undoubtedly benefit the organisation and a sense of direction, focus will be inculcated.
- Further, recruitment of highly qualified PhDs from IIMs/IITs and other science and engineering institutions in India and abroad should be encouraged for specialist technical functions such as for structures, signaling and telecommunication, etc. Such recruits

can either be on a contract basis or on regular employment with attractive compensation packages.

- Lateral recruitment from the market for jobs in R&D and marketing should also be considered. IR needs to transform into a smart organisation through a constant process of technological upgrade and stress on customer focused growth. This requires that personnel at all levels are recruited and trained with a view to building skills and attitudes required for attainment of the organisational goals.

ANNEX 1.5 RAIL CONNECTIVITY WITH NEIGHBOURS: THE PRESENT STATE²²

Historically, the rail network of the region prior to independence and partition constituted an organic system. However, in the post- independence and post-partition period, rail systems of South Asia have developed in the national context with little consideration for cross-border connectivity and interoperability or compatibility/uniformity of standards in infrastructure and equipment. The current country-wise status is presented below.

Bangladesh: A number of connections existed between India and East Pakistan (now Bangladesh) at the time of independence. These include: Haldibari (India) - Chilahati (Bangladesh), Gitaldaha (India) - Mughalhat (Bangladesh), Agartala (India) - Akhaura (Bangladesh) and Shahbazpur (Bangladesh) - Mahishasan (India). Many of these, however, fell into disuse over the years. At present, railway systems of India and Bangladesh are linked to each other at five points. Of these, three BG links, namely, Gede (India)-Darshana (Bangladesh), Singhabad (India) - Rohanpur (Bangladesh) and Petrapole (India)-Benapole (Bangladesh) are currently open for freight trains. A bi-weekly passenger train, 'Maitree Express' introduced on 14 April 2008 also runs between Kolkata and Dhaka Cantt. via Gede-Darsana route. The other two links, though in existence, lie dormant at present. These are:

1.	Radhikapur(IR)-Birol (BR)	BG on Indian side, MG on Bangladesh side. Inoperative since 1 April 2005
2.	Mahishasan(IR)-Shahbazpur (BR)	MG. Extensive damage by floods. Not functional since December 1996. Track on BR side needs strengthening

Over the years, the gap between BR and IR in regard to the loading capacities of rolling stock, length of passing loops, size of trains, braking systems, etc

has widened. Difference in ground infrastructure and technology platforms has adversely affected interoperability. On the positive side, construction of a rail-cum-road bridge over the Ganga (Jamuna) with provision of dual -gauge rail tracks suitable for both MG and BG operation has connected the previously isolated east and west rail networks.

Akhaura, which was the rail-head for Agartala during the British colonial rule in undivided India, served as a major link between Chittagong port and Tripura. IR have now extended the MG rail network up to Agartala and are extending it further south to Sabroom located on Tripura's border with Bangladesh. India has offered assistance to construct the MG Akhaura-Agartala rail link.

Pakistan: As with Bangladesh, there used to be several rail connections between India and Pakistan at the time of independence. Many of these connections fell into disuse over time. At present Attari-Wagha and Munabao-Khokhrapar links (both on BG) are operational. Attari-Wagha route is used to run both freight and passenger services, while a weekly passenger service runs through Munabao-Khokhrapar. Other links which are no longer in use are: Sialkot (Pakistan) - Jammu (India), Dera Baba Nanak (India) - Jassar (Pakistan), Hindumalkote (India) - Mandi Sadiq Ganj Jn.(Pakistan), Fazilka (India) - Mandi Sadiq Ganj Jn. (Pakistan), Hussainiwala (India) - Ganda Singhwala (Pakistan) and Khemkaran (India) - Kasur Tehsil (Pakistan). Uneasy relations between the two countries have prevented any serious efforts to re-establish these connections.

Nepal: Nepal had a small narrow-gauge network. In 2004, an ICD which also serves as a rail terminal for bulk traffic was operationalised at Birgunj and connected to Raxaul on the Indian Railway network through a new 6-km long broad- gauge line. It deals with both inbound and outbound bilateral traffic from and to India and third country traffic through Kolkata

22. Report of the Working Group on Railways (NTDPC)

Rail Routes Surveyed for Nepal

PROJECT	LENGTH (KM)	ESTIMATED COST (RS BILLION)	RATE OF RETURN: PER CENT
Jaynagar-Bijalpura-Bardibas	69	4.7	-5.7
Nepalganj Road-Nepalganj	12	1.5	Negative
Nautanwa-Bhairahawa	15	1.8	-4.14
Jogbani-Biratnagar	18.6	2.1	-3.6
New Jalpaiguri-Kakarbita	70	3.4	-3.6

Rail Routes Surveyed for Bhutan

PROJECT	LENGTH (KM)	ESTIMATED COST (RS BILLION)	RATE OF RETURN: PER CENT
Banarhat-Samtse	23	2.05	-4.6
Hasimara-Phuentsholing	18	1.68	6
Kokrajhar-Gelephu	58	2.94	-9.7
Pathsala-Nanglam	51	6.69	4.7
Rangia-Sandrupjongkhar via Darranga	41	6.07	-8.2

and Haldia ports. Survey for five other rail connections between the two countries has been conducted:

Of the above, Ministry of External Affairs has decided to fund the Jaynagar- Bardibas and the Biratnagar-Jogbani lines. These have been sanctioned and taken up by Indian Railways for execution. In addition, Ministry of Physical Planning and Works, Nepal got a techno-economic survey carried out in 2006 for a rail line to connect Birgunj with Kathmandu. The survey estimated the cost of the 160 km long BG electrified rail line along Kathmandu-Thingari-Kaveri-Hetuada-Pyramidi-Amlekgunj-Pathlauja-Birgunj alignment at Rs 30 billion.

Bhutan: Bhutan does not have a railhead and is dependent on the stations on New Jalpaiguri-Guwahati Broad Gauge line in North East Frontier Railway for its rail transportation. Government of India commissioned studies for the following five connections to Bhutan:

Of the above, the Hasimara-Phuentsholing line which will connect Bhutan to the Indian Railway BG network has been proposed for construction.

Myanmar: Myanmar constitutes the crucial missing link or land-bridge between India and South-east Asia. Adequate connectivity with Myanmar would be an essential first step towards the integration of India's North-east region with South-east Asian economies.

Rail linkages envisaged in the Trans Asian Railway project includes connections to Moreh in Myanmar from Jiribam in Manipur via Imphal. At present, work is progressing on the construction of a new line between Jiribam and Imphal.

In 2008, India signed the Indo-Myanmar cooperation agreement on the Kaladan multi-modal transport project. Although this project envisages use of riverine and road transport to connect Sittwe with Mizoram and Manipur, a railway line from Silchar longitudinally through Mizoram connecting Sittwe port will provide access to the land -locked regions of North Eastern India, in particular, states of Mizoram, Manipur, South Assam and Nagaland .

Sri Lanka: India and Sri Lanka are separated by sea and there is no physical connection between the two railway systems of Sri Lanka and India. In the past, railway line existed upto Dhanushkoti near Rameshwaram in Tamil Nadu from where there was a ferry service to Talaimannar in northern Sri Lanka. This link was destroyed in a cyclone in December, 1964. Since then railway link to Rameshwaram has been restored and upgraded to BG, but the link to Dhanushkoti remains disrupted. A ferry service remained operational between Rameshwaram rail-head to Talaimannar till 1984 when it was discontinued owing to the militancy plaguing North and East Sri Lanka in the subsequent years.

ANNEX 1.6 REGIONAL AND MULTILATERAL INITIATIVES FOR CROSS-BORDER RAIL CONNECTIVITY²³

Both SAARC and United Nations Economic and Social Commission for Asia and Pacific (UN-ESCAP) have attempted to draw a roadmap for regional and international rail connectivity in the context of SAARC and Asian region respectively.

A multi-modal transport study carried out at the instance of SAARC Secretariat suggested the following potential rail corridors:-

Corridor 1: The SAARC Rail Corridor 1 (2,800 kms) is on BG from Lahore in Pakistan to Dhaka in Bangladesh and thereafter on MG on its eastern side. It is an almost continuous rail link and has the potential of moving intra-regional cargo via the shortest and the fastest mode. Lahore-Dhaka containerised cargo currently moving by a much longer rail-sea-road network (Lahore-Karachi-Chittagong-Dhaka) could move on this shorter and faster corridor, saving transportation cost and transit time significantly. This route would also facilitate traffic moving from destinations in India to its North-Eastern states, drastically reducing transportation costs and transit time (Kolkata-Badarpur via Guwahati is 1,356 km on the existing rail route against 682 km via Gede-Akhaura-Shahbazpur on this identified corridor).

The port at Karachi could provide a shorter route for international inward and outward cargo especially from North India, compared to the distance it has to travel to and from JNPT. **In fact, this corridor commands immense potential of carrying inter-continental containerised cargo, say, between Dhaka in the east and Europe in the west via a BG rail network through India and Pakistan onwards to Zahedan in Iran with only one transshipment at Zahedan to SG for further movement through Iran and Turkey on standard-gauge Network.**

Corridor 2: This 707 km rail corridor, re-commissioned on 15 February 2006, connects Karachi (Pakistan) and Jodhpur (India) and thus provides connectivity to the entire IR network. Currently, a passenger train 'Thar Express'/'Link Express' operates between Mirpur Khas (Pakistan) and Munabao.

Corridor 3: This 700 km BG rail corridor provides the shortest and the fastest access for traffic to and from land-locked Nepal. The 704 km Birgunj-Kolkata port via Naihati and 832 km Birgunj-Haldia via Howrah corridor has been extended by a 30 km BG line link along Sugauli-Raxaul-Birgunj with a 6 km extension inside Nepal connected directly to ICD at Birgunj.

Corridor 4: The 1,146 km Birgunj-Katihar-Chittagong port corridor also starts at Birgunj in Nepal and con-

nects the Indian rail network at Raxaul and runs South-east through Barauni-Katihar-Malda Town-Singhabad to the Bangladesh, border-crossing at Rohanpur. In Bangladesh the corridor then extends to the port of Chittagong via Rohanpur, Abdulpur, Ishurdi, Tungi and Akhaura. The existing rail link from Jogbani to Katihar has been identified as part of this corridor. Proposed connectivity to Biratnagar in Nepal with Jogbani (last station on IR) would provide a second rail route connecting Nepal with India and Bangladesh.

This corridor can potentially connect Akhaura in Bangladesh with Agartala in India and shorten the link between Kolkata and Agartala. Howrah-Agartala via Guwahati is 1,561 kms against 502 kms from Howrah to Agartala via Joydebpur and Akhaura.

Corridor 5: This 1,025 km Colombo-Chennai corridor has the potential of further connectivity with other SAARC member states through the IR network. It could also be utilised for the movement of containerised traffic with transshipment to sea vessels for movement across the channel connecting to the Indian mainland. The 35 km ferry link from Talaimannar Pier in Sri Lanka to Rameshwaram in India would provide connectivity with Chennai, 653 km away, through the IR network.

TRANS ASIAN RAILWAY

UN-ESCAP under its Asian Land Transportation Infrastructure Development (ALTID) project identified three Trans-Asian Railway (TAR) routes. These are: (i) Northern Corridor which passes through Russian Federation, Kazakhstan, Mongolia, China and Korean Peninsula, (ii) TAR in the Indo-China and ASIAN sub-region starting from the Chinese border through Lao People's Democratic Republic and Thailand up to Malaysia (with linkages connecting Myanmar, Cambodia and Vietnam) and (iii) The Southern Corridor comprising Turkey, Iran, Pakistan, India, Nepal, Sri Lanka and Bangladesh. Inter-governmental agreement on TAR has been negotiated under UN-ESCAP.

The Southern Corridor commences from Kunming in China and Bangkok in Thailand and ends in Kapikule in Bulgaria. The total length of this route between Bangkok and Kapikule is 11,460 kms and it provides Trans Continental rail connectivity to the countries of China, Thailand, Myanmar, Bangladesh, Pakistan, India, Iran and Turkey. The route, as proposed, would enter India at Tamu, bordering Myanmar, pass into Bangladesh at Mahisasan/Shabajpur and re-enter India from Bangladesh at Gede. On the West side, this route was proposed to enter Pakistan at Attari-Wagah. This route has a missing link of 180 kms between Jiribam and Tamu in India.

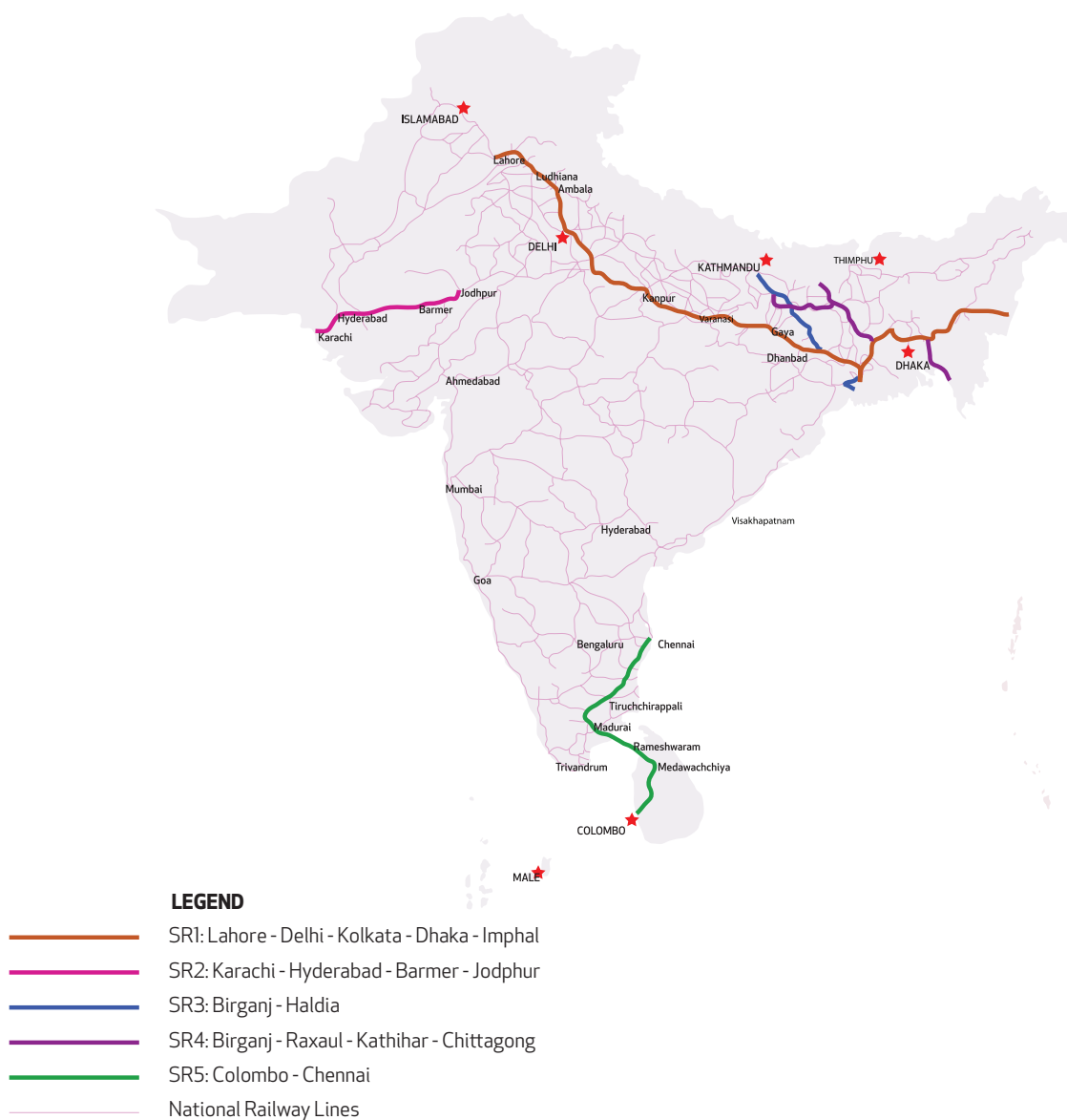
The Trans Asian Railway network is intended to provide connectivity between (i) capitals of member countries, (ii) main industrial and agricultural centers, (iii) major sea and river ports, (iv) major container terminals and depots, and (v) places of major tourist attractions.

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SAARC Corridors

	CORRIDOR	COUNTRIES SERVED	BASIS FOR SELECTION
SRC 1.	Lahore (Pakistan)-Delhi/ Kolkata (India)-Dhaka (Bangladesh)-Mahishasan-Imphal (India)	Pakistan, India & Bangladesh	Potential growth of intraregional traffic. Reduced distance and shorter transit time.
SRC 2.	Karachi (Pakistan)-Hyderabad-Khokrapar-Munabao-Barmer-Jodhpur (India).	Pakistan & India	Shorter route for intra-regional traffic. Access to Karachi port and potential third country traffic.
SRC 3.	Birgunj (Nepal)-Raxaul-Haldia/Kolkata (India)	Nepal & India	Access to the landlocked Nepal. Potential corridor for third country and bilateral traffic (Already functional).
SRC 4.	Birgunj (Nepal)-Raxaul-Katihar (India)-Rohanpur-Chittagong (Bangladesh) with links to Joghani (Nepal) and Agartala (India)	Nepal, India & Bangladesh	Access to Chittagong port for Indian and Nepalese traffic. Shorter route for North Eastern States of India through Bangladesh
SRC 5.	Colombo (Sri Lanka)-Chennai (India)	Sri Lanka & India	Restoration of old rail ferry link to provide passenger and goods access from Sri Lanka to mainland South Asia

SAARC RAIL CORRIDORS



ANNEX 1.7 THE CHINA FACTOR²⁴

Trans-continental rail connectivity as a strategic tool is being deployed to great effect by China. It has already developed transport links to the Korean peninsula, South-east Asia, Myanmar, Pakistan and Afghanistan. It is busy developing extensive multi-modal connectivity in India's neighbourhood which is perceived in strategic circles as an act of encirclement. It has established a presence in Pakistan with a new port at Gwadar and strategic linkages through Pakistan, Iran and Central Asia.

China Metallurgical Group Corporation, involved in the development of the Aynak copper mines, has signed an MoU with Afghan government on 22 September 2010 to undertake a feasibility study for a 700 km rail-line connecting the Aynak copper mines in northern Afghanistan with Kabul and the two neighbouring countries, with connectivity to ports in Iran and Pakistan (estimated cost- \$5 billion). China is also actively working to incorporate the Gilgit-Baltistan tract into Xinjiang's logistics grid by widening the highway and laying a Pakistan-China rail link, through an MoU between Beijing and Islamabad for a trans-Karakoram rail line through the Gilgit-Baltistan region. Pakistan plans, with active Chinese involvement, a 900 km rail line from Gwadar port in Balochistan on Pakistan's south-west coast close to the Straits of Hormuz to join the Quetta-Zahedan line and via Dalbandin along Koh-i-Taftan (on Iranian border)- Spezand-Quetta-Chaman (on Afghan border) onwards through Khunjerab Pass in the Karakoram to Kashgar (Kashi) connected to Xigaze in China. It has planned a railway and pipeline from Gwadar port to western China along the Karakoram Highway route.

China has also plans to build a new rail corridor to link it to the Mediterranean Sea through Central Asia, Afghanistan, Pakistan and Iran. It has proposed 580 km rail-line from Tehran through Hamadan, Malayer and Kermanshah to Khosravi on the border with Iraq, which will also provide a link between Arak and Malayer. The line will offer onward linkages via Iraq to the Mediterranean port of Latakia in Syria, thereby facilitating a southern route from China to Europe. Yet another transit route being considered is through Afghanistan and Pakistan along Askabad-Torghundi-Herat-Kandahar-Chaman-Quetta.

In the east, China has long-term plans to link up with the Bay of Bengal port of Sittwe (Akyab) through Mandalay and the Irrawady River. China is also planning to build a 232-km Lashio-Muse/Ruili rail line that would provide a strategic link through an extensive rail network across Myanmar. From Kunming in its Yunnan province, a network of road, rail and river links fork out to Sittwe in western

Myanmar and Thilawa near Yangon on the Bay of Bengal. Myanmar would thus emerge as a possible land-bridge connecting South Asia and South-west China.

Besides the Irrawady corridor through Myanmar into the Bay of Bengal, China extends significant development assistance to Bangladesh by way of grant, credit, and interest-free or concessional loans for important bridge works, natural gas, etc. Plans are on the anvil, among other projects, for constructing the second Padma Bridge and a 130 km rail line from Chittagong to Gundum on Myanmar-Bangladesh border. A Myanmar-Bangladesh rail link will help connect Kunming to Chittagong as well.

In the north, China is busy extending the world's highest 1,142 km Golmud-Lhasa rail line, that was opened in July 2006, to Xigaze, Tibet's second largest city, 253 km apart from its capital city, with plans to take it further towards Nepal, first to Nyalam, 400 km from Xigaze, on the China-Nepal border and finally a 120-km extension to Kathmandu.

In the south, a part of its 'string of pearls' strategy of links with regional maritime nations, China is now Sri Lanka's biggest investor as well as aid donor. The Economist (10 July 2010) reported that China is financing nearly all of Sri Lanka's biggest infrastructure projects, e.g., a new sea port at Hambantota, an oil storage facility, a new airport, a thermal power plant, an expressway, besides a special economic zone at Mirigama near Colombo. China is also rebuilding the main roads in the war-shattered north and east, and also a performance arts centre.

Chinese road and rail connectivity projects to speedily knit the South-east Asian land mass include the ambitious 5,380 km ASEAN flagship Kunming-Singapore rail line venture, a crucial corridor critical to the Trans Asian Railway project. China has been keen on connectivity of its rail network across those of the ASEAN region, even though there is no rail linkage between China and Myanmar, China and Laos, Myanmar and Thailand, Thailand and Cambodia, Cambodia and Vietnam, and Vietnam and Laos.

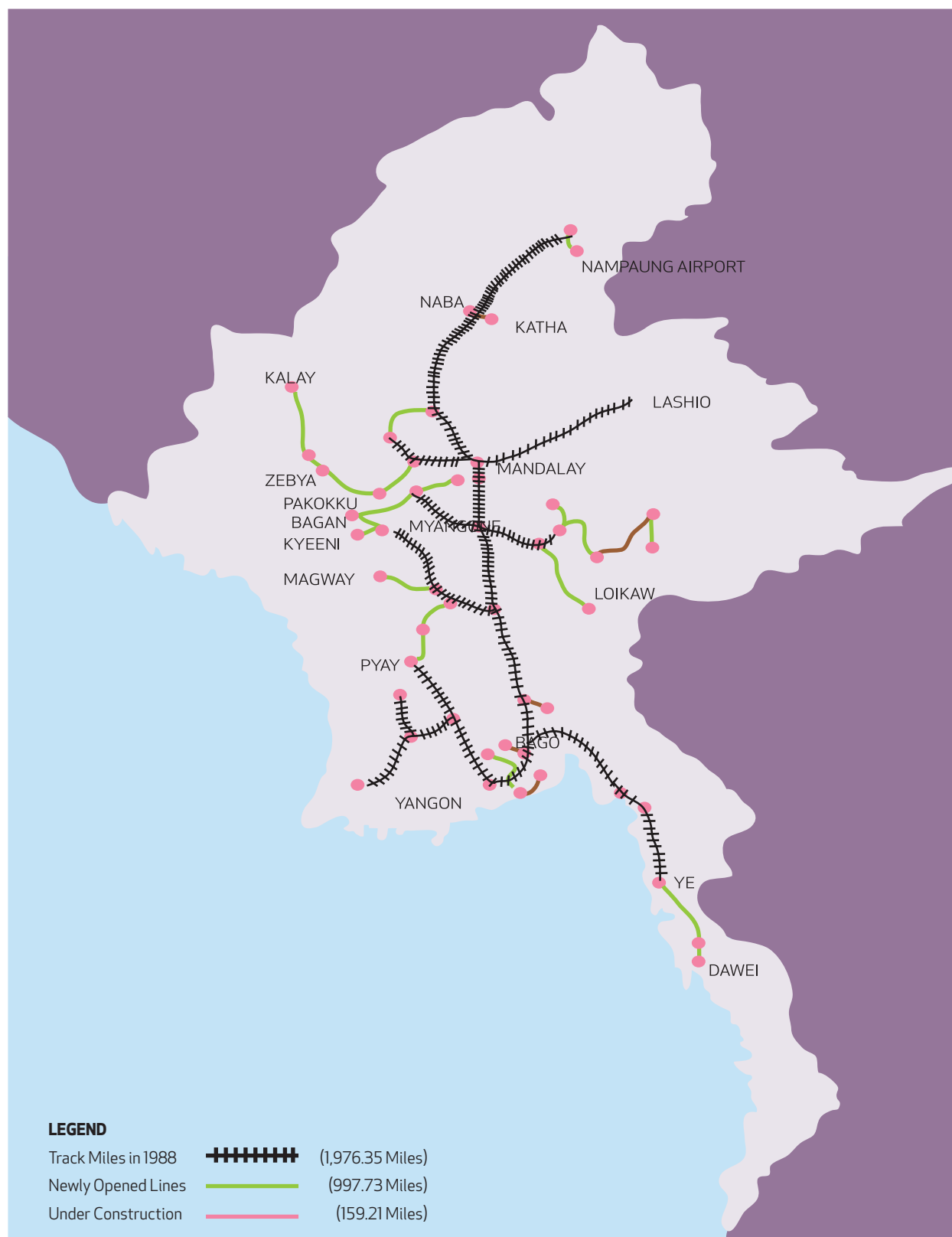
China's initiatives in expanding its rail connectivities beyond its own geographical borders has been dealt with in some detail because of its overarching strategic as well as political significance for our country. There are very important implications of Chinese advances in the neighbouring countries. In order to secure our strategic interests in the region, looking at rail linkages beyond the country's borders is not an option but a compulsion. Our long-term transport policy, therefore, has to take note of and provide for solutions to the challenges posed by the Chinese initiatives in the region.

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Annex 1.8

Railway Projects That Need to be Taken Up with Neighbouring Countries²⁵

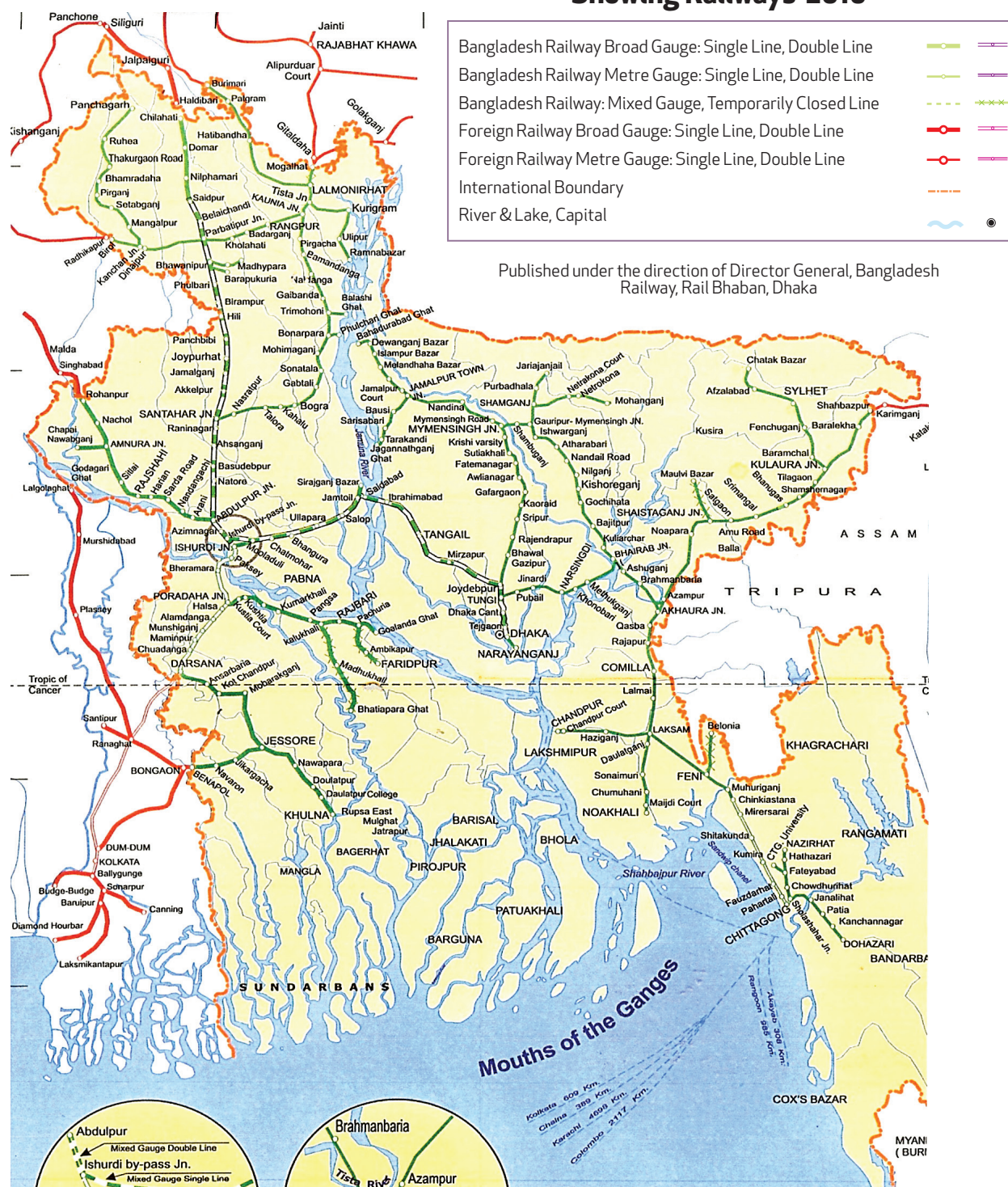
[A] MYANMAR



- i. A study should be commissioned to work out the costs and other details of the Kaladan project.
- ii. Jiribam-More and Seggi-Chaungh-Myohaunes lines should be constructed.
- iii. Yangon-Mandalay rail-link needs to be upgraded.

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BANGLADESH Showing Railways-2010

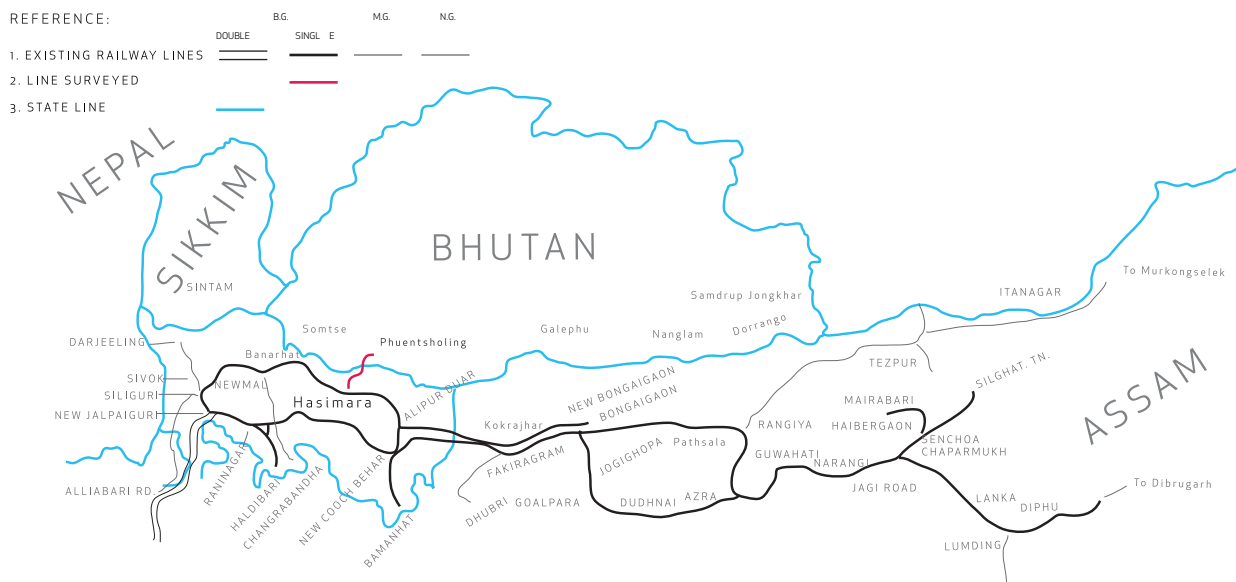


- i. The old links between the two countries need to be restored for the sake of the development of India's North Eastern states as well as for the sake of better relations with our most populous neighbour. These would include: Haldibari (India)-Chilahati (Bangladesh), Gitaldaha (India)-Mughalhat (Bangladesh), Agartala (India)-Akhaura (Bangladesh) and Shahbazzpur (Bangladesh)-Mahishasan (India).
- ii. Radhikapur (India)-Birol (Bangladesh) line needs to be reopened to facilitate transit

trade between Bangladesh and Nepal through India.

- iii. Haldibari-Chilahati link needs to be restored for trade between Bangladesh and Bhutan through the Indian Territory.
- iv. Agartala (India)-Akhaura (Bangladesh) connection needs to be re-established to provide the much-needed direct rail link to states like Tripura, Mizoram and Manipur to Chittagong port.

[C] BHUTAN



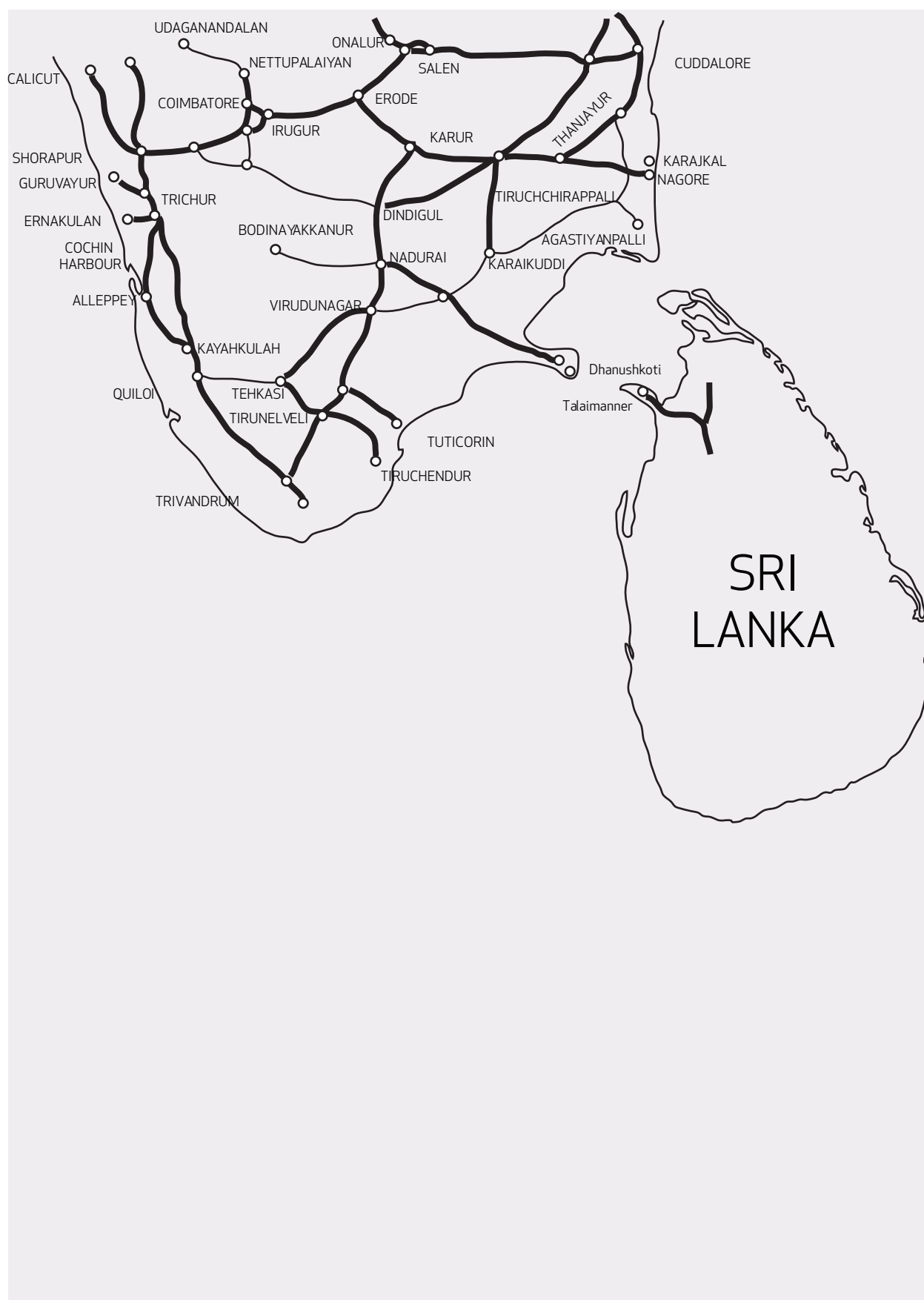
- i. The 17.5 km long Hasimara (India)-Phuentsholing (Bhutan) which has been identified for execution should be constructed. Issues relating to land acquisition need to be addressed by the State and the Union Government.

[D] NEPAL



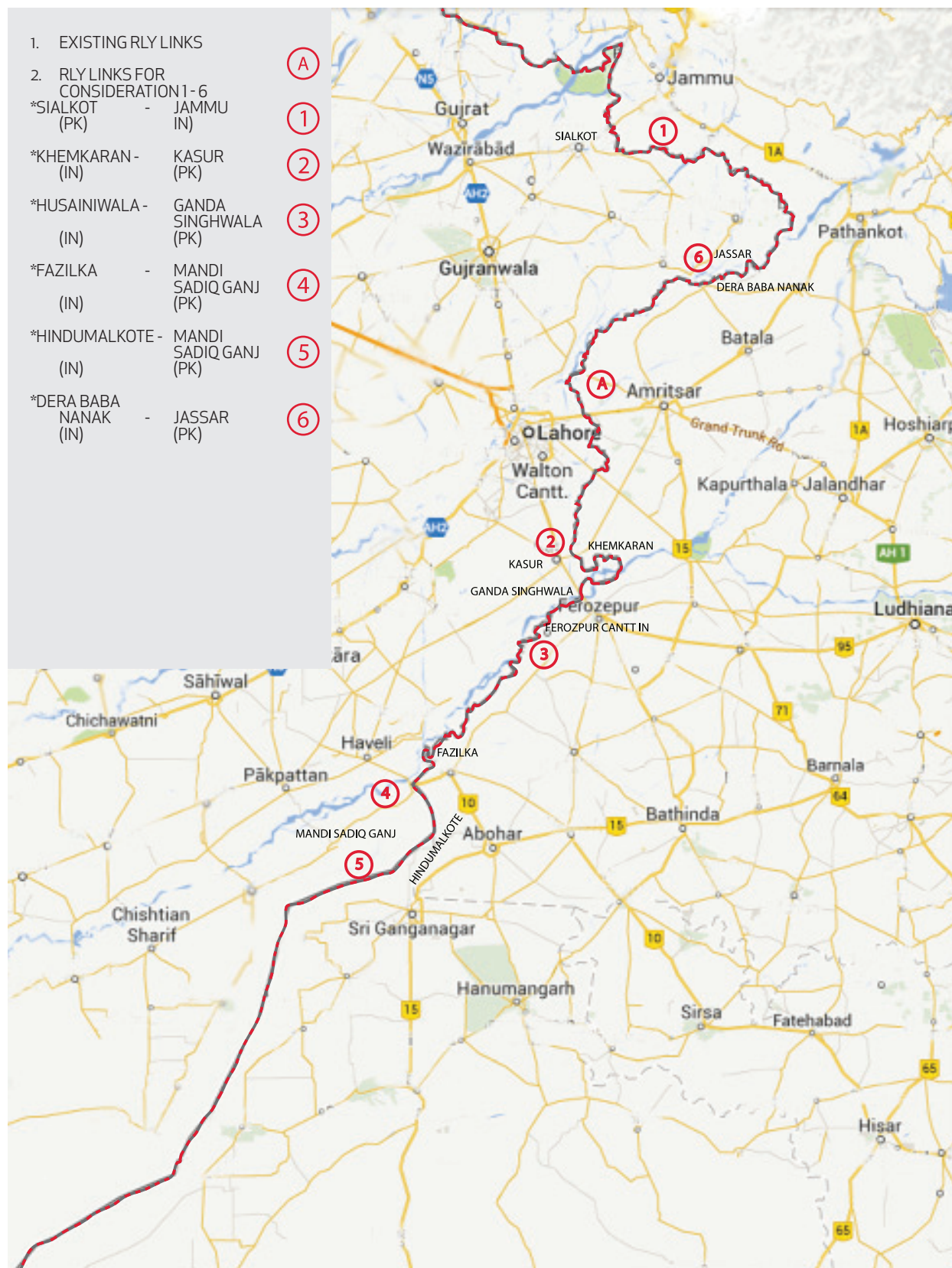
- i. Jaynagar-Bardibas (69.10 kms) and Jogbani-Biratnagar(18.60 km) lines costing Rs 4.7 billion and Rs 2.1 billion respectively and being entirely funded by the Government of India should be expedited.
- ii. Nepalganj Road-Nepalganj (12.11 km), Nautanwa-Bhairahwaha (15.30 km) and New Jalpaiguri-Kakra-bitta (46.30 km), which have also been surveyed, should be taken up by the Government of India.
- iii. Rail connectivity with Nepal assumes special importance in view of the China factor discussed earlier. China is planning a rail line between Lhasa and Kathmandu. Strategically, it would be in India's interest to construct the Birganj-Kathmandu line (160 km). The cost of this line as estimated by Pipavav Rail Corporation Ltd. (PRCL) is Rs 12.85 billion (2006). This project admittedly will not be financially viable but it will be in India's strategic interest to undertake the project at its cost if it has to preserve its preeminence in Nepal.

[E] SRILANKA



- i. Rameshwaram-Dhanushkoti (17km) railway link and Dhanushkoti-Talaimanner ferry service should be revived for faster, easier and convenient communication between India and Sri Lanka.

“INDIA - PAKISTAN RAIL LINKS”



- i. The following links should be revived and rebuilt: Sialkot (Pakistan)-Jammu(India), Dera Baba Nanak (India)- Jassar (Pakistan), Hindumalkote (India)- Mandi Sadiq Ganj Jn.(Pakistan), Fazilka (India)- Mandi Sadiq Ganj Jn. (Pakistan), Hussainiwala (India)-Ganda Singhwala(Pakistan) and Khemkaran(India)- Kasur Tehsil(Pakistan).

Annex 1.9

International Experience in Railway Reforms

	JAPAN NATIONAL RAILWAY	RUSSIAN RAILWAYS	GERMAN RAILWAY REFORM	BRITISH RAILWAY	CHINESE RAILWAYS
Problems of Railway and Aims of Reform	Erosion of market share Heavy debt burden	Rapid fall in traffic Efficiency of the system Inadequate investments	Poor performance Loss of market share High amount of government subsidy/debt EU directive to open up infrastructure	Shrinking market share Poor financial health	Requirements of transport capacity and quality of service Separating state control from economic activities Orienting railway institutions towards transport market
Institutional and Regulatory Framework prior to reform	JNR's management reported to a board of directors. The governor of the board was appointed by the Cabinet and s/he in turn appointed other directors with the approval of the Minister of Transportation. As public corporation JNR was not subject to same civil and commercial laws of private companies. Its employees and officers were public servants, they had right to organise into unions and negotiate labour contracts, but did not have right to strike. It had obligations beyond profit making objective. It also had to operate in low density lines that were not economically viable under the political directions.	Russian federation has a monopoly and carries half of the freight ton as compared to 8 percent in the European union. The road network is comparatively weaker and is not able to provide competition. Under the federal rail transport law, railways were unified under the direct management of Russian federation. The infrastructure and operations were not accounted for separately. There was no open access for other operators either for freight or passenger transport.	The West Germany system was referred as Deutsche Bundesbahn (DB). The Government of Deutsche Bundesbahn was heavily centralised and had several public service obligations. The workforce enjoyed the status of being civil servants. It was speculated that it under reported deficit. The state owned railway carrier of East Germany, i.e. 'Deutsche Reichsbahn' (DR). The infrastructure of DR was in poor state. It was state owned monopolist undertaking and the socialist nature of political system meant that there was no objective of earning profit from the business. In 1975 an attempt to focus on high ridership routes was made, however it was stalled by the federal states, town halls, and unions due to the fear of closing of various routes. The railway had to compete with a well developed road network and a population with high car ownership rate.	British railways was operating as a single integrated entity including track maintenance, train operations, and supporting activities. It functioned under British railways board. Around 1980, ancillary activities (hotels, ferry service, rail vehicle manufacturing business) were sold to private player. The service was organised on business service lines including intercity operations, network south east, regional railways, euro passenger service, train load freight and rail freight distribution.	Chinese railways functions under the ministry of railways and has 14 regional administrations. The government is involved in planning, operation, and regulation of Chinese railways. There are no separate suburban railway operations. New operators do not have access to infrastructure.
Reform	Restructuring of JNR involved the reorganisation and reassignment of core businesses, assets and operations, organisational structure, work force, management, liabilities, and commercial orientation among the successor companies. JNR operation was divided into six separate passenger and a freight companies. The passenger rail companies were organised into three contiguous regions on the main island and one region on each of the three islands of Hokkaido, Shikoku, and Kyushu. The main reason for this division was the fact that 95 percent of all the trips originated and terminated within one of these services territories.	The first stage was corporatisation of Russian Railways Limited (RAO RR) and creation of subdivisions for Freight Infrastructure maintenance and development Locomotive traction Long-distance passenger service 17 regional suburban railways Maintenance of carriage and locomotives Construction Research and development	In 1980, the accounting method of Deutsche Bundesbahn was changed to introduce higher degree of detail, in order to identify the origins of the deficit, particularly in local and regional passenger transport. Three cost centres were identified: Public service obligations, i.e. local and regional passenger transport The remainder of the transport infrastructure as a public obligation However, the accounting did not separate the profits between infrastructure and operation and ended up as becoming a means to justify public subsidy.	The reform process was an extreme case which involved fragmented structure in order to introduce competition. Infrastructure was separated and privatised in 1995. By 2001, it was considered as failed move due to poor maintenance. The renewal contracts were found to be badly designed. It was bought back.	Asset Operation Liability System, which was started in 1999, has made managers of regional railways administrations (RRA) accountable for returns on capital, output, profitability and safety. RRAs are accountable for capital expenditure. Individual managers also receive financial incentives for better performance. It has focused on improving its employ productivity and reducing staff costs. Chinese railway has also done away with below cost provision of passenger services. It has separated non-core activities such as enterprises dealing with construction, manufacture, telecom, design, education and social activities. Many of these enterprises

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	JAPAN NATIONAL RAILWAY	RUSSIAN RAILWAYS	GERMAN RAILWAY REFORM	BRITISH RAILWAY	CHINESE RAILWAYS
Reform	<p>Freight operations were organised into a separate company with a nationwide service territory. This freight operation company had no ownership of tracks but would get the access to the rail network through track usage contract with other newly formed regional rail companies.</p> <p>All non-core assets and liabilities of the former JNR in excess of those assigned to the individual companies were conveyed to a new entity i.e. JNR Settlement Corporation, a government agency. The Settlement Corporation, which held the shares of each of the seven operating companies that emerged from the restructuring, was intended to liquidate the assets it held, including the most important i.e. excess real estate, to pay back as much as possible of its outstanding liabilities with the proceeds of this liquidation.</p> <p>The new regional companies were transformed as joint stock companies, each with its own board of directors and management. The organisational structure was similar in JNR and the regional companies, except that in the regional companies departments related to railway operation were put together within the new Railway Administration unit, so that operation-related decisions can be taken in a more coordinated way. Since the regional departments of regional companies were smaller than that of JNR, meeting local needs was manageable because of smaller size.</p> <p>The Supervisory Committee estimated that JNR had approximately 93,000 excess employees. The restructuring plan made specific provisions for surplus employees:</p> <ol style="list-style-type: none"> 1. A special fund was set up for early voluntary retirement of 20,000 employees 2. Provisions were made to transfer 32,000 employees of the newly formed regional passenger companies to other parts of JNR 3. Remaining 41,000 excess employees were assigned to the Settlement Corporation <p>In spite of these, JNR restructuring faced union oppositions from the employees and were dragged to the court of law. JNR Settlement Tribunal failed to manage the debt was later dissolved. Its assets and liabilities were inherited by Japan National Railways Construction Cooperation, a government entity.</p>	<p>In the second stage, private sector was encouraged to involve into freight traffic movement and maintenance activities. Increasing passenger and suburban operation competition is also on the anvil.</p>	<p>Another round of reform started with merger of DB and DR in January 1994. It also attempted to separate commercial activities from liabilities. DB AG, the commercial division, was formed as a joint stock company under private law. BEV, the public division, administered by the Federal Transport Ministry and the Federal Finance Ministry, was created to take the liabilities. Infrastructure was separated from operations. Subsequently, the rail was also opened up of the rail network for third parties against the payment of track charges. The federal railway agency was founded as a regulatory agency, while the financial and contract responsibilities for regional services were transferred to states.</p> <p>In 1999, five joint stock companies were created:</p> <ul style="list-style-type: none"> DB Reise und Touristik AG (long distance passenger transport); DB Regio AG (local and regional passenger transport); DB Cargo AG (freight transport); DB Netz AG (infrastructure); DB Station and Service AG (passenger stations) <p>DB Reise & Touristik AG and DB Regio AG, the companies responsible for long-distance and regional passenger transport respectively were merged for better control on passenger transport.</p> <p>In December 2007, DB AG reorganised again bringing all passenger services under DB Bahn, freight and logistics services under DB Schenker, Infrastructure and operations under DB Netz. In June 2008, passenger and logistic services were brought under a new company DB ML AG. In 2008, Federal Government and the parliament agreed to the partial privatisation (24.9 percent) of the DB ML AG. IPO of DB Mobility Logistics AG was planned in October 2008 but was deferred due to economic recession in the market.</p>	<p>The passenger operation was split into 25 companies later consolidated into 19. Three passenger rolling stock leasing companies were established for leasing rolling stock and were ultimately sold. Freight operation was sold with open access.</p> <p>Network Rail was named as the infrastructure company. The government sets the expectations for Network Rail and specifies the passenger service requirement. The regulator determines the efficiency targets and decides on the competition issues.</p>	<p>now provide services to China Railways on a competitively tendered basis. In the area of rolling stock, this has resulted in very rapid modernisation of products as a result of several joint ventures with foreign firms that became possible due to separation of production units.</p> <p>Chinese railways also removed a whole layer of management by eliminating the 44 sub-regional administrations.</p> <p>Management was consolidated at the level of the 18 regional administrations and some 60,000 staff positions were removed. All stations and depots now report directly to RRAs and train control centers were also consolidated at RRA level. This was made possible by advances in communication and information technologies. This change brought together management responsibility and accountability at the regional level. It also facilitated and encouraged higher utilisation of locomotives and crews, which had normally been changed at sub-regional boundaries.</p> <p>Recently, in March 2013, China has decided to dissolve the Ministry of Railways (MoR) and separate railway policy and regulation from commercial operations. As a result the functions of railway sector policy and regulation, particularly in respect of safety in construction and operation of railways, were assigned to the Ministry of Transport (MOT).</p> <p>In future, MoT would also establish policy for railways. It would develop a unified policy for all transport modes aiming at modal integration and optimal use of resources.</p> <p>The responsibility for the enterprise (commercial operations of railways) has been assigned to the newly formed China Railway Corporation (CRC) that is manned virtually by all the staff and managers of MOR except a few that will move to MoT.</p>

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	JAPAN NATIONAL RAILWAY	RUSSIAN RAILWAYS	GERMAN RAILWAY REFORM	BRITISH RAILWAY	CHINESE RAILWAYS
Improvement in finances of railways	<p>The market share of railways both in passenger and freight transport increased substantially after the reform process. The financial health of the privatised firms improved.</p> <p>The market share of the high speed railway was as high as 65 percent to 80 percent on various routes.</p>	<p>The performance has improved and better accountability has been achieved.</p>	<p>The reforms were able to arrest decline in modal share. Major traffic growth in overall passenger and freight market was observed. The freight share also increased. The open access operations, primarily run by private sector also grew over the years.</p>	<p>Some aspects of reform have been successful:</p> <ul style="list-style-type: none"> Privatisation of freight operators Privatisation of passenger rolling stock leasing companies <p>After privatisation, both passenger and freight traffic have increased. Along with the traffic, costs have also increased.</p> <p>One aspect of reform which has not been very successful is managing the interface between infrastructure and operations, both for investment decision making and operations</p>	<p>The Chinese railway has performed well with these changes. It adopts a market culture and tries to match its services with customer requirements. It has been able to progress on creating one of the largest networks in a very short span.</p>

International Experience in Setting Track Access Charges

[A] Australia: Interstate Freight

The Australian Rail Track Corporation (ARTC) publishes a list of Reference Tariffs for track access on each of its routes. The Reference Tariffs are based on a fixed component (referred to as a 'flagfall') per train for each route, plus a variable element that depends on the gross tonne-km of the train. The fixed element itself is actually fixed for different routes reflecting the length of route, so is basically distance-related rather than a true 'flagfall'. This distance-based component is affected by the speed of train and whether the train path is peak or off-peak.

The different train types are listed in Table below. The current Reference Tariffs for the different train types on different routes is publicly available and can be reviewed on line. The pricing formula is the same for each route and the tariffs are shown separately by route for convenience of customers.

FLAGFALL	TRAIN TYPE AND DESCRIPTION	TRAINS
Super Premium	Max train speed 130 km/h Max axle-load up to 20 tonnes	XPT (fast passenger train)
Premium	Max train speed 115km Max axle-load up to 20 tonnes	Passenger, Bi-modal
High	Max train speed 110km/h Max axle-load up to 21 tonnes Length up to corridor standard max	Superfreighters
Standard	Max train speed 80km/h Max axle load up to 23T Length up to corridor standard max	Express goods
Low	Off -peak train paths	Metro shunts/work trains

The Reference Tariffs relate to a particular (standard) service performance specification. There can be negotiation with individual customers for specific needs or service characteristics that vary from the reference assumptions; for example, with respect to axle loads, speed, train length, origin and destination, stops and operating timetable. However, ARTC has undertaken to the Australian Competition and Consumer Commission that it will not charge different prices to different clients where the characteristics of the service are alike; and where the applicants are operating within the same end market. ARTC also specifically undertakes not to discriminate pricing on the basis of whether the Train Operating Company is privately owned or owned by a state or federal government. All negotiated tariffs are also published.

The fixed component is paid for the right to reserve a train path and is payable by the customer whether they use the train path or not. The ARTC has also undertaken to the Australian Competition and Consumer Commission to limit the increase in the Reference Tariffs to a rate below the inflation rate, as its own efficiency incentive.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Page 38-39, Paul Amos, July 2011

[B] Canada: Interswitching

Canada has many examples of what are referred to as 'voluntary running rights' which are commercial agreements between two railway companies (usually between Canadian National and Canadian Pacific companies) to allow one to run its trains on the track of the other. There are also some broader access provisions administered by the Canadian Transportation Agency (CTA) which administers interswitching rights (a form of limited-distance track access rights) and sets the access tariffs. CTA can also impose more general running rights, where one railway seeks to operate on the lines of another. Interswitching rights allow freight customers with access to a federal (inter-province) railway (basically Canadian National or

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Canadian Pacific) to have cars transferred (interswitched) onto another federal railway if the point of origin or destination is within 30km of the interchange point. This provision basically avoids the need to transfer wagons from one train to another for short distances at the beginning and/or end of journeys. The tariffs for this form of track access are set by the CTA because it is not convinced that market forces could otherwise protect shippers from the market dominance of one railway service provider. The CTA's Regulations establish four distance zones within the 30-kilometre radius and prescribe rates per car for interswitching traffic to or from each zone. The rates are based on the estimated costs of interswitching traffic borne by the Canadian National Railway Company and the Canadian Pacific Railway Company.

Lower per-car rates are prescribed for the interswitching of blocks of 60 or more cars as a unit. The Canadian Transportation Act requires that the Canadian Transportation Agency examine railway costs in its determination of the rates and stipulates that the resulting rates shall not be less than the average variable cost of moving the traffic. The interswitching rates are also subject to section 112 of the Act, which requires that rates established by the Agency be 'commercially fair and reasonable to all parties'.

As noted, imposed running rights can also be mandated by the CTA on a federal railway, if it decides this in the public interest. In practice, the CTA's power to approve such applications (and so confer wider track access rights) has rarely been used and most examples of running rights in Canada have been by private agreement (voluntary running rights). If the CTA does grant an application for running rights, the two railways have the opportunity to negotiate the tariff for track access. If the negotiations fail, the Agency may determine the financial compensation to be paid.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Page 39-40, Paul Amos, July 2011

[C] United States of America: Track Access Agreements

Privately negotiated track access agreements have a history as long as railways themselves. Early railway companies in most continents were regionally rather than nationally based. In the boundary areas in particular they had a strong incentive to come to agreement to use each other's tracks to reach major business origins and destinations that lay over their own company's boundaries.

Access by private contract is the predominant form in the World's biggest single freight railway market, the USA. In 2010 for example there were over 550 common carrier freight railways operating in the USA. They include seven major (Class 1) railways, 31 regional railways 314 local railways, 204 switching (shunting) and terminal railways, plus 2 Canadian railways operating in the USA. All the Class 1 railways and around 90 percent of the rest are privately-owned. United States Law does not give any legal rights of access of one freight railway company over the tracks of another freight railway company.

However, under US Competition Law, railways have 'common carrier' obligations to freight customers. They must provide to customers routes and tariffs to move traffic from any origin to any destination on the railway network. If it is necessary for more than one railway to participate to complete the traffic movement the railways must interchange the traffic and establish a tariff for the total movement. However, as an alternative to interchanging the traffic, a railway can complete the movement with its own trains by entering into track access agreement with one or more other railway(s). Around 37,000 km of route operated by US railways is on track owned by another railway. That is equivalent to around a quarter of the total route-length of the network.

Agreements that set out the conditions and prices for use of another railway's infrastructure are known generically as 'trackage agreements.' They exist in many different forms. They can include agreements to use specifically defined sections of track, to use terminals, to use shunting yards, or to use 'haulage' (i.e. the locomotives and crews) of another railway entity. The agreements vary but will typically set out the services to be performed and the performance level agreed, (which will generally be an undertaking to provide the same level of service as the host railway provides to its own trains of the same type or volume - i.e. without discrimination). Any additional expenses borne by the host railway such as fueling costs, rolling stock repairs etc. are charged back to the guest train operator at agreed rates.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Page 39-40, Paul Amos, July 2011

Line-of-Business Management Structures

The managements of most major freight railways in the countries reviewed have adopted lines-of-business (LOB) structures. This has been partly to better tailor products and customer care to the target markets, because each market has different customers with different needs. Equally importantly (and like the split of freight and passenger services) it has also been to devolve management of specific segments to line managers, thereby making a complex freight business more manageable. Most freight is consigned by relatively few corporate customers who employ a small number of logistics decision makers. It is both desirable and feasible for LOB managers and marketing staff to get close to these customers, understand their businesses, assess their needs, determine whether railways can meet these needs economically, and try to match product to commodity or customer.

LOB structures are applied in several different forms. LOB structures can be implemented through Product Managers responsible for client relationships for defined markets or products and who 'transact' internally in the railway to plan and monitor delivery of the services sought; with agreed internal 'cost rates' or 'prices' for those services, management accounting systems can also segment financial performance according to LOB and so devolve 'bottom-line' accountability to product managers. LOB for larger traffic segments (say, coal or intermodal business) can be divisions of the company with management responsibility for dedicated rollingstock, terminals and other assets. Ultimately, LOB may be established as separate or subsidiary companies, particularly if services are so specialised that the required market profile and/or skill-set needs to be differentiated from that of the railway itself. Freight railways in the countries reviewed display elements of all these LOB models, sometimes within the same railway. There is no best approach. It all depends what the management thinks will work best in the context of its corporate aims and the nature of markets on offer.

It is not possible to create an effective LOB organisation simply by creating segmented accounting systems or appointing segment marketing managers. Accounting and Marketing structures are tools of LOB, not the other way around. Finance departments need to adapt their accounting procedures to an authentic and agreed LOB structure, otherwise there will be no constituency of support for the accounting structures required and no market for the information they can provide. Similarly, marketing managers can discern client needs but if they have little influence and no control over product design and delivery, the implementation of LOB will probably fail. LOB management must be structured to suit the business and be holistically applied in the sense of linking market need, service response, and accountability for outcome.

Nevertheless, LOB management has led to the transformation of railway freight marketing. Those railways organised by LOB tend to have individual marketing teams specialising in the industry or customer group concerned. When railways still had monopoly power in freight, the main function of the Marketing Department (if there was one) was taking wagon orders, completing waybills and handling complaints; they employed clerical skills appropriate to clerical tasks. Rail freight providers today need marketing groups who can manage client relationships and not just client paperwork.

Source: Freight Railways Governance Organisation and Management: An International Round-up, World Bank, Page 19, Paul Amos, July 2011



2.

ROADS AND ROAD TRANSPORT



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2.

ROADS AND ROAD TRANSPORT

It is a matter of some pride that India boasts of the world's second-largest road network, and the densest amongst countries of similar size. Over the years, both accessibility and mobility have improved through construction of new roads and development of existing roads.

However, as a very broad characterisation, our roads still suffer from a litany of ills. They are capacity constrained, slow, unsafe, environmentally unfriendly, not maintained or non-maintainable, and patchily administered. Meanwhile, efforts to improve the situation are hampered by delayed clearances, multiple overlapping authorities and jurisdictions, frequently changing rules of engagement with the private sector, unyielding land laws, and skill shortages.

Over the next 20 years, India's roads must address these issues to accommodate an economy that will both be substantially larger, and structurally different in economic, social and demographic terms.

ROADS AS PART OF INTEGRATED MULTIMODAL TRANSPORT

Roads should not be looked at in isolation, but as part of an integrated multimodal system of transport (Chapter 4, Volume II). The planning and development of the primary road network must tie up with planning of the railways' dedicated freight corridors and other segments of the rail network, connectivity with ports, airports, special economic zones, logistic hubs, major tourist centres and linkage with neighbouring countries. Similarly, advantages of lower emissions and fuel consumption in movement of bulk cargo through inland water transport and coastal shipping should be fully harnessed to reduce avoidable burden on road and rail. Further, there is need to promote multimodal transport operators who provide seamless movement between the consignor and the consignee and they use each mode depending upon its inherent strength and efficiency.

CAPACITY ENHANCEMENT

Various construction programmes for different classes of roads over the past two decades have yielded a significant expansion in network size. With the notable exception of the National Highways Development Project (NHDP), the major focus of this network expansion has been to improve connectivity rather than to increase network capacity. Under the NHDP, much has been accomplished to build better trunk routes with various phases of the programme aiming for capacity upgradation, and minimum standards for wider and faster roads, though progress has been somewhat slower than anticipated. The bigger hurdles on this front are timeliness in awarding contracts, difficulties in acquiring land, and securing environmental clearances, and the persistent shortages in construction capacity. Increased focus is required in provision of service roads along high capacity corridors to cater for local motorised and non-motorised traffic and social requirements of pedestrian/cattle underpasses. At the other end of the spectrum, rural areas have benefited enormously from the PMGSY which emphasises new connectivity and upgradation of rural roads to meet the growth in traffic demand. In a major shortcoming, however, there is no resolute effort that is dedicated to bringing existing rural roads upto standards of all-weather connectivity.

While National Highway development has been motivated by the necessity of urgently improving trunk capacity, and rural road development by the basic goal of ensuring universal connectivity, there has been no fundamental stimulus for state highways

Existing land laws in India make it difficult and time-consuming to acquire the land required to complete infrastructure projects. The major fault lines lie along issues related to valuation and compensation, acquisition of agricultural, forested, hereditary or tribal lands, and government rights to eminent domain

and district roads. A transport network is only as strong as its weakest links. Consequently, these much neglected roads that connect with newly expanded National Highways create bottlenecks with congestion repercussions across the wider network and pose a deeper problem than is immediately apparent. In similar fashion, inefficient junctions, bridges, and other choke points moderate capacity enhancements from new and improved National Highways.

MAINTENANCE

At all levels, roads are often found in a state of disrepair, with potholes, poor drainage, weak bridges, sub-standard pavement and so on. For all the attention given to new construction and upgradation, much less funding and effort is expended on preserving the existing asset base. Regular preventative maintenance has yet to form an integral element of thinking on road investment. Much maintenance occurs when things fall apart rather than as a preventive measure. Rehabilitation requires far more substantial financial resources than preventive measures do. Importantly, rehabilitation imposes higher indirect and opportunity costs since the citizenry and government are more likely to have to contend with catastrophic failure, or with the decommissioning of important links in the network for long periods.

As compared with construction projects, there are fewer institutional incentives to perform, monitor and enforce maintenance. In the case of PPP projects, construction and maintenance contracts are often awarded to the same agency or private enterprise; but monitoring is less rigorous, and the penalties for missed or poor maintenance are smaller than for delayed or incomplete construction. Maintenance earns less political goodwill than the fanfare associated with the opening of a new road.

HUMAN RESOURCES

As with other sectors, the construction and ongoing maintenance of Indian roads is severely limited by a shortage of skilled professionals. Upon graduation, civil engineers are poached by other disciplines with higher pay scales and better career prospects. At the graduate level, few institutions offer courses or degrees in road network planning, design and construction. Agencies responsible for the roads must consequently make do with a bureaucracy whose

core skills may not run deep enough to contend with the difficult issues posed by modern design practices and construction methods. The paucity of good jobs at these agencies also serves to signal promising engineers away from the road sector. Then, there is huge deficit in availability of skilled construction workers in the road sector. There is hardly any ITI or training centre that imparts training to workers, equipment operators and work supervisors (Chapter 11, Volume II) on Research and Human Resource Development).

SAFETY

Indian roads are grossly unsafe. This statement is made even gloomier as it is closer to being likely conjecture rather than established fact. We simply do not have a good quantitative understanding of the nature and extent of safety-related problems on the roads. Acute under-reporting, poor accident recording, and limitations of the data that are actually collected make it difficult to form an objective view on the severity of the problem. As a qualitative characterisation, consider these everyday observations: over-loaded goods and passenger vehicles, unregistered and uncertified vehicles, unlicensed drivers, and poor compliance and enforcement of road rules. Narrow, poorly maintained roads do not conform to common safety-related design principles such as traffic segregation, divided carriageways, lane markings, and demarcated intersections amongst others. Road design favours motorised vehicles at the expense of vulnerable pedestrians and cyclists. The latter also tend to number amongst the less financially capable, and bear an unequal burden of traffic-related injuries and fatalities. Emergency medical response at accident sites is rarely guaranteed and often delayed, providing the major reason for why disproportionately more injuries on Indian roads end up with fatalities (Chapter 12, Volume II on Safety).

LAND ACQUISITION

Existing land laws in India make it difficult and time-consuming to acquire the land required to complete infrastructure projects. The major fault lines lie along issues related to valuation and compensation, acquisition of agricultural, forested, hereditary and tribal lands, and government rights to eminent domain. The land acquirers' responsibilities with respect to the resettlement and rehabilitation of project affected persons are complex and inconsistent. The new The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act may have clarified some of these issues, but will also make land acquisition more expensive.

With respect to road construction, timely land acquisition is commonly cited as the dominant reason for

delayed project completion. Small changes in alignment can have very large implications for overall project costs, as well as for road safety and the environment. Land acquisition issues are especially pertinent for the several projects seeking to build new roads in tribal lands. Besides providing much-needed connectivity to hitherto neglected populations, these roads are essential for national security and integration. However, acquisition is especially fraught in these areas and must be addressed by sound policy and judicious administration. Road upgrading also suffers from want of land. It is natural for economic enterprise—whether sanctioned or otherwise—to spring up at the edge of existing roadways. This makes it difficult to enforce claims over existing, but unused rights of way or to purchase new land for widening of roads.

INSTITUTIONAL ARRANGEMENTS

Roads perform a large variety of functions from providing both basic and trunk connectivity to serving as the fulcrum in inter-modal exchanges of passengers and freight. With the road network's distributed nature and role, it is not surprising that an exceptionally large number of institutions and agencies are responsible for design, construction, operation and maintenance at all levels of government. The network's extent, complexity and varying characteristics mean that this model of distributed governance is desirable; no single institution should be expected to successfully negotiate the multitude of responsibilities and functions associated with all classes of roads. However, the current institutional arrangements leave much to be desired and need considerable capacity building for implementation of the government mandate. This is all the more critical now that a good deal of network expansion has taken place and we need to consolidate these gains by focusing on achieving higher levels of quality and imbibing international standards and practices.

INTER-AGENCY COORDINATION

Successful distributed governance of the roads requires that its various elements be bound together in a common vision of what India's roads should deliver to its citizens. It further requires that there is clear administrative responsibility for the construction and maintenance of each class of road. Horizontal and vertical inter-agency cooperation is lacking. Roads are not always built in harmony with existing or planned land use, to ensure inter-modal connectivity, and to connect well with other parts of the network to boost overall capacity. It is crucially important that professionals and agencies in charge of developing roads also co-ordinate with other agencies and authorities that are responsible for other transport modes, urban planning, village governance, and so on.

FUNDING

No other piece of transport infrastructure can replace the street outside one's home in its role as the instrument of basic connectivity. Consequently, it is sensible that sources for road funding are principally commitments from gross budgetary outlays, though these may stem from earmarked revenue streams, taxes and cesses, dedicated road funds, or special development programmes such as the PMGSY. The desirability of universal accessibility on developmental and nation-building grounds motivates budgetary funding for roads as a redistributive tool.

However, to a significant degree, the benefits from road use accrue to private agents, be it from the transport of goods to market or the movement of people for work or leisure. As such, after accounting for all positive consumption externalities and correcting for all other market failures, this offers good economic support for more direct financing of road infrastructure from user charges including fuel taxes, vehicle registration fees, tolls, etc.

PRICING

Fuel is subsidised, ostensibly for agricultural relief, but has many unintended beneficiaries. More vehicle-kilometres are driven than would be if fuel were priced at market. Demand has increased significantly for diesel vehicles, with severe environmental implications, given the generally high-sulphur diesel fuel available in India. Further, the method and practice of setting the subsidy is such that required adjustments are delayed until the fiscal implications become untenable, at which point they are made in large jumps causing more pain at the pump as consumers struggle to adjust to hugely increased fuel outlays. Meanwhile, vehicle registration and parking fees and taxes on cars are disconnected from the economic value of the public resources that are used up. The current programme for recalibration of diesel prices to approach consistency with international prices is a welcome move.

Successful distributed governance of roads requires that its various elements be bound together in a common vision of what India's roads should deliver to its citizens

ROADS AND THE ENVIRONMENT

This report echoes the major economic and environmental concerns of the increasing share of road-based transport in the carriage of both passengers and freight. Roads also affect the environment more directly. The new roads that India requires must often be cut through sensitive geographies either in

Independent India inherited about 21,000 km of National Highways. Though expansion was slow over the next 50 years, the period from 1997 has seen more concerted road building than at any other time in India's history

terms of the local terrain that will mandate large-scale destructive re-engineering of the landscape, or in terms of disturbing the habitat of local flora and fauna. Current environmental laws seek to address both of these concerns, but the unwavering stringency of their application leads to delayed execution, costly realignments, and curiosities like trees in the middle of an urban road, an outcome of obvious disadvantage to both tree and commuter. More rational solutions to the competing demands between road construction and the preservation of the natural environment are essential.

India's lax fuel and vehicle efficiency standards present more immediate and substantially more dangerous environmental concerns. These loosely enforced norms already lag those in other parts of the world, contributing in no small measure to some of the most polluted air on the planet, and the consequential health effects. The partial rolling out of new standards in certain cities is unhelpful, and only seeks to undermine the credibility and usefulness of the standard-setting process. India already exports vehicles that conform to more stringent overseas standards, but which cannot be sold domestically on account of the incompatibly poor fuel available (Chapter 7, Volume II on Energy and Environment).

INDIA'S ROAD NETWORK TODAY

"In opening the Indian Road Congress, 15 January 1950, Mr Lal emphasised the urgent need to complete the Nagpur plan. The plan has a target of building or improving 68,000 miles of hard crust roads and 90,000 miles of earth roads. Mr Lal stressed the need for improving the education of road engineers. He gave a detailed account of how technical committees of the IRC established standards, studied economics of highway types, etc. He pleaded for the establishment of a powerful independent Road Board capable of smoothing differences between the Central Government and the provinces."

—from the **UNESCAP Transport Bulletin**, Volume. I, No. 1 September 1950

Eleven days before India declared itself a republic, the Indian Roads Congress – a “semi-official” society of highway engineers and other road-development professionals—met for its 14th annual meeting in Mumbai.¹ The concerns addressed were as familiar

then as now: the urgent need for rapid expansion of the network, dismay at missed deadlines, funding shortfalls, lamentable inter-agency co-operation, capacity limitations, the necessity of building technical expertise and so forth. The major agenda item was discussion on the progress of the Nagpur Plan of 1943, the first attempt at devising a long-term road development plan. The discussions were fruitful enough for the new republic to provide a fillip to the Plan for its remaining 13 years: the originally promised 200,000 km of road network were delivered on schedule by 1963. Recognising the long-lived nature and enormous cost of road networks, the Nagpur Plan was devised to be implemented over a twenty year period, and road transport policies for individual five-year plans have since been hewn from subsequent twenty year plans.

The other enduring outcome of the Nagpur meetings was to lay the genesis for the familiar modern hierarchical division of the road network as determined by certain objective criteria. According to the Nagpur Plan, National Highways would pass through the states, and places having national importance for strategic or administrative purposes. State highways would link state capitals with other large cities in the state, and district roads would take traffic from the main roads into the interior of the district. Road statistics from the Nagpur Plan period aggregate these two types of road into ‘state highways’. Finally, rural roads would connect villages with major roads. Hence, the classification of the road network was largely defined by the settlements that a road linked.

Even as the Nagpur Plan period was nearing completion, it was apparent that the quality of the recently enlarged network left much to be desired. Consequently, in 1961, a new twenty-year plan—the Bombay Plan of 1961-81—for Indian roads was adopted. This plan made rural accessibility its defining objective and sought to construct rural roads on better technical foundations. It also first outlined a case for the construction of access-controlled expressways. Many of the individual initiatives for network expansion were stillborn, though progress was made in widening roads and in tarring previously unsealed roads. It was during this period that the state highway classification was refined, and district roads—both ‘major’ and ‘other’—were identified separately.

The Lucknow Road Congress of 1984, as part of the third twenty-year plan (1981-2001), proposed, for the first time, ‘softer’ considerations such as energy conservation, environmental impact and road safety as integral elements in the design of road policy and infrastructure together with the usual ambitious goals for expanding the network, raising capacity and improving accessibility.

Then the Ministry of Road Transport and Highways formulated Road Development Plan Vision: 2021

¹ 1950 also saw the inception of the Central Road Research Institute, India's nodal road research and development agency.

Table 2.1
India's Road Network Since 1951
 ['000 Km]

ROAD NETWORK	1951	1961	1971	1981	1991	2001	2011
(i) Total Length	400	524	915	1,485	2,327	3,374	4,690
(ii) Of which National Highways	22	24	24	32	34	58	71
(iii) Of which State Highways	-	-	57	94	127	132	164
Surfaced Roads	157	263	398	684	1,113	1,602	2,525

Source: Various issues of Basic Road Statistics of India, Transport Research Wing, Ministry of Road Transport & Highways, Government of India

for roads by entrusting the task to IRC. The major thrust areas covered related to mobility in respect of main roads and accessibility in respect of rural roads to connect all villages in a time-bound manner. Strategies for capacity augmentation and preservation of assets were brought out together with measures to mobilise resources and capacity building in road organisations, consultants and contractors. Soon, thereafter, the Ministry of Rural Development embarked upon a dedicated Rural Road Development Plan: Vision 2025 with the support of IRC. Building up from the current Pradhan Mantri Gram Sadak Yojana (PMGSY: Prime Minister's Rural Roads Plan), it laid a road map for achieving universal connectivity to all habitations above population 100 with all weather rural roads.

Independent India inherited about 21,000 km of National Highways. Fifty years later, India celebrated its golden jubilee with 34,298 km of National Highways, having added just over one per cent to the network for each year of independence. However, early road-building priorities lay in other areas, and, happily, there was substantially more progress in building district and rural roads (Table 2.1). By the standards of the first 50 years, the period from 1997–corresponding directly with the 9th, 10th and 11th Five Year Plans—has seen more concerted road building than at any other time in India's history. This is reflected in the significantly increased investment in roads (Chapter 2, Volume II).

NATIONAL HIGHWAYS

National highways constitute the primary system of road transportation in India, Figure 2.1 gives at a glance the growth of National Highways over the years. These are main highways running through the length and breadth of the country connecting major ports, highways in neighbouring countries, capitals of states and union territories and large industrial and tourist centres, and include roads required for strategic considerations. These highways are under the administrative and financial purview of the Union Government, which exercises

jurisdiction through the Ministry of Road Transport and Highways (MoRTH). The Central Government retains powers to designate any road as a National Highway. The Ministry follows an agency model. There are three agencies for implementation viz. the National Highways Authority of India (NHAI), the Border Roads Organisation (BRO), and the Public Works Departments (PWDs) in the states.

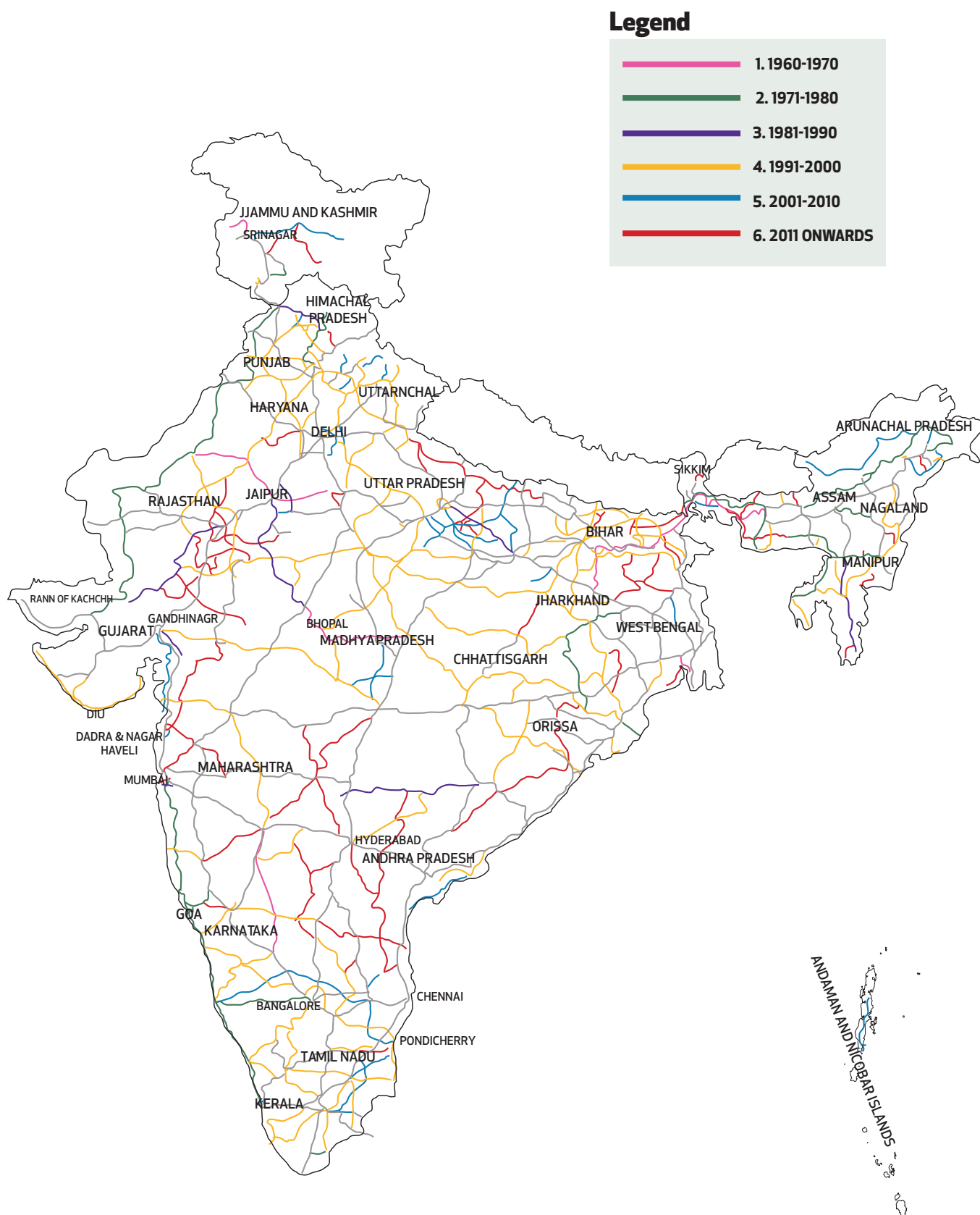
Totalling 76,818 km or 1.9 per cent of the total road network as of March 2012, about 40 per cent of road traffic plies on the National Highways; a figure that is comparable with that of other countries. That the highways constitute a very small share of the overall network is understandable, given the vast rural road network required to connect to India's widely distributed villages and habitations. Better international measures of the adequacy of the size of the network are assessments of the highways relative to land area, population, and GDP. International comparisons must be treated with caution since road statistics are not quality-adjusted: one nation's National Highway may well be another's minor road.

Box 2.1 gives a snapshot of the socio-economic impact of development of National Highways on the rural communities, captured by a seminal work undertaken by the Asian Institute of Transport Development.

The construction, improvement, maintenance and general administration of selected current and planned stretches of the National Highway network are carried out under various phases of the National Highway Development Project (NHDP). The project is executed by the NHAI, an autonomous statutory government agency serviced by MoRTH. Other sections of National Highways are administered directly by MoRTH under various smaller programmes, and are collectively demarcated as NH (Original), or NH (O).

Under the first two phases of the NHDP, four-lane highways have been constructed linking Delhi, Mumbai, Chennai and Kolkata (the Golden Quadrilateral), and spanning the length and breadth of the

Figure 2.1
National Highway Network of India



Source: Ministry of Road Transport and Highways

Box 2.1

Highways of Socio-Economic Change

Contrary to the traditional view that a National Highway mainly facilitates intercity travel and transport of goods, it is also an integral part of the road network serving the rural areas. This is borne out by the fact that almost 50 per cent of the total trips originating from the selected villages involve the use of the National Highway.

Proximity to a highway and its upgrading has significant beneficial influence on major aspects of socio-economic well-being of the rural population. Greater opportunities of employment and earnings in non-farm activities are generated. Access to education and health facilities improves. Household incomes rise and so do asset holdings.

The immediate net benefits of an upgraded highway mostly relate to improvement in access to work and educational opportunities: three-fold increase in the share of income from non-agricultural activities; 85 per cent increase in female labour participation; two-fold increase in per capita trip rate for education; and about 50 per cent increase in school enrolment.

The temporal shifts in the related parameters have brought about a distinct structural shift in the rural economy. A development of considerable importance is the noticeable increase in female participation in the workforce as also the school enrolment of girls. These welcome changes would help in the much-desired empowerment of women.

The benefits of the highway mostly extend up to a distance of 5 km on its either side, which may be treated as the influence zone. This approach distance can be covered in 30 minutes on a cycle and an hour on foot. Beyond this distance, the influence of the highway falls off sharply.

The density of population in the nearby villages is generally higher mainly due to the poor staying closer to the highway because of better non-farm job prospects. They are relatively better off in terms of various indicators of well-being vis-à-vis comparative households living away from the influence zone.

The extensive use of the National Highway by the rural population for their social and work-related trips brings out the need for building service roads along the highway to cater to the slow moving traffic comprising pedestrians, cyclists, bullock carts, etc. Equally important is the safe design of road crossings between highways and village roads.

Among other interventions, large-scale public investments in road infrastructure development can also be an effective and viable policy measure for improvement in the well-being and quality of life of the rural population.

Source: Asian Institute of Transport Development: Study on Socio-economic Impact of National Highway on Rural Population, 2011.

country through the North-South and East-West corridors. Later, NHDP was expanded and it now covers seven phases. Table 2.2 gives a broad break up of various phases together with current status.

Though admirable progress was made in the early years of the NHDP, especially under Phases I and II, there has been recent cause for concern at the slow-down of implementation. There have been hold-ups in commissioning detailed project reports, in the award of contracts, and in the timely completion of construction activity. The problems besetting the NHAI in ensuring timely delivery of completed projects are:

- i **Funding** issues including the adequacy of budgetary supply and commercial borrowing;
- ii **Commercial** issues including shortages of eligible bid concessionaires, restrictive model concession agreements;
- iii **Shortages of skilled staff** in NHAI as well as at concessionaire and construction firms;
- iv **Land acquisition** including issues related to the shifting of existing utilities along the right of way, and resettlement and rehabilitation of affected persons;
- v **Delays in obtaining railway and environmental clearances.**

Figure 2.2



Table 2.2

National Highway Development Project

PHASE	PROJECT DETAILS	LENGTH (KM)	APPROVED	INITIAL SCHEDULED COMPLETION	CURRENT SCHEDULED COMPLETION	APPROVED COST (RS BILLION)	EXPENDITURE (30 TH SEPTEMBER 2013) (RS BILLION)	LENGTH COMPLETED (IN KMS)	LENGTH UNDER IMPLEMENTATION (IN KMS)	NO. OF CONTRACT UNDER IMPLEMENTATION (IN KMS)	TO BE AWARDED (IN KMS)
I	4-laning of Golden Quadrilateral (5846 km), 981km of NS-EW corridors, 356km Port connectivity, 315km other NHs	7,522*	Dec 2000	Dec 2003	Declared complete Jan 2012	303	401	7,514	8	10	-
II	4/6-laning of 6161 km of NS-EW corridors, 486 km other NHs	6,647	DEC 2003	DEC 2007		344	631	5,657	600	52	390
III	4/6-laning of other NHs	12,109	MAR 2005	DEC 2012		806	717	5,692	4,732	89	1,685
IV	2-laning with paved shoulders of selected NHs	20,000	MAR 2005	DEC 2015		278	37	304	4,179	33	10,316
V	6-laning of selected stretches of NHs	6,500	OCT 2006	DEC 2015		412	225	1,634	2,446	28	2,420
VI	Development of expressways	1,000	NOV 2006	DEC 2015	DEC 2015	167	0.2	NIL	NIL	-	1,000
VII	Construction of ring roads, flyovers, bypasses, tunnels, over-bridges	700	DEC 2007	DEC 2014		167	16	21	20	2	659
	Total	54,478				2,476	2,027	20,822	9,539	214	16,470

* Chennai – Ennore port connectivity two projects (24 km) has been re-awarded, these two projects was merged to another projects (6 km) under Phase – I, Total length increased by 24 km.† 14799 km was assigned to NHAI remaining 5201 km with MoRT&H

Table 2.3
Physical Achievements Under Non-NHDP [NH(O)]

CATEGORY	10 TH PLAN (2002-07)	11 TH PLAN (2007-12)
Two Laning	4,177 km	5,161 km
Four Laning	157 km	341 km
Strengthening Weak Pavement	3,510 km	4,625 km
Improvement of Riding Quality	16,250 km	11,831 km
Bypasses	16 Nos.	16 Nos
Bridges	604 Nos.	480 Nos

Source: Report of WG on Roads for the NTDP, May 2012

At present, a few short stretches of National Highways are designated expressways: limited access motorways of four or more lanes with grade-separated interchanges, and restricted to motorised transport. With their purposefully limited accessibility, expressways are often built as greenfield projects that run parallel to existing roads. Phase VI of the project, approved in 2006, provides funds for the completion of 1,000 km of expressways along certain very highly trafficked corridors emanating from the nation's largest cities, such as from Mumbai to Vadodara, and Bangalore to Chennai. This phase is scheduled for completion by the end of 2015. Though seven years have elapsed, a detailed programme of implementation and investment decisions has yet to be finalised.

In recognition of the view that overall network capacity and movement efficiency depend crucially on provision of interchanges and bypasses, Phase VII of the project directs explicit attention to this infrastructure. Progress on this phase needs to be accelerated.

NON-NHDP NATIONAL HIGHWAYS: NH (ORIGINAL)

MoRTH is also responsible for the upgrade and upkeep of several National Highways that are not accounted for by the NHDP. Lumped together under the moniker NH (Original), or NH (O), these NHs are typically lightly trafficked, mostly less than two lanes, and so are lower priorities for capacity-enhancing investment. However, many of these run through economically less developed regions of the country, and assume greater significance. Management of these roads is delegated to state PWDs and the BRO for the most part, and activities include widening, strengthening of pavement, improvement of ride quality, and the construction of bridges and bypasses. Table 2.3 gives a broad picture of physical progress during the 10th and 11th Plan in respect of NH (O) works. Table 2.4 gives a broad break of

expenditure on central sector roads administered by the MoRTH during the 10th and 11th Plans.

STATE HIGHWAYS

State highways (SH), together with Major District Roads (MDR), constitute the secondary system of road transportation in the country, and are administered and financed by state governments. SHs provide links with NHs, district headquarters of states and important towns, tourist centres and minor ports. The total length of SHs at present is about 166,000 km. Their length is about 4 per cent of the total road network and they carry 25 to 30 per cent of the total road traffic. About 60 per cent of these route-kilometres have carriageways of less than the minimum desired two-lane standards. The SH network is compromised by weak and narrow bridges and culverts, at-grade railway crossings, and poor upkeep and maintenance. Several roads have failed to keep up with changing traffic patterns and have become hopelessly ill-equipped to accommodate increasingly large vehicle volumes.

Table 2.5 gives a broad idea of capacity of state highways by the end of 11th Five Year Plan.

An expenditure of Rs 628 billion was incurred on state sector roads during the 10th Plan. This got increased to Rs 1,656 billion during the 11th Plan.

State governments fund state highways and there is a general shortage of available funding for the maintenance and upgrading of these roads. SHs are important roads. However, a slow-burning campaign exists on the part of many state governments to have these roads declared as National Highways instead. In this event, the Central Government assumes financial and administrative responsibility over these roads, while the states benefit from better roads that deliver localised connectivity and accessibility. Some states

Table 2.4
Expenditure on Central Sector Roads (excluding PMGSY) During The 10th and 11th Five Year Plans
 [Rs billion]

PARTICULARS/SCHEME	10 TH PLAN (2002-07)	11 TH PLAN (2007-12)
NHDP (NHAI) (of which Private Sector Investment)	383	1,278 (653)
NH (O) (of which Private Sector Investment)	91	220 (4)
SARDP-NE including Arunachal Pradesh package	6	50
Left Wing Extremism, Tribal Areas, etc.	--	20
Roads of Economic and Interstate Importance (E&I)	4	8
Strategic Roads	2	4
Miscellaneous Including Research, Training, IT, etc.	0.90	0.37
Total	486	1,581

Source: Report of WG on Roads for the NTDP, May 2012

have benefited from the Central Government scheme of providing viability gap funding upto 20 per cent of the project cost for PPP road projects.

MAJOR DISTRICT ROADS

MDRs run within districts connecting areas of production with markets, and rural areas with district headquarters and with SHs and NHs. Serving as links between rural and urban areas, SHs and MDRs contribute significantly to the rural economy and to the country's industrial development by enabling movement of raw materials and products from and to regional India. The development and maintenance of MDRs is the responsibility of state governments. The total length of MDRs is about 266,000 km with more than 90 per cent of the network length not meeting two lane standards.

RURAL ROADS

Rural roads cover Other District Roads and Village Roads and constitute the tertiary road network. They are a key component of rural development since they provide access to economic and social infrastructure and services, thereby generating increased agricultural income and productive employment oppor-

tunity in rural areas. Rural roads are used as an entry point for poverty alleviation. There is growing empirical evidence that links transport investments to the improved well-being of the poor. A study² (Fan, Hazell and Thorat, 1999) carried out by the International Food Policy Research Institute on linkages between government expenditure and poverty in rural India has revealed that an investment of Rs 100 million in roads lifts 16,500 poor persons above the poverty line. A joint study by the Asian Institute of Transport Development (AITD) and UN:ESCAP also confirmed close link between accessibility and incidence of poverty and advocated provision of access as an entitlement (Box 2.2).

The Bombay Plan (1961-81) had laid down that all villages are brought reasonably close to a planned system of all-weather roads so that no village is more than 2.5 km from a road in an agricultural area and 8 km from a road in a non-agricultural area. The Lucknow Plan (1981-2001) had envisaged that all villages with population above 500 be brought within 1.6 km of an all-weather road.

The thrust to the development of rural roads was given at the beginning of the 5th Plan in 1974 when it was made part of the Minimum Needs Programme

2 Study on Linkages between Government Expenditure and Poverty in Rural India by Fan, Hazell and Thorat, International Food Policy Research Institute, 1999.

Table 2.5
Capacity of State Highways
(Km)

LANE WIDTH	AT THE END OF 10 TH PLAN (UPTO YEAR 2007)	AT THE END OF 11 TH PLAN (UPTO YEAR 2011)
Single Lane or Intermediate Lane	111,995	101,049
Two-Lane	36,405	60,811
Four-Lane (or more)	2,313	4,269
Total	150,713	166,129

Table 2.6
Connectivity of Villages with Roads Achieved Upto Year 2000

POPULATION CATEGORY	TOTAL NUMBER OF VILLAGES	NUMBER OF VILLAGES CONNECTED BY 1980	NUMBER OF VILLAGES CONNECTED BY 1990	NUMBER OF VILLAGES CONNECTED BY 2000
1500 & above	71,623	37,950 (53)	59,722 (83)	70,000 (98)
1000-1500	58,229	21,970 (38)	35,362 (61)	50,000 (86)
Less than 1000	459,465	107,324 (23)	166,311 (36)	200,000 (43)
Total	589,317	167,244 (28)	261,395 (44)	320,000 (54)

Note: Figures within brackets give the per centage of villages in each population category to the total number of villages in that category. The basis for population is 1981 census. For balance unconnected habitations not eligible under PMGSY.

Source: Planning Commission and MoRTH Road Development Plan Vision 2021 (published by IRC in 2001).

Box 2.2 **Access as An Entitlement**

A joint study by AITD and UN: ESCAP has brought out that wherever there is better access, there is less poverty. Hence, the ‘public good’ aspect of transport assumes an added significance. Fixed transport infrastructure, such as roads, constitutes such a ‘public good’ and this raises the issue of entitlement. An entitlement is another name for a right. It is necessary that a new perspective on transport – one deriving from the idea of access as an entitlement – is adopted. The study concluded that most of the benefits that flow from rural access projects are likely to be indirect and intangible, generating significant beneficial externalities. Although these benefits pose measurement problems, it is these very benefits which are likely to be of paramount importance in projects like rural roads, irrigation, education, health and housing.

Source: Study on Evaluation of infrastructural interventions for rural poverty alleviation by AITD and UN: ESCAP.

Table 2.7

Physical and Financial Progress PMGSY (as on 31.3.2012)

PARTICULARS	UNIT	TOTAL ELIGIBLE	ACHIEVEMENT DURING 10 TH PLAN	ACHIEVEMENT DURING 11 TH PLAN (2007-12)	ACHIEVEMENT AS ON 31.3.2012
Habitations	Number	178,181*	36,694	47,809	84,503
Length	Km	367,673	86,716	122,130	208,846
(a) New Connectivity	Km	374,844	33,861	107,726	141,587
(b) Upgradation	Km	742,517	120,577	229,856	350,433
(c) Total					
Expenditure Incurred	Rs billion		210	705	915

* There are in all 849,315 habitations in the country. Of these, number of habitations remaining to be connected at the time of PMGSY launch was 346,607. Against this unconnected habitations, eligible habitations under PMGSY are 178,181.

(MNP) along with electricity, health care, primary school and dwelling unit. Funds were provided by the states. However, there were several states that could not achieve the intended targets. Table 2.6 gives the connectivity of villages of various population groups achieved upto the year 2000.

THE PRADHAN MANTRI GRAM SADAK YOJANA (PMGSY)

In order to give a boost to rural connectivity and to promote balanced development of all districts and states, a rural roads programme known as Pradhan Mantri Gram Sadak Yojana (PMGSY) was launched in December, 2000. This programme shifted the focus from the village to the habitation since it was realised that a village may consist of several clusters separated by considerable distance, often mirroring socio-economic stratification. As against 589,000 villages (Table 2.6), there are about 850,000 habitations and the programme envisages connecting all habitations with a population in excess of 500 people in the plains, and 250 people in hill, tribal and desert areas, to the road network. It is a fully funded scheme sponsored by the Central Government to provide all-weather connectivity to previously unconnected rural areas of India. Rural road connectivity is also part of the Central Government scheme known as *Bharat Nirman*. The initial goals under *Bharat Nirman* were slightly more modest in targeting habitations with populations exceeding 1,000 in the plains and 500 in hills, deserts and tribal areas. The actual execution of PMGSY construction is delegated to state governments, but a centrally mandated standards and quality control programme is in place. The PMGSY also provides funds for upgrading rural roads in those districts where all the eligible habitations had been provided with new connectivity. Funds for maintenance are to be provided by the states. The physical and financial progress of PMG-

SY upto the end of the 11th Five Year Plan is given in Table 2.7.

ROAD SECTOR INVESTMENTS IN THE PAST DECADE

The road sector has seen an unprecedented increase in investments during the last one decade (Table 2.8). It would be seen that investments to the tune of Rs 5,600 billion have been made during the period 2002 to 2012. It is essential therefore to consolidate these investments and ensure they provide quality service to the road users.

THE ROAD NETWORK ASSET BASE

It is, of course, extremely difficult to quantify how much a given kilometre of road is worth. Even the broadest estimates, however, may be useful if they also permit quantification of the annual loss in the asset base from want of maintenance and other factors. Amongst the many variables that will influence the replacement value of a kilometre, the more important are: the number of lanes, the difficulty of terrain traversed, the date of construction and quality of material used, the degree of periodic upkeep and current condition of roads and bridges. Of course, the true economic cost will also depend on the availability of transport alternatives, and the time- and rupee-value of transport services executed on the road. Table 2.9 presents a broad ballpark assessment of the current replacement value of the road network for taking a policy view on maintenance. The unit replacement cost assumed here are the average costs for constructing or upgrading the road to a particular capacity under each category of road network. These unit costs are on the lower side than is the current experience.

Table 2.8
Investments (Expenditure) on Roads
 (Rs billion)

PARTICULARS	10 TH FY PLAN (2002-07)			11 TH FY PLAN (2007-12)		
	PUBLIC SECTOR	PRIVATE SECTOR	TOTAL	PUBLIC SECTOR	PRIVATE SECTOR	TOTAL
Central Sector	486	NA	486	924	657	1,581
National Highways	474	NA	474	842	657	1,498
E&I, LWEE, Tribal, etc.	7	NA	7	33	NA	33
SARDP-NE	6	NA	6	50	NA	50
PMGSY	125	-	125	915	NA	915
Sub Total (I)	611	-	611	1,839	657	2,496
State Sector	683	NA	683	1,800	NA	1,800
Sub Total (II)	683	NA	683	1,800	NA	1,800
Total Roads (I+II)	1,294	NA	1,294	3,640	657	4,297
Say	1,300	NA	1,300	3,640	657	4,300

VEHICLE FLEET AND TRAFFIC FLOWS

The number of vehicles per 1,000 people has more than doubled from 53 to 117 between 2001 and 2011, suggesting large increases in ownership penetration, and the rise of multiple-vehicle ownership within households. Meanwhile, relative to the size of the road network, the vehicle fleet has exhibited more moderate increases: in 2001, there were 328 vehicles per 100 km of road; by 2011, this had increased to 388. With a focus on road widening rather than on new construction, it is possible that *aggregate* network congestion has eased, though no certain data on this is available. The caveat to this suggestion is that network congestion is a complex phenomenon, depending on many factors other than the number of vehicles in use.

The number of registered vehicles is not an accurate guide to the number that are actually in-use. Unregistered vehicles ply on the roads, especially in rural areas, and decommissioned vehicles are often not deregistered. Accurate data on the distribution of vehicles by age is not available. Vehicle counts 7-day, 24 hours are available only on National Highways and selected State Highways. These data are important for understanding the overall fuel efficiency and emissions of the vehicle fleet, and for a better picture on traffic flow patterns.

There is a perceptible shift in rural areas from non-motorised rural transport (camel/bullock carts) used in the movement of passenger and agricultural produce to tractor-trailers, improvised vehicles like juggads; and this has implications on energy, environment and safety.

Indeed, in the absence of detailed nationwide traffic and vehicle use surveys, it is extremely difficult to gain a deeper understanding of geographically disaggregated trip length and routes, travel times, origin-destination pairs, congestion, fuel emissions, and vehicle efficiency. These factors are critical to effective long-term network planning by enabling realistic and consistent traffic assessments and preparation of DPRs for new projects.

INSTITUTIONS

A number of organisations are responsible for the administration of the road network at various levels of government. With the exception of PMGSY roads, MoRTH is the overseeing central agency for the nation's road network. National highways and roads constructed under special development programmes for Left-Wing Extremism (LWE) affected states, Jammu and Kashmir, and the North-East are under its direct mandate. The new MoRTH programmes must have the approval of the Cabinet or the Empowered Group of Ministers. Actual execution of MoRTH

Table 2.9

The Replacement Value of India's Road Network; January 2013 Estimates

		KM ('000)	ROUGH REPLACEMENT COSTS (RS MILLION/KM)	ESTIMATED REPLACEMENT VALUE (RS BILLION)
A	National Highways			
	4-Lane or more	19,000	70	1,330
	2-lane	40,000	20	800
	Single-Lane	19,000	8	152
	Total	78,000		2,282
B	State Highways			
	4-Lane or more	4,000	65	260
	2-Lane	61,000	18	1,098
	Single-Lane	101,000	7	707
	Total	166,000		2,065
C	Major District Roads			
	Mostly single lane	266,000	5	1,330
D	Rural Roads			
	PMGSY	400,000	4	1,600
	Non-PMGSY	2,500,000	1.2	3,000
	Total	2,900,000		4,600
	Grand Total			10,277

Note: This excludes urban roads, project roads and other special roads.

Source: NTDP estimates prepared by DP Gupta, former DG (Roads) MoRTH

programme roads is delegated to the NHAI, the BRO or state PWDs. MoRTH is also the central agency for classifying National Highways and defining standards across the entire road network, and for compiling network statistics.

State Highways and Major District Roads are administered by the State Public Works Departments. Projects on these roads are executed by state PWDs.

The Ministry of Rural Development oversees the PMGSY programme through its arm National Rural Roads Development Agency (NRRDA). From the bottom-up, Panchayati Raj and state institutions assist in the formulation of district- and block-level rural roads plan for each district. The district Panchayat is considered the competent authority to prioritise the construction of various roads in the plans. State-level agencies such as the PWDs or Rural Engineering Organisations or Rural Works Departments function as the executing agencies. There may be multiple executing agencies within a state, but execution of the plan for a given district is entrusted to only one agen-

cy at a time. State technical agencies (academic institutions) provide technical support to the executing agencies, scrutinise design plans and cost estimates. State Rural Roads Development Agencies have been gazetted within each state to disburse PMGSY funds to the agencies, and to monitor implementation. The NRRDA provides operational and management support to the programme, including standardisation of design specifications, bidding documents and procurement procedures, quality control during execution and monitoring of progress.

At the state level, the Public Works Departments and the Rural Works Departments are the key institutions for bulk of the road network and their capacity and performance need to be enhanced for efficient delivery of government mandate.

FUNDING

Investment in road infrastructure has a long gestation period, and returns are typically not seen until several years after construction. This, coupled with

Indian road funding agencies cannot access international equity or debt capital markets directly. As no agency has been corporatised or privatised, access to domestic equity funding is also not feasible. The only option that remains is the domestic debt market

the lumpy and large nature of infrastructure investment, and the public goods nature of roads, has meant that the road network was historically funded mostly from government outlay.

Today, the Indian road network is funded through both government and private sources and from multi-lateral agencies. Government sources consist of funding commitments derived from gross budgetary outlays, though these may stem from earmarked revenue streams, taxes and cesses, or from dedicated road funds. Depending on the classification of the road, funding is available from central governments, state governments, or both.

Private funding essentially refers to investments made for building a road asset for which the financial return is the right to levy an agreed toll from the users for an agreed period of time. Ownership of the asset usually returns to the government upon expiry of the contracted period. During this period, the concessionaire is also responsible for maintaining the road to a defined performance standard. Agreements between government and private agencies that determine the precise contours of the latter's funding of road infrastructure come in a very wide variety of flavours. For example, they may or may not include viability gap funding, government revenue or traffic guarantees, and may provide annuities instead of tolling rights and so forth. It is an ongoing challenge to ensure that negotiated agreements are fair to all parties, represent value for money for the government, and do not actually increase the government's risk exposure, and provide for proper allocation of risks between the government and the entrepreneur.

Finally, multi-lateral agencies, foreign governments, and non-governmental organisations provide funding to build roads in order to supplement government funds. Over time, this has become a proportionately less important source. In assessing and contributing to road infrastructure investments, these agencies frequently, though not always, combine economic criteria with other development goals such as poverty alleviation, and access to social infrastructure. The institutional strengthening of road agencies, contractors and consultants are also a part of their financial assistance strategy. The entry of international agencies like the World Bank and the Asian Development Bank did help in enhancing the delivery of road development projects and increased capacity of contractors and consultants.

GOVERNMENT FUNDING

THE CENTRAL ROAD FUND (CRF)

Apart from other budgetary resources, this is the principal mechanism by which roads are funded in India, and is legislated in the Central Road Fund Act of 2000. The Central Government is responsible for the general administration, management and allocation of the fund, and for monitoring the outcomes to which disbursements are applied. The CRF is funded from a two-rupee cess on each litre of high-speed diesel (HSD) and motor spirit (petrol) sold in the country. Table 2.10 gives the allocation of the current CRF accruals. The cess was fixed at this level in March, 2005

The CRF is at present an accounting mechanism, under the Ministry of Finance, without any capacity of its own to negotiate work programmes with road agencies, scrutinise disbursement applications, or commission financial or technical audits of expenditure.³

With the increase in fuel prices in recent years, the proportional share of the cess in the fuel value retailed has decreased. Expenditure on fuel and fuel-derived products such as bitumen can account for up to 30 per cent of the actual construction cost of a highway, excluding pre-construction activity such as land acquisition.

STATE AND OTHER ROAD FUNDS

Some states have also established road funds for state road network development and maintenance. Amongst the states to have already done so are Assam, Kerala, Maharashtra, Rajasthan and Uttar Pradesh, and similar initiatives are under active consideration by Tamil Nadu and Karnataka governments. These state road funds are financed from multiple resources: budgetary support from the Central Government and state government, direct road user charges, additional sales tax on fuel, motor vehicle taxes, fees and tolls, indirect road user charges and taxes. Some states like Haryana, Madhya Pradesh, Punjab levy fee on agriculture products for part deployment in rural roads construction and maintenance. Similar to the CRF, the state road funds are used for both development and maintenance of road network. The UP road fund, however, is dedicated to road maintenance.⁴

PRIVATE FUNDING

INTERNAL AND EXTRA-BUDGETARY RESOURCES

Agencies such as the NHAI and state road development authorities also raise extra-budgetary funds by appropriating surplus toll revenues, and from lines of credit from banks and the LIC. The PMGSY, NHDP, and the various states also receive supplementary funding from multi-lateral agencies such as the World Bank and the Asian Development Bank. These funds are usually supplied on concessional terms including repayment moratoria, long terms that are

3 "Road Fund Knowledge Base", World Bank, 2010, <http://go.worldbank.org/G0UXMX7XD0>

4 Ibid.

Table 2.10
Allocation of Current CRF Accruals
 [Rate of Cess: Rs 2.00 per litre on Diesel and Petrol]

CATEGORY	ALLOCATION	PETROL	DIESEL
National Highways (Administered by MoRTH)	(a) 50 paise per litre on diesel and petrol (b) of the remaining 150 paise per litre, distribution is as under: (i) 57.5 per cent of 150 paise per litre on petrol (ii) 57.5 per cent of 75 paise per litre on diesel	136.25 paise per litre	93.125 paise per litre
State Highways and Major District Roads (Administered by MORTH)	(i) 30.0 per cent of 150 paise per litre on petrol (ii) 30.0 per cent of 75 paise per litre on diesel	45.00 paise per litre	22.50 paise per litre
Rural Roads (PMGSY) (Administered by MORD)	50.0 per cent of 150 paise per litre on diesel	Nil	75.00 paise per litre
Railway over/under bridges and manning of unmanned railway crossings (Administered by Ministry of Railways)	(i) 12.5 per cent of 150 paise per litre on petrol (ii) 12.5 per cent of 75 paise per litre on diesel	18.75 paise per litre	9.375 paise per litre

commensurate with the life of the asset created, and below-market interest rates. Separately, multi-lateral agencies have also assisted with implementing new PPP funding mechanisms by providing technical assistance on an appropriate enabling environment that is transparent, competitive, and has clear guidelines for dispute resolution.

CAPITAL MARKET FUNDING

In line with usual restrictions on Indian corporate entities, road-funding agencies cannot access international equity or debt capital markets directly. As no road funding agency has been corporatized or privatised, access to domestic equity funding is also not feasible. Consequently, the only option that remains is the domestic debt markets. The NHAI has successfully issued bonds that are deductible on capital gains for many years. More recently, new 10- and 15-year bonds that are fully deductible on interest income and capital gains have proved to be overwhelmingly popular. Long-term infrastructure bonds issued by other entities such as IDFC and IIFCL are also directed towards PPP investment.

Commercial borrowing plays a large, but perhaps sub-optimal, role in the debt component of PPP finance given maturity mismatches. Bank funding is typically available only for shorter maturities. Given the long construction and payback periods of infrastructure assets, the maturity mismatch results in increase of the interest rate at which bank funding for infrastructure can be raised.

PPP AGREEMENTS

Together with the revamped CRF, the major innovation in the capacity augmentation of main roads over the previous two decades has been the use of

private enterprise to design, build finance and operate road projects See Box 2.3 for PPP policy arrangements for roads in India.

These PPP arrangements are partnerships in the sense that risk is shared between government and private enterprise, and that both must execute certain tasks for project delivery. The government completes pre-construction activity such as the acquisition of land, conducts feasibility studies, tenders contracts, and supplies any necessary funding for a project to become viable. Private enterprise must supply the bulk of the funding and execute the project for which it is compensated by revenues from the resulting infrastructure.

THE BOT-TOLL MODEL

Two versions of the PPP model are commonly employed in India. Under the Build-Operate-Transfer (BOT) toll agreements, the concessionaire is responsible for designing, building, operating and financing the infrastructure to be developed, though the government can supply up to 40 per cent of the project's cost as viability gap funding. The concessionaire is permitted to collect and retain an agreed toll. All risks, including construction, finance, operational, maintenance and commercial risks, are borne by the concessionaire. The concessionaire must deliver the project to an assured quality, including on-time construction. BOT toll agreements are generally better suited to highly trafficked routes in soundly administered jurisdictions where there is little scope for revenue seepage to alternative roads.

This provides a cap on the commercial risk that is borne by the private enterprise. In some instances, the government can choose to provide non-VGF

Box 2.3

PPP policy arrangements for roads in India

Incentives

Over the past twenty years, several new policy initiatives have assisted in making PPP a viable funding mechanism for India's highways. These policy incentives include:

1. Grants and viability gap funding of up to 40 per cent of project cost for marginal projects
2. 100 per cent automatic FDI for all road development projects
3. A 100 per cent income tax exemption for a period of ten consecutive years within a period of twenty years following the completion of a project
4. Agreements to avoid double taxation
5. Provision of encumbrance-free land for road construction
6. Traffic guarantees in some instances
7. Protection for private investors against force majeure type situations including political, non-political and legislative changes
8. Equity participation of up to 30 per cent by the NHAI in a special purpose vehicle (SPV) set up for road development

Model concession agreements

In order to specify the policy and regulatory framework on a fair and transparent basis, a Model Concession Agreement (MCA) for PPPs in National Highways has been introduced. The government also approved a new Model Concession Agreement (MCA), which is considered by some "a very attractive document as far as lenders are concerned", as it allows for grant funding and government guarantees, is high on transparency, and addresses principal concerns of lenders, such as land acquisition and protection in the event of default.

Source: <http://morth.nic.in/index2.asp?slid=17&sublinkid=9&lang=1>

grants, traffic guarantees to limit the commercial risk of the project, and to also prescribe revenue sharing agreements to participate in any revenue earnings upside. To maximise return on equity, the private concessionaire for BOT contracts will typically aim to contribute about 30 per cent equity to their share of project funding. With the complex nature of risks borne by the developer, and the absence of any feasibility of a lien on the underlying asset, the debt component is typically raised with recourse that is limited to the equity contribution of the developer.

THE BOT-ANNUITY MODEL

For several projects, especially in roads that are relatively lightly trafficked, viability gap funding at 40 per cent is not enough at which the project becomes feasible. In this situation, the government may choose to supply either a lump-sum payment, or more commonly an annuity in exchange for the private financing of construction and operation of a project. The toll collected accrues to the government, and the private operator is remunerated via a fixed, periodical payment from the government. Under these contracts, the private operator is responsible both for constructing the road, as well as for operating and maintaining it for a fixed period of time (typically 15 years). Because the break-even point for the private operator does not occur until

late in the contract, this form of PPP transfers both responsibilities for bridge financing and performance risks to the private sector. In addition, because the annuity payment is not indexed, the private sector retains any risk associated with higher than anticipated operations and maintenance costs. Annuity concessions are only paid once the road is constructed to agreed quality standards, thereby rewarding early completion and incentives for quality construction that requires less by way of maintenance. However, the Annuity Model is not a sustainable model for development of road infrastructure due to its heavy burden of contingent liability on the government.

PPP FUNDING IN THE 10TH AND 11TH PLANS

During the 11th Five-Year Plan, about 50 per cent of the 10,600 km of National Highways completed under the NHDP were funded through the BOT-Toll model. Around 10 per cent of completed length was paid for through a system of annuities to the concessionaire, with the balance largely in the form of traditional EPC contracts. This is in marked contrast with the 10th plan wherein the corresponding figures for 5,445 km built under the BOT toll, annuity, and EPC models were around 10, 10 and 80 per cent respectively. This illustrates the huge impact that toll-based private contracts have had on accelerating capacity augmentation of National Highways.

SAFETY

According to official statistics, 138,258 people were killed in road traffic crashes in India in 2012 (NCRB, 2013). The situation in India has worsened in recent years. Traffic fatalities increased by about 5 per cent per year from 1980 to 2000, and since then have increased by about 6-8 per cent per year for the years for which statistics are available. This is attributable partly to an increase in the number of vehicles on the road, and partly to the absence of a coordinated official policy to control the problem. The fatality rate has increased from 36 fatalities per million persons in 1980 to 115 fatalities per million persons in 2012. There is vast under-reporting of road accidents and resultant minor injuries. Given this under-reporting, fatalities which are much more widely reported—may prove to be a better indicator of road safety. Despite the flaws in the data, there is no denying that road traffic injuries are one of the leading causes of deaths, disabilities, and hospitalisations, with severe socio-economic consequences.⁵

2.122 It is possible that about three times that number (~400,000) were permanently disabled and 20 times that number (~2.5 million) hospitalised. With vehicle numbers, network size, and accessibility to motorised transport, it can be difficult to uncover the true nature of the severity of the safety problem. From the admittedly patchy data, the following facts hold. First, the absolute number of accidents has increased with time. Safety improvements in cars like seat belt, air bags may have been responsible for making car passenger safer. However, these may not have improved safety for other users. Meanwhile, the roads themselves continue to do users few favours, killing and injuring (on a per kilometer basis) with nearly unchanged intensity over the past twenty years. Finally, the effects of increased motorisation are most apparent when we consider per-capita incident rates which have continued to increase over the years.

Roads in India are being designed primarily for motor vehicles exposing vulnerable road users to greater accident risks. The absence or paucity of foot-paths, cycle tracks, and traffic calming measures to reduce speed where non-motorised modes of transport blend with motorised traffic, increases the risk of accidents and their severity.

Of the total road network, national and state highways accounted for 55 per cent of road accidents and 65 per cent of fatalities in 2011, reflecting the larger, faster, traffic flows on these networks. 'Driver error', principally in the form of excessive speed, is alleged to be one of the single most important factors in road accidents, injuries and fatalities. A more modern view is that road design should correct driver behaviour towards safer alternatives; that is, by default,

badly designed roads should be held responsible for accidents rather than bad drivers. Beyond this, however, the absence of reliable data and analysis restricts our ability to identify the causes and factors that characterize road accidents.

If the current safety paradigm persists unchanged, road fatalities and injuries are projected to increase inexorably. By 2030, road crash deaths and injuries in low and middle-income countries are projected to be the 4th largest cause of healthy life years lost for the total population compared with malaria (15th) and tuberculosis (26th), and the leading cause of health losses for children (aged 5 – 14) and the 2nd largest cause for men. Low and middle-income countries already bear around 90 percent of this burden, especially among their vulnerable road users. Unless scaled-up and sustained safety measures are undertaken, escalating health and associated economic losses from road crashes are very likely. Over the next 20 years, India must meet the challenge of bringing its road trauma sustainably under control, if it is to avoid the fatalistic pathway taken by high-income countries during the 20th century, where, for far too long, road deaths and injuries were accepted as an inevitable price of economic growth and traded off for mobility gains⁶.

INTERNATIONAL EXPERIENCES AND LESSONS THEREFROM

CONTEXT

India's road network compares favourably internationally (see Tables 2.11 and 2.12) in terms of the overall route length and density relative both to population and to land area. However, there remains much to be accomplished on several other fronts such as the design standards, quality of the road network, safety, operation and management, inter-state movement, energy efficiency, control on overloading, capacity and performance of road agencies in efficient delivery of road programmes.

Road traffic injuries are one of the leading causes of death and disability in India, with severe socio-economic consequences

CHINA

China has seen one of the fastest growths in road construction recently, driven by the National Trunk Highway System (NTHS) designed to connect all major cities and provincial capitals with population greater than 500,000 through the construction of 12 major highways. This has now been expanded by the 7-9-18 Highway Network which is intended to link all cities with population above 200,000 to those connected by the NTHS.

5 Bliss and Breen (2011), Improving Road Safety Performance: Lessons from International Experience. World Bank Resource Paper, prepared for the NTDP. NTDP Research
6 Bliss and Breen (2011), Improving Road Safety Performance: Lessons from International Experience. World Bank Resource Paper, prepared for the NTDP. NTDP Research

Table 2.11
International Comparison–Road Network 2004-09

COUNTRY	EXPRESS-WAYS	HIGHWAYS	SECONDARY ROADS	OTHERS	TOTAL ROADS
Argentina					231,374
Brazil	0	93,071	276,776	1,382,021	1,751,868
China	65,055	59,462	300,686	3,435,620	3,860,823
India		66,754	1,017,763	3,025,275	4,109,592
Mexico	7,056	40,509	78,267	240,975	366,807
Pakistan					258,350
Russia					982,000
South Africa	239	2,887	60,027	300,978	364,131
Thailand	450	51,405	44,000	84,198	180,053
Turkey	2,036	31,271	30,948	298,405	362,660
France	11,240	9,020	381,000	550,000	951,260
Germany	12,813	39,887	178,269	413,000	643,969
Japan	7,642	54,790	129,377	1,016,058	1,207,867
New Zealand	183	10,909	83,209		94,301
Spain	13,014	12,832	140,165	501,053	667,064
UK	3,674	49,032	122,543	244,416	419,665
USA	75,643	19,857	1,930,104	4,520,235	6,545,839

Source: International Road Federation, World Road Statistics, 2011
Expressways are access controlled primary roads, highways and primary roads with partial or no control of access.

MALAYSIA

The Malaysia Highway Authority was established in 1980 to facilitate the construction of a toll expressway from north to south of the peninsular link to all main towns. Most highways are tolled. As part of an overall master economic development plan called Vision 2020, the government plans to widen the implementation of the Private Finance Initiative (PFI) based projects during the Plan period to increase opportunities for the private sector (Box 2.4).

For the National Highway Development Project (NHDP) of India, the World Bank has studied the impact of the multi-laning of the Golden Quadrilat-

eral on the performance of organised manufacturing. Box 2.5 provides a summary of the impact.

Main lessons emerging from this are:

- i Each country would have its own planning and policy strategy for development of the road network. NHDP in India has given a good boost to the economy. This project should continue. Similar projects should be undertaken for state highways as well.
- ii Due to land acquisition constraints, green-field development is considered advantageous both in terms of speed and least social problems. This strategy would need to be pursued for the India's expressway network

Table 2.12
International Comparison–Road Network Ratios

	TOTAL		
COUNTRY	KM/100,000 POPULATION	KM/1000KM ² LAND AREA	KM/USD 1BN GDP
Argentina	573	84	627
Brazil	899	207	839
China	288	403	651
India	336	1,382	2,379
Mexico	323	188	354
Pakistan	149	335	1,461
Russia	693	60	663
South Africa	728	300	1000
Thailand	260	352	565
Turkey	498	471	494
France	1466	1,485	371
Germany	787	1,847	196
Japan	948	3314	221
New Zealand	2,159	359	744
Spain	1,448	1,337	474
UK	674	1,734	185
USA	2,116	714	449

Source: International Road Federation, World Road Statistics, 2011

development.

- iii Delegation of powers to field level functionaries helps avoid delays in project implementation. Simultaneously, they need to be made responsible and accountable for their performance.

DESIGN AND OPERATIONAL STANDARDS

DESIGN TRAFFIC VOLUME AND LEVEL OF SERVICE

A road is designed to cater to the traffic expected on it. Average daily traffic projected to some future design year, typically 15 to 20 years into the future, is an important criterion for determining the number of lanes and even characteristics of a highway. At

the planning stage of a proposed highway, the design traffic volume is determined. If this volume exceeds a certain threshold, then the highway is designed for the functional class consistent with that level. The thresholds for China, South Africa and New Zealand are given in Table 2.13. In some cases, there is an overlap between traffic volume threshold ranges for two functional classes. Other factors besides traffic volume are then considered, such as economic development, and environmental, social and political considerations.

Level of service, LOS, is another factor that influences the decision as to when an arterial road should be expanded or upgraded. Traffic volumes associat-

Box 2.4

Summarising Road-Building Programmes in China and Malaysia

Planning	Develop a good effective master plan for an integrated highway network and link it through regular economic plans	Develop a good, integrated master highway plan
Policy	Implement policies to facilitate desired plan outcomes	Implement policies to facilitate desired plan outcomes
Planning Accountability	Plan formulated mainly by provincial governments; they are responsible for administering construction and loan repayments	Plan developed and projects managed by federal highway authority
Land Acquisition	Greenfield development considered fastest and most productive due to lack of interference from existing networks	Greenfield development considered most advantageous with least social problems
Highway Industry Capacity	International contracts bring advanced technology and better management methods; supply chain improved through institutional reform and privatisation	Early network expansion relied on international contractors for expertise and to build domestic capacity; large projects divided into smaller chunks to allow competition from domestic firms
Regulation and Legislation	Aim to develop regulations and legislation that supports the overall policy	Separate government department to devise and administer regulations; highway authority solely manages the program
Trade Associations	Support the growth of trade associations; ensure open dialogue with government; promote self-regulation; establish a single apex organisation as 'voice of industry'	Maintain the view that trade associations help build much needed capacity
BOT	The privatisation experiment has been unhappy; government aiming to buy back concessionaires to reduce tolls	Extensive use of PPP; some criticism on speed of transfer to privatised arrangements; dissatisfaction with level and extent of tolling
Alternative Contract Arrangements	Preferring to experiment with pure private funding rather than BOT	Preferring to experiment with pure private funding rather than BOT
Operation and Maintenance Contracts	Used for about 40 per cent of toll expressways	
Building National asset base	Considered vital to complete projects with minimal delay; site staff has decision-making authority	Project level staff to make on-site decisions to avoid delay in project addition to asset base
Dispute Resolution	Typically, there are no disputes.	A new adjudication act is under consideration

Source: NTDP Secretariat and papers received from the World Bank on Cost Effective Standards for Roads and Traffic Based Benchmarks for Widening of Highways versus Construction of Expressways.

Box 2.5

Impact of Golden Quadrilateral NHDP for Location and Performance of Manufacturing Sector

The Golden Quadrilateral National Highway project sought to improve the connection of four major cities: Delhi, Mumbai, Chennai and Kolkata. It comprises 5846 km connecting several industrial, agricultural and cultural centres of India. The study on the impact of the GQ highway upgrades on the performance of the organised manufacturing revealed that the GQ upgrades have increased new entry the most in high- and medium-density districts that lie 0-10 km from the GQ network. For instance, moderate-density districts, like Surat in Gujarat or Srikakulam in Andhra Pradesh, that lie on the GQ highway registered more than 100 per cent increase in new output and new establishment counts after GQ upgrades. On the other hand, the GQ upgrades are not linked to heightened entry or performance in low-density areas. One interpretation of these results is that the improved connectivity enables manufacturing establishments to efficiently locate in intermediate cities, but that localization economies prevalent for the sector continue to preclude entry in low-density places.

The project improved the connectivity and market accessibility of districts lying close to the highway compared to those more removed. Non-nodal districts located within 0-10 km from the GQ network experienced substantial increases in entry levels and higher productivity. These patterns are absent in districts 10-50 km away. The data suggest that there might have even been declines in entry rates in districts farther away. Dynamic specifications and comparisons to the NS-EW highway system mostly confirm these conclusions, with the most substantial caveat being that the productivity gains may be upwardly biased by a pre-period dip. The GQ upgrades also appear to have facilitated a more natural sorting* of industries that are land and building intensive from the nodal districts into the periphery locations; the upgrades also appear to be encouraging decentralization by making intermediate cities more attractive for manufacturing entrants.

Source: Highway to Success in India: The impact of the Golden Quadrilateral Project for the location and performance of Manufacturing by Ejaz Ghani et al. January 2013, World Bank Policy Research Working Paper 6320.

ed with expected levels of service can be considered to assess implicit benchmark volumes. The level of service reflects the operating conditions of the road in terms of traffic performance measures related to speed and travel time, freedom to manoeuvre, traffic interruptions, and comfort and convenience (TRB, 2000). In the United States, as well as in a number of other countries, there are six levels of service from LOS A (least congested) to LOS F (most congested) as shown in Table 2.14.

Table 2.15 shows the maximum density, volume-capacity (v/c) ratio and service flow rates for various LOS for multi-lane highways in the United States. It is seen that for each level of service, there is a maximum acceptable traffic flow for that level of service.

Typically, there is a specified design LOS for each class of highway at the planning stage. The design LOS is the minimum LOS that the highway should provide before it reaches its design year. It also indicates that when the actual LOS of a highway is worse than its design LOS, the highway should be widened or upgraded so it provides the design LOS. For arterials in rural level area, the design LOS is B, which means that if the free-flow speed of an arterial in rural level area is 50 mi/h, the

maximum accepted traffic volume is 900 pcu/lane/hr. LOS performance is based largely on hourly performance.

Tables 2.16 and 2.17 present operational service levels for Freeways in China and in the United States.

For the same level of service, freeways in China and the United States are allowed to have more congestion (expressed as a higher vehicle-to-capacity ratio) than other highways. For example, for intermediate service levels of 2 and 3 for Chinese freeways, the vehicle-to-capacity ratios are 0.74 and 0.88. However, for Chinese Class I Highways, the corresponding values of vehicle-to-capacity ratios are 0.65 and 0.80.

The hourly lane capacities (corresponding to LOS E) for the United States is 2250-2400 passenger cars. The corresponding figure for Chinese freeways is 2000-2200 passenger cars. For the U.S. Multilane Highways and Chinese Class I Highways, the hourly lane capacities are 1900-2200 and 1600-2000 respectively. United Kingdom Motorways (Freeways) have a range of hourly lane capacities (1800-2000) similar to that of Chinese Class I Highways. However, Single Carriageway (undivided highways) have lower hourly lane capacities.

Table 2.13
Traffic Thresholds

		THRESHOLD TRAFFIC VOLUME (ADT)		
ROAD CLASS	CARRIAGEWAY WIDTH	CHINA	SOUTH AFRICA	NEW ZEALAND
Freeway	4-lane	25,000-55,000	15,000	>8,000
	6-lane	45,000-80,000		
	8-lane	60,000-100,000		
Class I	4-lane	15,000-30,000	8,000-10,000	<12,000
	6-lane	25,000-55,000		
Class II	2-lane	5,000-15,000		
Class III	2-lane	2,000-6,000		

Source: World Bank Paper for NTDP on Cost Effective Standards for Different Types of Roads by Kumares C. Sinha et al, USA (June, 2011)

Table 2.14
Highway Levels of Service in United States (AASHTO, 2004)

LEVEL OF SERVICE	GENERAL OPERATING CONDITIONS
A	Free flow
B	Reasonably free flow
C	Stable flow
D	Approaching unstable flow
E	Unstable flow
F	Forced or breakdown flow

Table 2.15

Capacity and Operational Service Levels for Multi-lane Highways in the United States (AASHTO, 2004)

FREE-FLOW SPEED	CRITERIA	LEVEL OF SERVICE				
		A	B	C	D	E
	Maximum Density (pc/mi/ln)	11	18	26	35	40
50 mi/h	Average Speed (mi/h)	50	50	50	48.9	47.5
	Maximum v/c	0.28	0.45	0.65	0.86	1.00
	Maximum Service Flow Rate (pc/h/ln)	550	900	1,300	1,710	2,000
45 mi/h	Average Speed (mi/h)	45	45	45	44.4	42.2
	Maximum v/c	0.26	0.43	0.62	0.82	1.00
	Maximum Service Flow rate (pc/h/ln)	490	810	1,170	1,550	1,900

Note: pc/h/ln means passenger car per hour per lane, pcmi/ln means passenger car per mile per lane

Source: World Bank Paper for NTDP on Traffic-Based Benchmarks for Widening of National Highways Versus Construction of Expressways, by Kumares C. Sinha et al. (July, 2011)

Table 2.16

Capacity and Operational Service Levels for Freeways in China

DESIGN SPEED	CRITERIA	LEVEL OF SERVICE				
		1	2	3	4	4
	Density (passenger cars/km/lane)	<7	<18	<25	<45	>45
Design Speed = 120 km/hr	Speed (km/hr)	>109	>90	>78	>48	<48
	Volume/ Capacity Ratio	0.34	0.74	0.88	1.00	>1.00
	Maximum Service for Transportation Volume (passenger cars/hr/lane)	750	1,600	1,950	<2,200	0-2,200
Design Speed = 100 km/hr	Speed (km/hr)	>92	>97	>71	>47	<47
	Volume/ Capacity Ratio	0.31	0.67	0.86	1.00	>1.00
	Maximum Service for Transportation Volume (passenger cars/hr/lane)	650	1,400	1,800	<2,100	0-2,100
Design Speed = 80 km/hr	Speed (km/hr)	>74	>66	>60	>45	<45
	Volume/Capacity Ratio	0.25	0.60	0.75	1.00	>1.00
	Maximum Service for Transportation Volume (passenger cars/hr/lane)	500	1,200	1500	<2,000	0-2,000

Source: Ministry of Construction, China 2004

Table 2.17
Capacity and Operational Service Levels for Freeways in The United States

CRITERIA	LEVEL OF SERVICE				
	A	B	C	D	E
Maximum Density (passenger car/km/lane)	7	11	16	22	28
Free Flow Speed = 120 km/hr					
Minimum Speed (km/hr)	120	120	114.6	99.6	85.7
Maximum Volume/Capacity Ratio	0.35	0.55	0.77	0.92	1.00
Maximum Service Flow Rate (passenger car/hr/lane)	840	1,320	1,840	2,200	2,400
Free Flow Speed= 110 km/hr					
Minimum Speed (km/hr)	110	110	108.5	97.2	83.9
Maximum Volume/Capacity Ratio	0.33	0.51	0.74	0.91	1.00
Maximum service flow rate (passenger car/hr/lane)	770	1,210	1,740	2,135	2,350
Free Flow Speed= 100 km/hr					
Minimum Speed (km/hr)	100	100	100	93.8	82.1
Maximum volume/capacity ratio	0.30	0.48	0.70	0.90	1.00
Maximum Service Flow Rate (passenger car/hr/lane)	700	1,100	1,600	2,065	2,300
Free flow Speed = 90 km/hr					
Minimum Speed (km/hr)	90	90	90	89.1	80.4
Maximum Volume/Capacity Ratio	0.28	0.44	0.64	0.87	1.00
Maximum Service Flow Rate (passenger car/hr/lane)	630	990	1,440	1,955	2,250

Source: World Bank Paper for NTDP on Cost Effective Standards for Different Types of Roads by Kumares C. Sinha et al, USA (June, 2011)

CONCEPT OF 2+1 ROAD SECTIONS

Several European countries have published standards on the design of 2+1 roads. A 2+1 road consists of two lanes dedicated to travel in opposite directions and a lane in the middle with alternating travel directions for the purpose of passing or turning. These roads involve either the new construction or the conversion of a two-lane facility (single lane in each direction) to three lane facility to defer expansion to a four-lane facility. Table 18 shows the longitudinal and transverse design standards implemented by Germany, Sweden, Ireland, Finland and South Korea.

The stated values for length of the passing section provide motorists a more generous opportunity for overtaking than passing sections available for US two-lane highways (Lee et al., 2010; FHWA, 2005).

Such an opportunity causes drivers to execute the passing manoeuvre with a more relaxed approach and consequently reduces crash frequency.

Main lessons emerging from these standards are:

- i The above capacity standards may not apply in India since there is a considerable mix of motorised and non-motorised traffic on roads in India both in urban areas and on inter-city highways. There is urgent need for development of a Highway Capacity Manual specific to India. It is understood that some research work has started in this direction by the Central Road Research Institute. This needs to be expedited and overseen by the Ministry of Road Transport and Highways.
- ii The capacity standards specified by the IRC

Table 2.18
Design Standards for 2+1 Road Sections in Selected Countries (Lee et al., 2010)

	SWEDEN	GERMANY	FINLAND	IRELAND	SOUTH KOREA
Diverging Area Length: Lnc (m)	100	30	50	50	90
Junction Length: Lc (m)	300	180	500	300	280
Length Of Passing Section: Lp (km)	1.00 to 1.25	1.00 to 1.40	1.50	1.00 to 2.00	1.00 to 1.50
Total Length: L (km)	1.40 to 1.65	1.21 to 1.61	2.05	1.35 to 2.35	1.37 to 1.87
Lane Width (m)					
First Traveled Lane	3.75	3.50-4.25	3.75	3.50	
Second Traveled Lane	3.25	3.25-3.50	3.50	3.50	
Passing/Turning Lane	3.25	3.25	3.25	3.50	
Shoulder Width (m)	1.00	0.25	1.25	0.50-1.00	

Source: World Bank Paper for NTDP on Cost Effective Standards for Different Types of Roads by Kumares C. Sinha et al., USA (June, 2011)

need immediate review particularly in respect of multilane highways. From Tables 2.15 to 2.17, it is observed that there is no perceptible decrease in operating speed under LOS C compared to that under LOS B and yet 40 per cent more traffic can be carried. The current Indian practice of designing roads for LOS B could be reviewed if studies in India show similar results. Adopting LOS C for design will imply more intensive use of the highway and it will also enable postponement of avoidable investment in capacity augmentation without any significant decrease in operational speeds.

- iii The 2+1 road section should not be considered at the current stage of road development in India until we have experimented with such designs and evolved specifications suitable for Indian traffic conditions on intercity roads.

ROAD ASSETS: PRESERVATION AND MANAGEMENT

In the 1980s, the growing perception of widespread failures in road maintenance led to a series of World Bank studies and these studies culminated in the publication in 1988 of Road Deterioration in Developing Countries (RDDC). The report asserted that sound road asset development and maintenance required that:

- A coalition of private and public stakeholders asserts 'ownership' of the road asset development functions.
- Road user costs and life-cycle analysis of road agency costs are both taken into account in

public policy decisions concerning road development and management.

- Owners of the road network set up adequate funding mechanisms to sustain maintenance and capital renewal.
- Road maintenance and renewal works are carried out by bodies separate from the public road planning and administration bodies, contracted out in competitively tendered contracts.
- The more broadly engaged owners of the road network establish strong accountability and incentives aligned with the public interest among road administration, funding sources, planners, executing agencies and contractors. Quantitative performance measures are set and monitored regularly to support accountability.

Table 2.19 summarises the extent to which the above prescriptions have been applied in selected countries.

Main lessons emerging from these practices are:

- i Long-term (five years or more) performance-based maintenance contracts have encouraged contractors to invest in economically efficient maintenance actions and purchase of proper maintenance equipment. While PPP approaches have in-built provisions for long-term maintenance for projects undertaken through EPC mode, it is inevitable to move towards outsourcing of maintenance on a long term basis.
- ii Success of outsourcing depends upon proper

Table 2.19

Cross-Country Comparison of Adherence by Successful Countries to Key Recommendations of “Road Deterioration in Developing Countries”

				OUT-SOURCING		
COUNTRY	COALITION OF DIVERSE STAKEHOLDERS FOR GOOD ROADS	PLANNING BASED ON HOLISTIC COST ANALYSIS	SUSTAINED FUNDING MECHANISM	WORKS DESIGN & SUPERVISION OUTSOURCED TO ‘ENGINEER’	WORKS DESIGN & SUPERVISION OUTSOURCED TO ‘ENGINEER’ WORKS EXECUTION OUTSOURCED TO ‘CONTRACTOR’	QUANTITATIVE PERFORMANCE MONITORING
South Africa	Yes, sustained, but has evolved from broad stakeholder representation to more specialised board of professionals	Yes, sustained application of HDM-4	Yes, adequate funding sustained by taxes, tolls, and toll-backed borrowing, but earmarking discontinued	Yes, the Engineer functions were corporatized in SANRAL, providing Full management flexibility as owner of National Roads	Yes, sustained	Yes, with sustained annual measurements of national roads condition
Rest of Sub Saharan Africa	Extensive experimentation, with widely varying results	At least one strategic application in most countries, but mostly ad hoc, not sustained	Much improved across the region, but still major problem due to low population and low GDP per road-km	In some cases	In many cases	Extensive experimentation, but generally not well sustained
Argentina	No specific coalition, but concessionaires and contractors well incentivised for high road quality	Yes, sustained application of HDM-4	Yes, long-term contract funding sustained even through major fiscal crisis	No—the Engineer functions have been retained in the government highways authority	Yes, sustained with major innovations in contracts to offset risks and incentivise contractors	Yes, sustained

Source: World Bank paper for NTDP on Road Asset Management by Clell Harral, et al. (May, 2011)

contractual framework, risk allocation mechanism and governance environment covering financial management, effective internal and external audits, accountability and responsiveness of road agencies to the needs/expectations of road users.

- iii Application of ICT measures offers promise to enhance performance. Quality of road agencies in planning, contract procurement and administration is the prime determinant of success in providing a good road infrastructure to society.

DIRECT CHARGING FOR HIGHWAY USE

Direct charging mechanisms to transfer the costs of construction, maintenance and operations to users is widely practiced in several countries. These include user fees paid to the road agency that reflects the amount of time or extent of highway use. Table 2.20 provides a summary of direct charge pricing schemes in Europe and Singapore. It would be seen that some of the general contexts of direct charging

include levy of toll, congestion pricing, cordon fee, distance/weight based fees.

In some European countries (Box 2.6) such as Switzerland, Austria, Germany, Czech Republic, Slovak Republic, heavy goods vehicles (HGV) or commercial vehicles are required to pay tolls proportional to distance travelled on some, or all, major roads. None of these schemes is designed for congestion pricing although Austrian and German technologies permit some differentiation of tolls by time and location.

Several countries have studied distance-based charges for passenger vehicles (Box 2.7). Depending on the technology, the fee could be varied by time, distance, and location to price based on congestion. In the UK and the Netherlands, such schemes have not yet been implemented due to political opposition. In the United States, the use of a Vehicle Miles Travelled (VMT) fee as a long-run alternative to fuel taxes as the primary funding mechanism for roads is being considered, although the current political climate does not

Table 2. 20

Summary of Direct Charge Pricing Schemes in Europe and Singapore

	SYSTEM	PURPOSE/ OBJECTIVE	TYPE OF PRICING	MILESTONE DATES	TECHNOLOGY	MEASURED IMPACTS	ANNUAL REVENUES AND COST (IN USD)	DISTRIBUTION OF NET REVENUES
Demand Management	Stockholm, Sweden: Congestion Tax	Manage Congestion (primary) Promote Transit and protect Environment (secondary)	Cordon pricing in city center by time of day at SEK10 to SEK20 (about US\$1.50 to US\$3) per crossing of cordon line into and out of city center	Trial: January–July 2006 Referendum: September 2006 Permanently reinstated: August 2007	Automated number plate recognition (ANPR) to assess tax to vehicle owner	20 per cent reduction in traffic congestion in the city center 10-14 per cent decrease in emissions	Gross revenues (2009): SEK850 million (US\$118.5 million) Net revenues (2009): SEK530 million (US\$74 million) Overhead costs: SEK320 million (US\$44.5 million), about 37 per cent of revenues	Collected by national government and transferred to the city of Stockholm Net revenues used to invest in transit and new roads
	London, United Kingdom: Congestion Charge	Manage Congestion (primary) Promote Transit and Protect Environment (secondary)	Area pricing in central London and its Western extension Flat daily rate of £8 (US\$13)	Started in Central London: February 2003 Price increased from £5 to £8 (60 per cent increase) in July 2005 Western extension: February 2007 Repeal of western extension: planned in 2010	ANPR to track compulsory payment compliance and identify violators	Initial traffic reductions of 25 per cent and 19 per cent (central London and western extension, respectively)	Gross revenues (2008): £268 million (US\$435 million) Net revenues: £137 million (US\$222 million) Overhead costs: £131 million (US\$212 million), about 50 per cent of Revenues Capital costs for central London zone: £130 million (US\$211 million)	Net revenues used for transit (80 per cent) and other transport (20 per cent) Improvements within greater London
Revenue Generation	Singapore: Electronic Road Pricing (ERP)	Manage congestion (primary) Promote transit (secondary)	Cordon and expressway pricing by time of day and vehicle class	Cordon pricing via manually enforced paper permit system in 1975 Transition to ERP in 1998, followed by expressway pricing	Dedicated short Range Communication (DSRC) in-vehicle units with removable stored-value smart card for payment ANPR for enforcement	Achieves free flow road speed targets of 45–65 km/h on expressways and 20–30 km/h on arterials.	Gross revenues (2008): SG\$125 million (US\$90 millions) Net revenues: SG\$100 million (US\$72 million) Overhead costs: SG\$25 million (US\$18 million), 20 per cent of gross revenues	Net revenues returned to vehicle owners through tax rebates – heavy investment from general fund in transit and highway systems

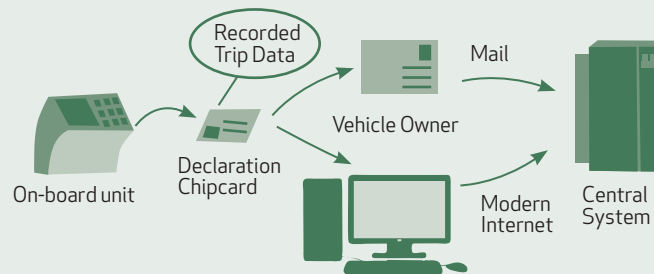
	SYSTEM	PURPOSE/ OBJECTIVE	TYPE OF PRICING	MILESTONE DATES	TECHNOLOGY	MEASURED IMPACTS	ANNUAL REVENUES AND COST (IN USD)	DISTRIBUTION OF NET REVENUES
Revenue Generation	Germany: Heavy Goods Vehicle (HGV) Charging on Highways	Generate revenue and promote user pays principle (primary) Protect environment and encourage mode shift to rail and water (secondary)	Truck tolls for HGVs greater than 12 metric tons on the autobahn and limited por- tions of other National High- ways based on distance traveled, num- ber of axles, and emissions class	Opened in January 2005	Global Posi- tioning System (GPS) for vehicle location Global System for Mobile Communica- tions (GSM) for data Transmission DSRC and ANPR for Enforcement Manual book- ing system via kiosk terminals and Internet for those without on- board units	Violations less than 2 per cent Empty truck trips declined by 7 per cent 58 Per cent shift from dirtier truck models (Euro class 1, 2, 3) to cleaner trucks (Euro class 4, 5)	Gross revenue (2008): €3 to 5 billion (US\$5 billion) Overhead costs: 15–20 per cent of gross revenues Average toll rate: €0.163 per km (US\$0.378 per mi)	Net revenues for roads (50 per cent), rail (38 per cent), and Waterways (12 per cent) €560 million (US\$815 mil- lion) per year for Truckers “harmoniza- tion” program
	Czech Republic: Truck Charging on Highways	Generate revenue and promote user pays principle (primary) Advance envi- ronmental objectives (secondary)	Truck charges on selected National High- ways based on distance traveled, num- ber of axles, and emissions class	Opening: Janu- ary 2007 Originally for HGVs >12 metric tons Expansion to include trucks >3.5 metric tons in January 2010	Transponder- based DSRC system with gantries on mainline highways ANPR for enforcement	Average toll rate of US\$0.35 per mi on freeways	Gross revenue (2008): CZK6 billion (US\$340 millions) Overhead costs: 30 per cent of gross revenues Average toll rate: CZK4.05 per km (US\$0.36 per mi) for highways; CZK1.90 per km (US\$0.17 per mi) for first- class roads	Net revenues for roads and highways, railway lines, and inland transport routes
Demand Planning	The Nether- lands: National Distance Based Tax (The plan has been dropped in 2010 due to political inac- tion)	Manage congestion, replace vehicle tax revenue, and promote user- pays principle (primary) Promote transit and protect environment (secondary)	National distance based road pricing of all vehicles (commercial trucks and private cars) on all roadways	Phased implemen- tation was originally planned to begin in 2011, with all trucks covered by 2012 and all vehicles by 2018 Implementa- tion is on hold	Under develop- ment, likely GPS for vehicle location, GSM- based data communica- tion, and DSRC interrogation with ANPR for enforcement	2020 fore- casted results: 5-10 per cent reduction in vehicle-miles traveled 40–60 per cent reduction in delays 10 per cent reduction in CO ₂ 6 per cent increase in public transit use	Gross rev- enues (2019 forecasted): €9 billion (US\$13.1 billion) Overhead costs: to be determined (capped in law at 5 per cent of gross revenues) Capital costs (estimated): €5.7 Billion (US\$8.3 Billion)	Revenues intended to replace existing vehicle owner- ship taxes

Source: World Bank Paper for NTDP on Direct Charging Mechanisms for Highway Use by Kumares C. Sinha et al. (July 2011)
(Adapted from FHWA, 2010)

Box 2.6

Distance-based Heavy Goods Vehicle Schemes in Europe

The **Swiss** toll applies to HGVs over 3.5 metric tonnes gross vehicle weight and is paid on the entire 71,000 km national road network. It is differentiated by emissions class but not by type of road or time of day. Distance is recorded using a digital tachograph and a smart card. The unit is activated by roadside dedicated short-range communication device (DSRC) transponders when a vehicle enters the country, and it is deactivated when the vehicle exits. Charges are paid by inserting the smart card into a roadside terminal.



Billing procedure of Swiss HGV distance-based pricing scheme

In contrast to the Swiss system, HGV tolls in **Austria** are only charged on the 2,060 km primary road network and are not differentiated by emissions class. An on-board unit called a “Go Box” is used for communications. It uses DSRC microwave technology, is attached to the windscreen, and can be easily set to register the number of axles on the truck and trailer. Such pricing schemes in European countries offer interoperability or seamless travel. For instance, the Swiss on-board unit (OBU) can be used in Austria as an alternative to the “Go Box”.

Germany’s HGV scheme “Toll Collect” applies to federal motorways and some secondary roads (12,000 km in total). Toll differentiation is similar to Switzerland, but the technology is more advanced, using GPS to measure distance. DSRC beacons are used for backup location information. The system is scalable in that more roads can be added, and the technology allows tolls to be differentiated by road type and time of day.

Source: World Bank Paper for NTDP on Direct Charging Mechanisms for Highway Use, Kumares C. Sinha et al. (July, 2011)

favour such a scheme. Several US experiments with regional distance-based pricing have been conducted that provide evidence on the technological possibilities and challenges.

Main lessons emerging from these practices are:

- i Road toll is a good mechanism for direct charging for road use and to generate additional revenues. The current practice of levy of tolls for use of multi-lane highways in India should continue.
- ii For collection of tolls, manual toll booths are prone to revenue leakage. It is, therefore, preferable to switch over to electronic toll collection. A transparent system improves confidence of the general public. There is need to display toll collected upto date at each toll plaza.
- iii Toll charges may be dynamic, different for

peak and non-peak periods.

- iv The policy of weight-distance charges being implemented for heavy goods vehicles in Europe should be introduced in India to generate additional revenues.
- v Linking the rates/charges to the benefits received by the users contributes to public acceptance. There is a strong case, therefore, for a detailed highway allocation study that should capture the costs occasioned by different class of vehicles on road construction and maintenance. Evidence-based research in this direction is of paramount importance. This would help the government in facing the occasional threats/concerns by the transporters and truckers as they do believe/perceive that benefits received by them are not commensurate with the taxes and toll charges being recovered.

Box 2.7

Experimental Distance-based Passenger Vehicle Schemes

- i Oregon VMT Pricing Pilot Project (2004–2006)
 - Assessed viability of distance-based charges as a replacement for fuel taxes.
 - Charges defined by zone and peak/non-peak periods
 - Test vehicles equipped with GPS devices that recorded mileage
 - Individual vehicle movements cannot be tracked
 - Distance-based charge paid automatically when vehicles refuel at participating gasoline stations
 - State fuel tax was deducted from the bill
 - Conclusion: GPS technology is reliable; privacy protection can be assured.
- ii Puget Sound Regional Council assessed the merits of several road-pricing schemes (2002–2008)
 - Examined driver responses to network-wide facility based tolls
 - Tolls were varied by road class, peak/non-peak period
 - Unlike Oregon, GIS used with GPS; distances travelled on freeways and arterials recorded separately
- iii University of Iowa study (2005)
 - Assessed feasibility of GPS-based tolling technology, gauged driver response and public attitudes
 - GIS is used in combination with GPS to record distances within the region, to compute charges on the vehicle, and to download updates to the database
 - Only aggregate charging data is transmitted from the vehicle
 - Unlike in the Oregon and Puget Sound studies, tolls are flat

Source: World Bank Paper for NTDP on Direct Charging Mechanisms for Highway Use, Kumares C. Sinha et al. (July, 2011)

USE OF INTELLIGENT TRANSPORT SYSTEMS

ITS has been deployed by several countries to provide a number of services to enhance the operational performance of highway networks by increasing user awareness of traffic conditions and alternative routing opportunities. The deployment status of ITS services and application areas in different countries is presented in Table 2.21.

Main lessons emerging from this are:

- i The on-going advances in information and communication continue to lower the cost of ITS deployment.
- ii ITS can be installed at the time of development of road infrastructure (to save on additional retrofitting cost later on).
- iii Low cost incident management systems (highway service patrols, call centres) are most cost-effective ITS.
- iv Electronic Toll Collection has helped reduce congestion at toll booths besides ensuring transaction security and reducing revenue leakage.
- v ITS application in Commercial Vehicle Operations is critical to the productivity and effi-

ciency of trucking and interstate bus operations. Such applications are designed to enhance commercial vehicle safety, communication between carriers and consignors/consignees, fleet management and facilitate regulatory processes. They help in seamless movements across states.

- vi To start with, a simple ITS architecture and gradual phasing-in of ITS components is preferable.

ROAD SAFETY

Road safety is a matter of grave concern in India. Box 2.8 gives a glimpse of some of the best international practices.

A Report of the Committee on Road Safety and Traffic Management was submitted to the MoRTH in February 2007. Based on this report, the National Road Safety and Traffic Management Board Bill, 2010, was submitted to the Lok Sabha in 2010 and considered by the Standing Committee On Transport, Tourism & Culture. The Bill was referred back to the MoRTH for reconsideration and it has not yet been resubmit-

Table 2. 21

Deployment Status of Selected ITS Application Areas in Different Countries

APPLICATION AREAS OF FOCUS	SUB-AREAS I	SUB-AREAS II	SELECTED COUNTRIES WITH EXPERIENCE
Advanced Traffic Management Systems	Incident Management	Service Patrols and Call Centres	US, Europe
		Automated Systems	US, Europe, China, Malaysia, South Korea, South Africa
	Electronic Toll Collection (ETC)	ETC Systems	US, Europe, China, Malaysia, South Korea, South Africa, India, Singapore
	Arterial Management	Adaptive Traffic Control Systems	US, Europe, China, India, Thailand, South Korea, Brazil
		Automated Enforcement (red light, speed limit)	US, Europe, South Africa
	Demand Management	Ramp Metering	US, Europe, South Africa
		Managed Lanes	US, Europe
Advanced Traveller Information Systems		Variable Message Signs	US, Europe, China, Malaysia, Thailand, South Korea
		Internet/Mobile Applications	US, Europe, Malaysia, Thailand, South Korea
		Call Centres	US, Europe
Commercial Vehicle Operations		Credentials Administration	US, Europe
		Safety Assurance	US, Europe
		Electronic Screening	US, Europe
		Carrier Operations and Fleet Management	US, Europe, Brazil
		Security Operations	US, Europe

Source: Resource Paper by World Bank for NTDPCC

ted to the Parliament. The main recommendations of the Sundar Committee report are:

- The National Road Safety and Traffic Management Board should be established through an Act of the Parliament called the National Road Safety and Traffic Management Act.
- It should address road safety issues in respect of the National Highways and Mechanically Propelled Vehicles and make recommendations and set guidelines on road safety on other roads. It should contain enabling provisions to set up Road Safety and Traffic Management Boards in the states. It should also encompass the provisions related to road safety contained in the other relevant Acts like the Motor Vehicles Act. The Parliament is competent to legis-

late on Road Safety and Traffic Management in respect of National Highways and Mechanically Propelled Vehicles as they fall in List II of Schedule VII of the Constitution. This Act should be administered by the Ministry of Shipping, Road Transport and Highways.

- The primary objective of this Board would be to promote road safety and improve traffic management in India. It would be responsible for the following functions:
 - Road related measures: designing, setting standards and conducting audits
 - Vehicle related measures: prescribing safety features and setting standards
 - Road safety research: institutional linkages and training
 - Traffic laws, operations and management

Box 2.8

Best practices: Systematic Road Safety

1. Sweden

In 1997, the Swedish Parliament adopted the Vision Zero, a bold new road safety policy based on four principles:

- i Ethics: Human life and health are paramount; they take priority over mobility and other objectives of the road transport system;
- ii Responsibility chain: The providers, professional organisations and professional users are responsible for the safety of the system. The users have the responsibility to follow rules and regulations. If the road users fail to follow rules and regulations, the responsibility falls back on the providers of the system;
- iii Safety philosophy: Humans make errors; road transport systems should minimise the opportunity for error and the harm done when errors occur;
- iv Driving mechanisms for change: Providers and enforcers of the road transport system must do their utmost to guarantee the safety of all citizens and each of the participants should be ready to change to achieve safety.

Who is involved?

The Swedish Road Administration (SRA) has the overall responsibility for road safety within the road transport system. According to the principles of Vision Zero, all other stakeholders in the field of road transport also have responsibilities for ensuring and improving road safety.

How effective and costly is it?

Vision Zero is estimated to achieve a possible reduction in the number of deaths by a quarter to one third over a 10-year period. The adoption of Vision Zero in Sweden helped in developing further research and implementing a new system design. It helped in the implementation of the upgrading of single carriageways to 2+1 lanes roads with central cable barriers to shield drivers from opposite traffic.

2. The Netherlands

A Sustainable Safe road system aims to prevent crashes and if they still occur, to minimise their consequences. It is based on the idea that people make mistakes and are physically vulnerable. There are five main principles: functionality, homogeneity, predictability, forgivingness, and state awareness. The Sustainable Safety vision has a large influence on road safety work in practice, and has led and still leads to the implementation of effective and sustainable road safety measures. For example, one of the consequences of the principle of homogeneity is that motorised traffic and vulnerable road users (pedestrians, cyclists) can only interact if speeds of motorised traffic are low. If speeds cannot be kept low, separate facilities for vulnerable road users are required.

Who is involved?

Sustainable Safety has been the leading vision in the road safety policy of the Netherlands since the early nineties. The road authorities at the different levels (national, regional and local) actually implement the Sustainable Safety measures.

How effective and costly is it?

It has been estimated that the infrastructure measures of the sustainable safety approach reduced the number of fatalities and in-patients by 6 per cent nationwide. Costs, in particular those related

to reconstruction of roads are high, but can largely be combined in the budget for regular maintenance work.

3. Australia and New Zealand

Road authorities in Australia and New Zealand have committed to the Safe System approach as a conceptual framework which guides all activities relating to the provision and operation of roads. In managing road safety, the safe system approach implies:

- Designing, constructing and maintaining a road system to reduce fatal or debilitating injury accidents.
- Improving roads and roadsides to reduce the risk of crashes and minimise harm.
- Regulating or encouraging high quality active and passive safety systems in vehicles to reduce impact forces on occupants and on struck pedestrians and cyclists.
- Managing speeds, taking into account the risks on different parts of the road system. Advising, educating and encouraging road users to obey road rules and to be unimpaired, alert and responsive to potentially high-risk situations.
- Using enforcement and penalties to deter road users from breaking the rules, including removing the privilege of road use from those who do not comply.
- Program research to identify the most cost-effective interventions for particular situations. Promoting public understanding and endorsement of the safe system approach, and public participation in achieving a safer road system.

Source: Europa Road Safety Handbook, 2009

- Capacity building
- Medical care and rehabilitation: Lay down guidelines for establishing and upgrading trauma care systems at all levels
- The Committee noted that the Committee on Infrastructure decided that one per cent of the cess accruing to the National Highways should be employed to create a National Road Safety Fund. The Committee was of the considered view that a minimum of one per cent of the total proceeds of the cess on diesel and petrol should be available to the Road Safety Fund of Centre and the states, as road safety is a matter of concern not only on National Highways but also on the state roads, village roads and railway level crossings.
- The legislation should also contain an enabling chapter for the states to set up Road Safety and Traffic Management Boards, which the states could adopt.

RECOMMENDATIONS IN THE 12TH FIVE YEAR PLAN

Annually, 130,000 people die in road accidents. To strengthen the data, there is need to set minimal

road death and injury data reporting requirements in accordance with standards set by the International Accident Database Group (IRTAD) for national level data. Web-based data systems should be established and be made operational in the 12th Plan period. There is need to implement on an urgent basis the key recommendation of the Sundar Committee Report regarding the creation of National Road Safety and Traffic Management Board.

High level of awareness is required so that systemic problems get rectified. Awareness should be spread using all modes of communication: TV, newspapers and radio. ITIs need to be involved in driver training. MoRTH provides a scheme for setting up IDTR/DTI at state level. Before they start imparting driving training in driving schools, they should attend 'Trainers Training' in IDTRs/RSIs. To ensure that the needs are met, driver training schools should be encouraged to come up in the PPP mode.

At present, the introduction of new safety standards is dependent on testing facilities available in the country including those at NATRIP. Since the vehicles produced in the next few years will be pre-

Box 2.9

Capacity and Performance Indicator Framework for Road Agencies

- i **Mandate, Policy and Legal Framework:** The indicators under this category are intended to capture the vision/mission statement of the highways agency and to find out if a formal road policy, backed by a legal and regulatory framework, has been laid down covering development, asset management and safety.
- ii **Planning:** Indicators in this category are expected to inform planning capabilities of the highway agency by assessing the existence of long- and short-term investment plans for both development and maintenance of their road network and asset management system.
- iii **Capacity:** Under this category, indicators are intended to capture the highway agency's strength to deliver its mandate by knowing outputs of the budget, expenditure, projects delivery, skill development strategies, and human resource management.
- iv **Efficiency:** The indicators under this category would capture the agency's ability to evolve cost effective strategies in developing the road programs and efficient contract administration to contain time and cost overruns during the implementation. Monitoring the 'asset value' of the network is one such indicator.
- v **Quality of Road Network:** The indicators under this category are intended to assess the agency's ability to provide a safer, greener, reliable and more comfortable road network. The indicators suggest the shifting of focus from a traditional input- and process-based one to outcome- and user-oriented measures, for example, capturing the degree of congestion, network quality index, and accident hazards.
- vi **Private Sector Participation:** The indicators under this category intend to assess the road agency's effort to attract and promote private sector financing of the road sector.
- vii **Governance:** The indicators under this category are intended to capture initiatives such as right to/freedom of information, e-procurement, website, publishing of annual reports, road user satisfaction surveys, and grievance redressal mechanisms.

Source: A Review of Highway Agencies in the South Asia Region by Rajesh Rohatgi et al. World Bank and DFID, 2011

sent on the road for about two decades, it is essential that the provision of testing facilities and introduction of new standards should be expedited. Impact standards for vehicles should be implemented on an early basis. Since a vast majority of those injured and killed in road accidents comprise pedestrians, bicyclists, and motorcyclists, India should take the lead in introduction of pedestrian impact standards for all vehicles. India should set up an NCAP India Programme. In the first phase, cities with significant transport vehicles (Metros) should introduce a modern inspection and certification regime.

CAPACITY AND PERFORMANCE INDICATOR FRAMEWORK FOR ROAD AGENCIES

A study of road agencies in the South Asia region including India was undertaken by the World Bank with the objective to help governments and policy makers in identifying reforms required to strengthen the capacity and performance of their agencies to deliver large investment programmes. The study utilised the systems prevalent in Australia, South Africa, New Zealand and Sweden. It recognised that each country and within each country, each road agency has to identify its own capacity and performance

indicator framework based on its specific mandate and vision. Keeping in view the functions required to be performed by the road agencies, the Bank has proposed a seven-category framework. These are indicated in Box 2.9.

The benefits of adopting such a framework are:

- i The agency is able to improve its performance and pride itself in doing so as the performance of its roads become verifiable.
- ii The accountability of the agency improves as it becomes easier to assign responsibilities to specific departments and engineers/managers.
- iii It brings transparency to the agency's decision-making process.
- iv It supports highway agencies in improving its efficiency and effectiveness in delivery of road programmes.

The road agencies need to move steadily and gradually to modern organisation. The basic requirement is to establish a regular data and information collection strategy in the highway agency and instituting a system of annual performance targets, capacity

building and enhancing competence of staff in business practices in programme delivery and bringing in a culture of road asset management and focusing on responsiveness to needs of users. The MoRTH has already a system of RFD (Result Framework Document) for functions within its mandate. This can be reviewed to capture outcome based indicators suggested above.

POLICIES TO ENCOURAGE ENERGY EFFICIENT VEHICLES

Policies for enhancing energy efficiency of vehicles may be intended to improve operational efficiency of existing vehicles or to encourage purchase of fuel efficient vehicles. Fuel efficiency also leads to reduction in CO₂ emissions. There are five core areas where international experience provides examples that might be helpful to consider: financial measures; regulatory standards; inspection and maintenance programme; public outreach; and traffic management. They have been applied in various forms, in a number of countries, including the US, UK, Canada, Australia, Japan, China, Singapore, Hong Kong, and South Korea (Onoda, 2008; APEC, 2009; IEA, 2009, Kojima and Ryan, 2010). Box 2.10 gives broad details

SUMMARY AND CONCLUSIONS

- i The capacity standards adopted in USA, China, etc may not apply in India since there is considerable mix of motorised and non-motorised traffic on roads in India both in urban areas and on inter-city highways. Some research work for development of a Highway Capacity Manual specific to India is in progress by the Central Road Research Institute. This needs to be expedited and overseen by the Ministry of Road Transport and Highways.
- ii The current Indian practice of designing roads for LOS B could be reviewed if studies show that there is no perceptible decrease in operating speed under LOS C compared to that under LOS B. Adopting LOS C for design will imply more intensive use of the highway and it will also enable postponement of avoidable investment in capacity augmentation without any significant decrease in operational speeds.
- iii Experience from countries like South Africa and Argentina, which succeeded in improved delivery of road maintenance has revealed that long term (five years or more) performance-based maintenance contracts have encouraged contractors to invest in economically efficient maintenance actions and purchase of proper maintenance equipment. While PPP approaches in India have in-built provision for long-term maintenance, for pro-

jects being undertaken through EPC mode, it is inevitable to move towards outsourcing of maintenance on long term basis. Further, success of outsourcing depends upon proper contractual framework, risk allocation mechanism and governance environment covering financial management, effective internal and external audits, accountability and responsiveness of road agencies to the needs and expectations of road users.

- iv Direct charging mechanism for road development practiced in Europe, Singapore, etc provide evidence that road toll is a good instrument for direct charging of road use and to generate additional revenues. The current practice of levy of tolls for use of multi-lane highways in India should continue. For collection of tolls, it is preferable to switch over to electronic toll collection. A transparent system improves confidence of the general public. There is need to display toll collected upto date at each toll plaza. Toll charges may be dynamic, different for peak and non-peak periods.
- v The policy of weight-distance charges being implemented for heavy goods vehicles in Europe should be introduced in India to generate additional revenues.
- vi Linking the rates/charges to the benefits received by the users contributes to public acceptance. There is a strong case, therefore, for a detailed highway allocation study that should capture the costs occasioned by different class of vehicles on road construction and maintenance. Evidence-based research in this direction is of paramount importance. This would help the government in facing the occasional threats/concerns by the transporters and truckers as they do believe/perceive that benefits received by them are not commensurate with the taxes and toll charges being recovered.
- vii Intelligent transport system has been deployed by several countries to enhance the operational performance of highway networks. The ongoing advances in information and communication technology continue to lower the cost of ITS deployment. ITS application in Commercial Vehicle Operations is critical to the productivity and efficiency of trucking and interstate bus operations. Such applications

For projects undertaken through the EPC mode, it is inevitable to move towards outsourcing of maintenance on long-term basis

Summary of Core Areas to Achieve Energy Efficiency of Vehicles

i Financial Incentives and Disincentives:

Initiatives involving financial measures can be grouped under the following mechanisms:

- Differential taxes and charges based on fuel efficiency or greenhouse gas emissions (or proxies such as engine size or vehicle weight).
- 'Feebates' - a set of fees (surcharges) for fuel-inefficient old vehicles and rebates for the purchase of new fuel efficient vehicles, based on fuel-efficiency, GHG emission (CO₂) performance of the vehicle.
- Internalization of the external costs of highway energy consumption by increasing fuel taxes.
- Subsidies for purchasing alternative fuel vehicles or for converting traditional fuel vehicles to alternative fuel vehicles.
- Support to manufacturers to develop vehicles that use alternative fuels.
- Support for research and development into existing fuel enhancement and new fuel technologies.
- Mandate government agencies to purchase hybrid, alternative fuel, or efficient vehicles for agency fleets

ii Regulatory Standards for Vehicle Fuel Efficiency

In countries where regulatory standards for vehicle fuel efficiency have been used, it has been in the form of one or more of the following specific mechanisms:

- Foster mandatory vehicle fuel efficiency or CO₂ emission standards.
- Establishing automotive industry agreements on fuel efficiency and adaptation of efficient and innovative vehicle technology.
- Improve on-road fuel efficiency of vehicles by focusing on energy efficiency of non-engine components (generally not considered in official fuel efficiency tests), including tyres, cooling technologies, and lighting systems.
- Developing and enforcing standards on imported or used vehicles.
- Vehicle efficiency labels/ratings at point of sale/purchase.
- Implement fuel efficiency standards for heavy duty vehicles
- Provide a mandate that two- and three-wheeled vehicles, a large source of petroleum fuel consumption and air pollution, should be retrofitted with modern engine improvements and alternative fuels that enhance energy efficiency and reduce emissions.

iii Inspection and Maintenance Programmes:

Inspection and maintenance (I/M) programmes are a common initiative in many countries to promote greater fuel efficiency and ensure that vehicles meet emissions standards. I/M programs have been implemented through a variety of specific mechanisms such as:

- Enforcing operational efficiency of used vehicles through periodic inspection and maintenance programs.
- Mandatory vehicle emissions inspection, targeted primarily to local air quality.
- Encouraging the retirement of old vehicles through both mandatory and voluntary programs

The enforcement of periodic inspection and maintenance requirements has been accomplished as a part of annual registration process or the use of windshield decals indicating compliance. In the US, universal I/M programs were discontinued after public complaints and are currently administered only in metropolitan areas that are not in compliance with EPA air quality standards. Some countries have experienced that I/M programs can become burdensome requirements for vehicle owners and thus can lead to evasion and attendant corruption.

iv Public Outreach and Awareness Programs

The mechanisms of public awareness campaigns, through billboards, television, print media, radio, and in-vehicle systems, have included the following:

- Provision of information to car purchasers on vehicle performance, e.g. fuel consumption

- labelling on vehicles, including fuel consumption data in vehicle advertisements.
- Standards/labelling requirements for non-engine components, such as tyres, cooling units and lighting, etc., which impact on fuel consumption.
- Communicating the range of operational efficiency of vehicles and its monetary significance to consumers/drivers, such as in-car feedback instruments for eco-driving.
- Heavy vehicle environmental rating scheme.

v Highway Traffic Management

Policy initiatives in this area are directed at minimising stop-and-go operations and frequent speed changes. Fuel efficiency can be improved if a relatively smooth traffic flow can be maintained.

Many countries are in the process of pursuing the following:

- Implement intelligent transportation systems in order to minimise delay and idling.
- Rapid incident detection and clearance at low capacity highways
- Improve highway, street, and intersection design standards that foster smooth flow of traffic.
- Adopt demand management programs.
- Add physical capacity by adding lanes, bypasses, or other improvements.

Source: World Bank Paper for NTDP on Government policies to encourage energy efficient vehicles on roads by Kumares C. Sinha et al. June 2011.

are designed to enhance commercial vehicle safety, communication between carriers and consignors/consignees, fleet management and facilitate regulatory processes. They help in seamless movements across states.

INDIA'S ROAD NETWORK OVER THE NEXT 20 YEARS

A VISION STATEMENT FOR INDIA'S ROAD NETWORK

There is value in constructing a normative vision statement for India's desired road network. It can help to ensure that the various institutions responsible for planning, providing and commissioning road infrastructure agree on the ends that the network must serve. A shared vision together with derived qualitative and quantitative goals is more likely to result in a coherent, comprehensive network that best addresses India's socio-economic needs and wants. It can serve as a valuable communication device in selling infrastructure policy and decisions to the populace. Equally, it can serve to hold to account the public and private institutions that are responsible for designing, planning, commissioning, building, operating, managing and maintaining India's road network.

By 2032, the end of the 15th Five Year Plan period, India's road network should:

1. Be of an extent and quality that is commensurate with supporting the desired pace of India's economic transition;
2. Facilitate export and import trade movements;
3. Provide reliable all-weather road connectivity between every village and settlement to an

arterial road that in turn connects with market towns;

4. Help in achieving enhanced road safety as also smooth and efficient movement of people and goods;
5. Mitigate the adverse environmental costs of road transport to the furthest extent;
6. Meet India's strategic and defence needs as also national and energy security goals;
7. Be the product of a sensitive approach to social considerations, including through fairly compensated land acquisition, and proper resettlement and rehabilitation of affected people;
8. Be sustainable, well managed and preserved commensurate with investments being made in the sector;
9. Promote the integration of scheduled castes and tribes, and national integration more generally;
10. Assist in providing equitable access to economic, educational and healthcare facilities for all citizens.

ESTIMATED DEMAND

The demand for both freight and passenger traffic has been growing rapidly over the years. The modal split between rail and road transport in both freight and passenger traffic is heavily inclined towards road transport. As of 2011-12, road transport is estimated to hold 69 and 90 per cent share in case of freight and passenger traffic respectively.⁷

The NTDP has estimated the growth in road freight and passenger traffic over the next 20 years (Table 2.23). The forecasts are made using the elasticity of traffic demand with respect to GDP as the underly-

Table 2.22
GDP Estimates for 12TH, 13TH, 14TH and 15TH Plan

YEAR	GDP ESTIMATES (PER CENT)
2012-17	6.6
2017-22	8.0
2022-27	8.5
2027-32	9.0

Source: NTDP Research (Chapter 3, Volume II)

ing approach. Table 22 presents the GDP growth projections.

As far as freight traffic is concerned, it is estimated on the basis of historical data that the total freight traffic (rail+road) holds an elasticity of 1.2 with respect to GDP⁸. In addition, it is estimated that the share of road in total freight traffic would decline from 69 per cent in 2011-12 to 65 per cent in 2016-17 to 55 per cent in 2021-22 to 50 per cent in 2031-32.

In case of passenger traffic, the elasticity of road passenger traffic has been estimated 1.9 with respect to GDP, keeping the GDP estimates same as above, which appears reasonable given the historical trend.

Road freight traffic is estimated to grow at about 9 per cent per annum and the road passenger traffic at about 17 per cent over the next 20 years. Through-out, the growth elasticity of freight transport is held, conservatively, at 1.2 and of passenger transport at 1.9. There is substantial international evidence that as countries enter phases of sustained high growth, growth elasticities—which, like all elasticities, are linear estimates valid only at defined points—become increasingly unrepresentative. If India sustains growth rates in excess of 7 per cent, implying a doubling in the size of the economy every 10 years, the GDP-elasticities for transport demand will almost certainly be different.

POLICY AND PLANNING

TRAFFIC SURVEYS

Transport operations in the road sector being basically in private hands, there is high level of customer focus. However, at the same time, this mode is much less energy efficient and environment friendly besides being more unsafe. As such, road develop-

ment should not be seen in isolation but as part of an integrated modal system of transport. For facilitating such a process, it is necessary to undertake regional traffic and transport surveys on regular basis—preferably every five years (to provide inputs to formulation of Five-Year Plans and mid-course correction of policy prescriptions formulated for long-term development goals)—of freight and passenger flows, transport pricing, resource costs and identify existence of distortions in the movement from point of view of a desirable/optimal intermodal mix and investment policy for different modes of transport.

To this end, a Total Transport System Study encompassing the five modes of transport in the country—railways, roads, coastal shipping, inland waterways and airways—should be mandated, covering the following main objectives:

- To generate and analyse inter-modal transport resource costs and traffic flows
- To identify the factors leading to the current distribution of passengers and freight traffic and reasons for distortions observed from the perspective of national resource costs
- To determine an optimal inter-modal mix and allocation of transport investment to assist the planners in designing a transport vision for the immediate term of five years and direction for the long-term

The exercise indicated above should be carried out under the umbrella of Office of Transport Strategy.

ROAD DATA CENTRE

Database in the road sector is virtually absent. This needs serious attention. Setting up of a dedicated road data centre managed through a high level institution does not admit of any delay. This would help

8 For more details, refer Chapter on Trends in Growth and Development of Transport (Chapter 2, Volume II)

Table 2.23
Projected Road Freight and Passenger Traffic

YEAR	TRAFFIC	
	FREIGHT BTKM	PAX BPKM
2011-12	1,385*	9,329
2016-17	1,987	17,272
2021-22	2,949	35,043
2026-27	4,321	74,079
2031-32	6,559	163,109

* Estimated
Source: NTDP Research

in reducing the current ad-hoc decision making in the road development planning process.

CAPACITY AUGMENTATION

The entire transport system, including roads, is facing capacity constraints. The economic and environmental costs of a saturated transport system are high. Strangulation of railway capacity is unduly burdening the road sector. Railways need to regain their share. This cannot happen until their capacity is enhanced and they learn from road transporters to provide a better customer focus. It is also to be realised that the congested roads lead to lower transport productivity, increased energy consumption and pollution. Lack of road and vehicle maintenance adds to the undesirable industry competitiveness in the international market besides resulting in high inventory costs. Once the role for roads and road transport is identified within the overall transport system, it is necessary to identify and carve out road development and maintenance programmes which not only meet the expected traffic demand and improve transport productivity but also ensure that such programmes reduce in their wake the negative externalities of energy inefficiency, environment pollution and accident hazards.

RURAL CONNECTIVITY

Integrated rural development has been another area of focus by the Government for considerations of social justice, national integration, economic uplift and overall higher productivity in rural areas. For this, there is all-round recognition of rural roads serving as one of the key infrastructures as they help in increasing accessibility to schools, health centres and in creating more employment opportunities. Rural roads serve as an entry point

for poverty alleviation. These roads also provide physical mobility of raw materials, farm produce, promote specialisation and increased size of market. Further, these roads influence the process of growth by facilitating dispersal of knowledge and reduction of inequalities. The states have already prepared district level Core Road Network master plans in due consultation with the Panchayati Raj institutions and local MLAs and MPs. These plans could be reviewed every five years to account for both agricultural and industrial growth in each district. The current programme of PMGSY needs to be expanded to achieve universal connectivity to all habitations on a time bound basis and upgradation of existing roads based on traffic and condition assessment. In remote hill areas, provision of ropeway bridges across streams/ rivulets need also to be considered to enhance access. Priority for upgradation of existing roads would need to be given to roads linking rural growth centres.

SOCIAL ASPECTS

Another area of concern is finding ways and means of reducing the burden of land acquisition where it affects the communities. Road design standards should account for this social factor as well. The rehabilitation and resettlement (R&R) of persons whose livelihoods or habitations are affected by road development projects varies widely, depending on whether projects are implemented through external aid or loan assistance, or through publicly funded projects or PPP projects. It is also dependent on the nature of the project and the area through which it passes. There is further variance in R&R policies between state and central governments who are each responsible for constructing, improving and maintaining different kinds of roads. A uniform R&R

The primary roads should have uniform design standards for a given volume of traffic and service level desired, irrespective of whether they are National Highways or State Highways.

policy is desirable to ensure that compensations are equitably rationalised for similar kinds of utility losses across state and central government projects.

REVISITING THE ROAD HIERARCHY

The current system of road hierarchy and classification dates back to 1943 when the Indian Roads Congress formulated the first Long Term Road Development Plan. The road network is divided into five classes—National Highways, State Highways, Major District Roads, Other District Roads and Village Roads. Many countries classify their road network into three broad groups—primary, secondary and tertiary. Primary roads offer a high degree of mobility at the cost of reduced accessibility in the sense that longer distances must be travelled to access the primary network. In direct contrast, tertiary roads feature high levels of accessibility together with low mobility that is characterised by local rural traffic, lower speeds and shorter trips. Bridging the gap, secondary roads have medium mobility and medium accessibility, and they basically serve as the collection and distribution system, providing links with higher and lower order roads in the total journey.

A simplification of the five-step Indian road hierarchy into a tripartite system of primary, secondary and tertiary roads would serve to bring greater strategic clarity to the goals of road investment planning and the resulting outcomes. It is recommended that an independent Road Classification Commission (RCC) comprising of administrators, economists, geographers and road engineers under the umbrella of the Office of Transport Strategy proposed by the NTDPCC should be set up for this purpose. This Commission should set down clear, objective criteria keeping in view holistic network planning perspective that maximizes the efficiency of each class. There is also a need to introduce systematic numbering of different classes of roads as per international practice.

Under a reworked hierarchy, both national and state highways could be classified as part of the primary network. For declaration of any road as a primary road, there should be well laid down criteria, for example connectivity to state capitals, district headquarters, ports, important industrial hubs and tourist destinations and linkages with highways in neighbouring countries. Road alignments that provide direct connection between important origin/destination points and result in cutting down jour-

ney distance could also be considered good candidates.

The primary roads should have uniform design standards for a given volume of traffic irrespective of whether they are National Highways or State Highways. Their development should be undertaken commensurate with the level of traffic and level of service desired and be independent of the actual designation. State Highways are a state subject and their financing is the responsibility of the concerned state government. The nomenclature National Highways and State Highways may therefore continue but the latter should be treated as part of primary road network. It may be added that, the Central Government provides financial support by way of certain component of CRF for state roads and roads/ bridges of interstate and economic importance. In addition, central funds are also provided towards viability gap funding for PPP road projects being undertaken by the states. States should formulate programmes of development of state highways on the lines of NHDP. This programme could be labelled SHDP and projects undertaken through various phases on the lines of NHDP.

Expressways need not be a separate class; they may be considered as part of primary road network since they are highways with features of access control and limited to movement of fast motorised traffic.

Similarly, Major District Roads may be classified as the secondary network with concomitant changes to design standards. And finally, Other District Roads and the Village Roads could be grouped as Rural Roads, as they already are informally.

EXPRESSWAYS

Access-controlled expressways feature heavily in plans for future highway development. The other defining features of these roads are grade-separated interchanges and divided carriageways. They are typically intended for use by fast-moving motorised traffic. However, investments in expressways are of an order of magnitude much higher than those in four- and six-lane highways that are not access-controlled, and should therefore be based on well-defined economic criteria for resource allocation. Further, all access-controlled roads foster faster traffic and divide villages and other communities. This makes local transit more difficult and longer, especially for non-motorised vehicles and pedestrians, and for livestock and agricultural produce. Alternative routes and crossings should be made available in conjunction with access-controlled roads. Wherever expressways provide the sole route within a defined area with no viable alternatives for slow-moving, non-motorised, or local traffic, it is essential that they are augmented with service lanes.

Box 2.11

Financing Expressways Around the World

Expressways are access-controlled roads with grade-separated intersections that are limited to motorised traffic that is capable of travelling above a certain minimum speed. These are known by different names around the world: interstates in the USA, motorways in the UK and in New Zealand, autoroutes in France, autobahns in Germany, autostrades in Italy, or simply as highways. Mechanisms that have been used to finance these are equally varied.

- In the United States, the interstate highway system is funded through the Highway Trust Fund, which is sourced from a tax on fuel and tyres. These tax rates have varied over time, and state governments levy their own taxes. There is very limited tolling, only a few roads and bridges.
- Motorways in the UK are developed through taxes on fuel and on vehicles. There is no direct tolling. Shadow tolling is adopted for some stretches of motorways that are built or upgraded under the scheme of Private Financing Initiative. A shadow toll is paid directly by the government to the entrepreneur, without a direct user charge.
- Australian and New Zealand expressways are generally free of tolls, though for certain bypasses and bridges, nominal user fees are levied.
- In Japan, all expressways were constructed through government funding and investments recovered through tolls. Toll rates are amongst the highest in the world. It is only lately that the government has awarded some operational and maintenance contracts to private agencies.
- The French autoroute system was built by several public and private companies. A length of around 1500 to 2500 km was entrusted to each agency. These agencies were permitted to recover costs by levying tolls governed by an agreed schedule.
- Over the past 15 years, China has developed a huge network of expressways through the state enterprise system. Though users pay tolls, initial funding is through several sources of taxes and user fees at the district level.
- Malaysia constructed about 250 km of expressway to partially link Kuala Lumpur to Singapore from its own budgetary resources. Thereafter, tolling rights were offered to private entrepreneurs who also had to build the remaining length (about 500 km). The government guaranteed a minimum level of traffic, and the project was successfully completed by the entrepreneur.
- In India, the Government of Uttar Pradesh commissioned the Yamuna Expressway linking Greater Noida with Agra through a private agency. Apart from tolls from users, the private agency has been given real estate rights (capturing incremental land values).
- In India, the Government of Maharashtra built an expressway between Mumbai and Pune by setting up a public sector road corporation and raising bank loans. After a few years of operation, the project was offered to a private concessionaire for operations and management, for the consideration of a lump-sum rights payment to the corporation. The concessionaire has right to retain toll collected from users.

Source: NTDP Research and World Bank Papers for NTDP

Expressways are likely to form the backbone of India's land transport network along with railways insofar as they will swiftly carry the large volumes of traffic along busy corridors. Box 2.11 gives a glimpse of financing modalities for provision of expressways around the world. Given that expressways are often greenfield developments that duplicate existing routes, they may not be straightaway attractive to private investors and developers.

It may be noted that most expressways in the world have been constructed by the government or public sector undertakings/authorities. There is mixed experience in the use of tolls to help recover costs. The use of fuel and vehicle taxes is common.

Based on international practices and experience, there appears to be a number of different options that could be considered for development of an expressway network in the country:

- a The government could choose to develop these expressways from its own budget, albeit seek to recover costs through user charges and tolls. In doing so, it may also explore the feasibility of obtaining external loan assistance including technology transfer. Private entrepreneurs could be involved after initial construction of say 2,000 to 3,000 km of expressways by the government. These stretches could be handed over to private entrepreneurs for their O&M and leveraging the revenue

The primary roads should have uniform design standards for a given volume of traffic and service level desired, irrespective of whether they are National Highways or State Highways.

earned to expand the network of expressways in a phased manner.

- b The entire expressway network be divided into eight to 10 packages of 1,500-2,000 km each on the lines of French autoroute development strategy. Each package could be entrusted to major private developers. For this purpose, a dialogue with industry leaders is critical to formulate a strategy for their financing, construction and operation. Some seed money can be infused by the government as a start-up. Costs are to be recovered through user charges and tolls. Each package could be bid out to private developers for financing, construction and operations, if feasible and found to be economic. In the light of international experience, to accomplish this, it will be necessary to make a clear assessment of the private sector to undertake projects of this magnitude

A target of 18,637 km of expressways has been approved in principle by the Government of India, and is intended to be achieved by 2031. However, there is inadequate information on characteristics of road links, traffic volumes and traffic patterns. This network should be subjected to a consultation process with the states. Ideally, industry should also be taken into confidence in freezing the broad contours of such a network. There should be a minimum threshold traffic to consider provision of an expressway, say 40,000 PCUs per day. Access control highways effectively divide the countryside, necessitating provision of flyovers and interchanges to permit cross movement. This involves high capital investments. Priorities should be determined based on the needs of economy and progress of railway network capacity augmentation. Some of the existing four-lane and six-lane roads under the NHDP may be considered for converting them into access control facilities by providing service lanes all through for local and non-motorised traffic as an immediate step.

STRATEGIES FOR DEVELOPMENT OF PRIMARY ROADS (NATIONAL HIGHWAYS AND STATE HIGHWAYS)

NATIONAL HIGHWAYS

A strategic plan (1981-2001) for India's roads envisaged that India's national and state highways should together connect all towns with population greater than 5,000. The Road Development Plan: Vision 2021 pegged the length of National Highways to 80,000 km and of State Highways to 160,000 km. MoRTH's preferred strategy for identifying desired lengths is to

partition the country into a square grid, with each gridline representing a road of a designated standard. For NHs, a grid size of 60 km has been suggested for being achieved by 2031. Of course, the practical realities of geography, topography and demographics will guide deviation from this ideal. The 60 km grid size is a rough average of several considerations: states with high traffic densities and throughput require more immediate access to the NH network, and topography in hill states and demography in sparsely populated states motivate a much larger grid size in these regions. With this reasoning, 80,000 km of National Highway are proposed by 2021, with an increase to 100,000 km by 2031. A large share of this will be accomplished by promoting existing state highways to NH status, and by upgrading these to the required standards.

Since the main function of the primary system is mobility and enhanced productivity of transport, stress should be laid on consolidation of National Highways in terms of capacity augmentation through multi-laning of existing highways and provision of access controlled expressway facilities.

For capacity augmentation of National Highways, the current programme of NHDP in seven phases is well conceived and its implementation may continue in the immediate term, i.e. the 12th Five Year Plan. Within these phases, the programme relating to widening of single lane roads to two lanes deserve to be accelerated for reasons of enhancing safety and energy efficiency. Six-laning of existing roads without access control has the potential of being more accident prone. As such, the programme relating to six-laning of existing four-lane stretches needs to be stopped and where traffic volumes are beyond four-lane capacity, consideration given to provision of expressway network. In order to improve transport efficiency and enhance safety, all existing four-lane and six-lane roads need to have service lanes to cater to the requirements of local (both motorised and non-motorised) traffic so as to bring in an element of partial access control on such facilities. Provision of wayside amenities along the highways is becoming an integral part of the road projects. Such facilities should be provided by the private sector.

STATE HIGHWAYS

At 166,000 km, the state highway network is already more extensive than was envisaged in the Road Development Plan: Vision 2021. For NH and SH put together, an average grid size of 20 km is reckoned adequate for network purposes. This will imply that the length of the national and state highways together may be about 300,000 km. Since 100,000 of these kilometres are already intended as NHs, the required extent of the SH network is 200,000 km. For these roads also, the focus should be on consolidating the existing network, with minimal expansion as needed, due to economic and geographic considerations.

When developing state highways, priority ought to be given to:

- Providing links to minor ports, special economic zones, industrial towns, and pilgrimage and tourist centres
- Connecting remaining towns with population exceeding 5,000
- Connecting remaining district headquarters with state capitals
- Construction of missing bridges and reconstruction/ widening of existing weak and narrow bridges and replacement of semi-permanent timber bridges with regular bridges in the North-East region.

Under the present system, state governments lobby the Central Government to declare certain SHs as NHs, thereby removing the SH from its administrative purview. About 64,000 km of SH are reported to be candidates for reclassification as NH. The present arrangements are inefficient in that they create incentives for state governments to delay maintenance and upgrades of key SHs. These sub-standard roads have ramifications for the entire primary network, and the Central Government becomes more amenable to reclassify these as NHs. States that ensure on their own that the SH network is upgraded and maintained may stand to get penalised for their diligence since MoRTH could be reluctant to reclassify such good SHs which require little rehabilitation as it places pressure on exhausting the budget allocation. It is important to reconsider the institutional, policy and budgetary mechanisms that encourage this unhelpful lobbying and punish diligence. As mentioned earlier, there is need for setting down objective criteria for classification of roads.

For capacity augmentation of state highways, every state should formulate programmes on the lines of NHDP and undertake implementation as per priorities identified through traffic surveys, economic and financial analysis of individual project stretches on the SH network. Each state should formulate its own State Highway Development Project (SHDP). The SHDP may comprise schemes of capacity augmentation by two laning, four laning, construction and rehabilitation of bridges, bypasses, replacement of railway crossings and works of riding quality improvements and safety engineering measures. Constitutionally, these roads are to be funded by the states. Central assistance is currently made available from the viability gap funding for projects being implemented under the PPP scheme and some funds for state roads out of CRF. There is a case for enhanced central assistance to make up for the past neglect.

OTHER ASPECTS

Financing of Primary Roads: Financing of the primary roads should continue with the existing Central Road Fund through additional levies on petrol

and diesel. The accruals to the CRF may be enhanced by making levy of cess on fuel on ad valorem basis rather than the current system of a fixed amount of Rs 2.0 per litre, which was fixed in 2005. At that time, the price for petrol was around Rs 40.0 per litre and diesel was around Rs 30.0 per litre. The existing policy of levy of toll on two lane roads needs to be done away with. A two lane highway on the primary network should be viewed as a basic minimum facility and provided through government budget including CRF. For four-lane highways and expressways, the user charge principle should be relied on. The levy of appropriate tolls would help in cost recovery.

Bypasses: While preparing projects for capacity augmentation, the need arises for planning of bypasses around towns to ensure smooth movement of through traffic. In most cases, these bypasses also serve as vehicle for development of the town along or on the other side of the bypass. Therefore, the alignment for such bypasses should be planned jointly by the road agency and the urban development agency. Further, these bypasses should be planned and provided as access-controlled expressway type facilities with entry/exit at predetermined locations. For large size cities (population above one million), bypasses could also be provided in the form of peripheral expressways. The intersection points of bypasses with main highways may also serve as freight logistics parks on case to case basis. The bypasses may preferably be elevated.

Dilapidated and Weak Bridges: Another critical requirement for development of National Highways and state highways relates to the strengthening and widening or reconstruction of several existing bridges that are showing signs of distress. As per the Report of the Working Group on Roads, there are as many as 1,650 bridges on National Highways which are in dilapidated condition which require reconstruction. Similarly, there would be several weak bridges on state highways and major district roads crying for replacement especially semi-permanent timber bridges in the North East region. It is to be recognised that a weak bridge on the section of the corridor can become the bottleneck for efficient movement of heavy loads thus impairing the transport efficiency. It is necessary to put in place a system of regular inspection of all bridge structures, diagnosis of their ill-health and formulation of remedial measures and strategies required for implementation on a defined time-frame. A system of maintaining and updating database on bridge inventory and their condition surveys need to be instituted to enable decision-making regarding their

The efficacy of airports, and especially ports, is greatly diminished when the quality of the connecting road network is poor. Special needs of connectivity to ports, airports, mining areas and development of power plants should be factored in when planning road programmes

maintenance. For the purposes of expeditious reconstruction of these bridges, consideration may be given to initiating a special plan scheme with associated earmarked funding. There are also missing bridges on several large rivers flowing across different areas. It is necessary to identify critical locations that are posing an impediment in opening up of the area. A phased programme of construction of missing bridges should also be undertaken.

Tunnels: In the recent past, tunnel technology has been promoted for both rail and road network. In hill areas, provision of tunnels on selected alignments can help in cutting down not only the distance of travel but also the potential for landslides in cases of hairpin bends requirements as an alternative. Another advantage can be that the road facility is available to the users for a much longer period during winter months.

Special Areas: Besides the programmes noted above, various ministries undertake road construction and development with a mandate to ensure more equitable access to economic opportunities for areas and peoples that have been historically under-served by prior road-building efforts. This may have come about for any number of reasons such as exceptionally difficult terrain, distance or disconnect from the broader Indian economy, historic marginalisation and so on. These special programmes can include road development of all standards from National Highway to village road. Under these programmes, funds are made available for widening and strengthening roads, constructing missing links, building and rehabilitating bridges, culverts and bypasses, and other measures aimed at improving ride quality.

North East: Under Phase A of the Special Accelerated Road Development Programme for North-East region (SARDP-NE) and Special Arunachal Pradesh packages, about 6,400 km of roads will be improved in the North-East states by the end of the 12th Plan period. Projects have been and will be commissioned with private participation when possible.

Tribal and Left Wing Extremism Areas: The Government has also taken up a programme for the development of about 1,120 km of NH and 4,352 km of state roads in Left Wing Extremism (LWE) affected areas as a special project, with the aim of completing all works by March 2015. Some relaxations are

also accorded in guidelines for PMGSY roads in such areas by including all habitations with population exceeding 250. On similar grounds, a special programme for funding road development in Jammu and Kashmir has also been approved.

Industrial Corridors: Several investment regions and areas are proposed along the new Delhi-Mumbai Industrial Corridor, and along future such industrial corridors. These regions and areas will require road connectivity both within the various lands they are developed over, and also to the rail and road network more generally. These greenfield roads must necessarily be built well in advance of actual demand.

Connectivity to ports, airports, power plants, etc: The efficacy of airports, and especially of ports, is greatly diminished when the quality of the connecting road network is poor. Development programmes exist to address this need. The aim is to ensure that each major port has at least four-lane road connectivity. Further, roads to non-major ports can now also be designated as National Highways on a case-by-case basis. Special needs of connectivity to ports, airports, mining areas and development of power plants should be factored in development of the road programmes. In certain cases of power plants, movement of ODCs (Over Dimensioned Cargo) will be involved and this will require advance planning particularly for strengthening of bridges involved and improvement of curves in hilly areas.

Container Freight Stations and Railway Stations: Similarly, there is a need to ensure good connectivity by road to railway stations and container freight stations while formulating plans for development of road network in cities and towns.

Inland Waterways and Water Fronts: Another area that requires attention would be the road connectivity to identified water fronts on the inland waterway network to facilitate smooth cargo entry to and evacuation from the IWT terminal stations.

Highway Facilities: A well-developed road network is also one that is easy and comfortable to use. Depending on traffic volumes, roads should variously offer opportunities for rest breaks, refuelling and meal purchase. Each of these can also be expected to contribute to the overall safety of the network by preventing driver fatigue and timely assistance to vehicle breakdowns. Facilities like parking lots, drinking water stations, snack bars and restaurants, rest rooms, kiosks, information facilities, petrol pumps with service and repair facilities and communication systems should be developed. As several of these facilities are revenue generating enterprises, the private sector may be encouraged and supported to provide for such amenities. The provision of these amenities must form an integral element of the design for both new projects as well as

Table 2.24
Investment Requirements for Expressways (at 2011-12 prices)

PARTICULARS	PERIOD				TOTAL
	2012-17	2017-2022	2022-27	2027-32	2012-32
Physical Targets (km)	500	2,000	4,000	6,000	12,500
Total Investments (Rs billion) including land acquisition	200	600	1,200	1,800	3,800
Of which Private Investment	NIL	100	300	1,000	1,400

for major widening and upgrading of roads. Provision must be made for concomitant land acquisition. For PPP projects, the construction and operation of a specified list of amenities and other project facilities can be attached to the concession agreement. On road stretches constructed directly by the government, wayside amenities should be set up and managed by private enterprises on commercial terms. The provision of such facilities must be commensurate with the buying power of truck and bus drivers along with passengers. (In recent times, some of the facilities built are not affordable for the common trucker).

INVESTMENT REQUIREMENTS:

It is difficult to hazard a precise estimation of physical and financial requirements for development of primary roads without a detailed study of traffic forecasts. However, a broad assessment is presented based on the exercise undertaken by the NTDP Working Group on Roads and taking into consideration the likely lower levels of private sector financing expected in future and constraints of budgetary support. An investment of Rs 21,400 billion for National Highways and Rs 11,600 billion for state highways at 2011-12 prices, spread over 20 years upto the year 2032 could be required. See Tables 2.24 to 2.29 for National Highways (including special programmes and expressways) and Table 2.30 for state highways. Targets for private sector financing are also indicated.

STRATEGIES FOR DEVELOPMENT OF MAJOR DISTRICT ROADS

These roads run within the districts connecting areas of production with markets and serve as connecting links between rural roads and the primary road network and are thus equally vital for agricultural and industrial development of the landscape. However, these roads have not received the desired level of attention and investments in the past. This gap has to be filled to ensure balanced development

of all classes of roads and in all regions of the country. An overall length of 400,000 km as proposed by the Working Group on Roads is recommended as a target network of MDRs. Here too, the strategy should be on consolidation of the road network. Currently, these roads are mostly single-lane with weak road pavement and bridges that are in need of immediate strengthening. A large percentage of these roads are reported to be in bad shape. This is posing a threat to even optimal use of PMGSY roads which are in much better condition. The situation is further aggravated due to movement of overloaded vehicles. Presence of railway level crossings causes undue delay to traffic movement on one side and lowering of speeds to the rail movement on the other. Therefore, the stress should be to accelerate the programme of widening of these roads to regular two lanes, including bridges, and provision of rail over/under bridges on heavily trafficked stretches. Priorities may be governed by the traffic—current and projected. Some limited stretches may requiring four-laning also in later years depending upon the traffic growth witnessed.

Besides two laning, attention would also be required for strengthening of pavement of existing single lane and provision of hard shoulders to enable safe movement of vehicles and preventing such stretches from getting damaged beyond repair and rehabilitation. Programmes of improvement in riding quality with partial strengthening need to be planned and implemented. Several isolated bridges on the MDR network which show signs of distress would also require reconstruction as standalone works.

An investment of Rs 6,000 billion, at 2011-12 prices, spread over the next 20 years is envisaged. See Table 2.31 for broad details.

Currently, the Central Government is providing some funds for these roads out of the CRF but fund-

Table 2. 25
NHDP Proposed Expansion/Improvement 12th Plan and Beyond(2012-32)

PHASES	TOTAL LENGTH (KM)	LENGTH COMPLETED (KM) END MARCH 2012	LENGTH TO BE COMPLETED (KM) BEYOND MARCH 2012
NHDP-I GQ,EW-NS corridors, Port connectivity, etc.	7,522	7,484	38
NHDP-II 4/6-laning N-S,E-W corridors etc	6,647	5,499	1,148
NHDP-III Upgradation, 4/6-laning	12,109	3,643	8,466
NHDP-IV 2- laning with paved shoulders	20,000	0	20,000
NHDP-V 6-laning of GQ and High density corridor	6,500	913	5,587
NHDP-VI Expressways	1,000	0	1,000
NHDP-VII Ring roads, bypasses, flyovers, etc.	700 km of ring roads / bypasses + flyovers	11	689

Table 2. 26
Investment Requirements for NHDP
 (Rs billion)

MODE OF INVESTMENT	2012-17	2017-22	2022-27	2027-32	TOTAL (2012-32)
Public Sector	1,100	1,650	2,000	2,750	7,500
Private Sector	550	700	1,000	1,250	3,500
Total	1,650	2,350	3,000	4,000	11,000

Table 2. 27
Investment Required for Special Schemes
 (Rs billion)

SCHEME	2012-17	2017-22	2022-27	2027-32	TOTAL (2012-32)
SARDP-NE including Arunachal Pradesh	250	400	500	600	1,750
Of which Private Sector	NIL	NIL	50	50	100
Left wing extremism tribal special package for J&K connectivity to ports, airports, E&I	100	150	200	200	650
Of which Private Sector	NIL	NIL	NIL	NIL	NIL
Total	350	550	700	800	2,400
Of which Private Sector	NIL	NIL	50	50	100

Table 2. 28
Investments Required for Non-NHDP National Highways
(Rs billion)

SCHEME	2012-17	2017-22	2022-27	2027-32	TOTAL (2012-32)
Four Laning	30	100	300	600	1,030
Two Laning with Paved Shoulders	270	450	600	700	2,020
Strengthening Weak Pavements	40	50	50	100	240
Reconstruction of Weak Bridges	80	100	100	100	380
Safety Engineering Works	40	50	100	100	290
Miscellaneous Works (bypasses, railway overbridges, etc.)	40	50	50	100	240
Total	500	800	1,200	1,700	4,200
Of which budgetary support including toll and external assistance	450	700	1,050	1,500	3,700
Private Sector	50	100	150	200	500

Table 2. 29
Abstract of Projected Investments for Central Sector NHs Including Expressways and Special Programmes
(Rs billion)

SCHEME	2012-17		2017-22		2022-27		2027-32		2012-32	
	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR
NHDP (NHs)	1,650	550	2,350	700	3,000	1,000	4,000	1,250	11,000	3,500
Non-NHDP (NHs)	500	50	800	100	1,200	150	1,700	200	4,200	500
SARDP-NE	250	NIL	400	NIL	500	50	600	50	1,750	100
Other Special Schemes	100	NIL	150	NIL	200	NIL	200	NIL	650	NIL
Expressways	200	NIL	600	100	1,200	300	1,800	1,000	3,800	1,000
Total	2,700	600	4,300	900	6,100	1,500	8,300	2,500	21,400	5,500

Table 2.30

Proposed Investment for State Highways in The State Sector

(Rs billion)

SCHEME	2012-17		2017-22		2022-27		2027-32		2012-32	
	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR
SHDP for State Highways	1,500	100	2,000	200	2,300	250	2,600	300	8,400	850
Reconstruction of Weak and Narrow Bridges	400	50	500	50	700	100	800	100	2,400	300
Safety Engineering Works	100	NIL	100	NIL	100	NIL	100	NIL	400	NIL
Additions to The SH Network	100	NIL	100	NIL	100	NIL	100	NIL	400	NIL
Total	2,100	150	2,700	250	3,200	350	3,600	400	11,600	1,150

Table 2.31

Proposed Investments for Major District Roads in The State Sector

(Rs billion)

SCHEME	2012-17		2017-22		2022-27		2027-32		2012-32	
	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR
SHDP for Major District Roads	800	NIL	1,000	NIL	1,200	NIL	1,700	NIL	4,700	NIL
Reconstruction of Weak and Narrow Bridges	100	NIL	200	NIL	300	NIL	300	NIL	900	NIL
Safety Engineering Works	50	NIL	50	NIL	50	NIL	50	NIL	200	NIL
Additions to The MDR Network	50	NIL	50	NIL	50	NIL	50	NIL	200	NIL
Total	1,000	NIL	1,300	NIL	1,600	NIL	2,100	NIL	6,000	NIL

Table 2.32
Funding requirement for the completion of PMGSY
 (Rs billion)

Funds Required for Completion of Works Already Sanctioned	342
Funds Required for Works Not Yet Sanctioned	1,814
Total Funds Needed	2,157
Funds Available in 2011-12	200
Net Funding Requirement in the 12 th Plan and Beyond	1,957
	(rounded off) 1,960

Source: Report of Working Group on Roads for the NTDP (May 2012)

ing needs a quantum increase in order to make up for the continued neglect by the states.

DEVELOPMENT OF RURAL ROADS

The design of rural roads must begin by acknowledging the all-or-nothing nature of the village road, and the attendant harsh realities of construction and maintenance. For the vast majority of Indian villages, the village road is the only avenue in and out for people, animals and goods. Contrast this with cities connected together with urban roads or with towns linked by highways, where there are not just alternative roads for transport between points A and B, but also alternatives offered by rail and possibly air. By connecting the village with a district road or highway, the rural road provides faster and better access to markets for the agricultural output of the hinterland, and provides access to social infrastructure including a wider array of education, employment and healthcare opportunities. Often, the absence of a road can mean miles spent traipsing across muddy fields and gullies, enormously raising the costs of engagement with the rest of the world. Indeed, as far as re-distributive policies go, the village road may well offer better value-for-money than any other alternative.

The challenges associated with delivering safe and reliable all-weather rural roads are manifold. First, construction must often take place in remote locales over unyielding terrain. Road design must safely accommodate pedestrians, cyclists, animals, carts, small vehicular traffic, large trucks, and perhaps even heavy machinery (such as for mining) on relatively narrow roads. The opportunity cost of appropriating farmland for wider roads in the face of limited traffic may be prohibitive. However, the relatively lower traffic carried does not justify lethargic maintenance. Where roads are not sealed, they are

prone to being washed away in the annual monsoon. All roads contend with the potholes and obstructions wrought by floods and landslides. If routine maintenance like the upkeep of drainage, clearance of vegetation, and repair of potholes is neglected, it is much more likely that major, more expensive, rehabilitation work will be required sooner than otherwise necessary.

Considerable progress has been made and is continuing under the current PMGSY. The National Rural Roads Development Agency (NRRDA) has developed a common set of engineering standards, contract documents and operating and financing procedures that are applied in respect of rural roads nationwide through the state implementing agencies. For the first time, well-engineered roads are being provided in rural areas. Funding for construction is provided 100 per cent by the Centre, while states are responsible for subsequent maintenance. The programme covers rural roads required for new connectivity (one basic access to unconnected habitation) and upgradation of existing roads (requiring improvement to provide all-weather access). Some dispensations have been given to accelerate the pace of implementation of PMGSY roads in Left Wing Extremism (LWE) affected areas and Integrated Action Plan (IAP) districts and in NE states. This programme is being implemented for the last over 10 years. Investments over Rs 100 billion have been made. This programme is well conceived and its implementation may continue. Main areas of concern emerging relate to assured maintenance, safety and upgradation in areas that have witnessed high agricultural and other economic growth. These aspects need special attention.

The Central Government has recently approved a scheme of PMGSY-II which envisages consolidation of the existing rural road network and cost sharing

Table 2.33
Cost estimates for Universal Connectivity

1. LEFT-WING EXTREMISM/INTEGRATED ACTION PLAN DISTRICTS (LWE/IAP)*	NUMBER	LENGTH (KM)	AMOUNT (RS BILLION)
i Habitations with Population Above 250	800	3,200	160
ii Habitations with Population Between 100 and 249	9,000	38,680	193
iii Additional Funds for Bridges and Drainage			149
Total for LWE/IAP districts			502
2. Other habitations			
Total Unconnected Habitations**	120,000	250,000	1,250
Total for Universal Connectivity			1,752

Estimates by MORD ** Quick estimates based on MORD-Rural Road Development Plan: Vision 2025

by the States. The selection of roads would be with the objective of identification of rural growth centres and other critical rural hubs.

The state governments have also been undertaking their own investments in provision of rural roads to connect other villages/habitations not eligible under the PMGSY or Bharat Nirman. This has helped in accelerated development of rural areas. The implementation needs to continue as per the district level core road network plans of the state governments. There is a need for expansion of the current mandate of PMGSY to achieve universal connectivity as these roads serve as entry point for poverty alleviation and provision of access to social infrastructure such as education and health, besides market. In order to estimate the overall requirements of rural connectivity, proper GIS maps should be generated covering habitations of various population sizes in terms of new road links and those requiring upgradation.

These roads can stay as single lane roads in view of low volume of traffic likely to prevail. However, some roads under this category could witness volumes that may justify widening to intermediate or two lanes. Some states like Punjab and Haryana are providing such facilities. Provision should be made accordingly in other states as well.

Fiscal federalism would suggest that since rural roads serve as a prime redistributive tool in the government's armoury, they should continue to be funded by grants from the Centre. It is proposed that for financing of these roads, the current CRF accruals

and RIDF window of NABARD may need to be augmented. The strategy of some states to raise funds through market committee fees on agricultural produce is commended for being emulated by other states as well. Some funds for earth work for example may be leveraged from MGNREGA schemes.

For completion of the PMGSY programme remaining at the end of 11th Five Year Plan, an investment of Rs 1,957 billion is estimated to be required. See Table 2.33. An amount of Rs 1,265 billion has been allocated for the 12th Plan (2012-17). Obviously, the programme would spill over to the 13th Plan.

As mentioned earlier, the programme needs to be extended to cover LWE/IAP districts and universal connectivity to habitations above population 100. This would require investments to the tune of another Rs 1,752 billion (Table 2.33)

In addition, need will arise for upgradation of the core road network which is not covered under the PMGSY and strengthening of pavement of PMGSY roads at the end of their design life. As per District Rural Roads Plans finalised by the states, the length of core network of rural roads is 1,134,114 km. Of this, a length of 374,844 km is covered under PMGSY. This leaves a length of about 750,000 km that is not covered under the PMGSY scheme. The estimated cost of upgrading and strengthening of pavement would be Rs 2,000 billion.

From the above, it will be seen that an investment of Rs 5,700 billion, at 2011-12 prices would be required

Table 2.34

Investments Requirements for Rural Roads (2012-32) (Budgetary Allocations) (Rs billion)

PROGRAMME/PROJECT	2012-17	2017-22	2022-27	2027-32	TOTAL
Balance of PMGSY	1,090	860	--	--	1,950
LWE/IAP Districts	175	200	125	--	500
Other Lower Size Habitations	185	290	675	100	1,250
Upgradation	--	500	500	1,000	2,000
Total	1,450	1,850	1,300	1,100	5,700

over the next 20 years for development of rural roads. Table 2.34 gives the broad phasing. These are to be budgetary allocations only as no private sector financing is envisaged.

OVERALL INVESTMENTS REQUIRED

An abstract of the overall investments required for the road infrastructure in the next 20 years is provided in Table 35. Broad assessment of private sector financing is also shown. Annual investments of the order of Rs 1,450 billion in the 12th Five Year Plan to increase to Rs 3,000 billion in the 15th Five Year Plan are envisaged. Of these, private sector financing may be of the order of 10 to 15 per cent as only part of the road network can be taken up on PPP basis.

MANAGEMENT AND PRESERVATION OF ROAD ASSETS

The absolute and opportunity costs of providing and maintaining roads for society at an acceptable serviceability level is high: for every km of district road we might instead choose to provide primary education for several children; for every km of expressway we may instead bring power to several villages. It is therefore essential to ensure that road assets do indeed supply a quality of transportation that is commensurate with the funds applied, and that this is not compromised over time for want of maintenance and repair.

The current replacement value of the existing road network defies precise estimation, given that there is no sustainable system of updating inventory and

condition assessment of roads and bridges at present. A ballpark figure of Rs 10,300 billion is claimed by some experts as a broad asset base of the road network. Even if such an assessment would be and could be debatable, for a policy dialogue, there can be no two opinions that to ensure continuity of benefits of the road infrastructure being developed at huge cost to the economy, the road agencies must preserve, operate and maintain the assets.

The vicious cycle of build, neglect and rebuild has to be broken. While PPP approaches have helped in taking care of operation and maintenance needs of roads built during the concession period which extends to 15-20 years, this addresses the issue for only part of the overall road network.

Timely and adequate maintenance of the existing road network does not admit of any laxity. It is an economic necessity as otherwise, erosion of asset base will get accelerated. Challenges will grow as the road network ages and traffic increases occur. Box 2.12 provides an example of Asset Management core principles of national highway network in South Africa.

It will be advisable for the road agencies to institute road network asset management systems. This will involve specifying asset performance indicators for each road class, scientific condition assessment and determination of priorities for maintenance interventions on rational basis.

Information pertaining to the consolidated inventory of road assets needs to be maintained and updated at

Table 2.35
Projected Investments for Road Infrastructure
(Rs billion)

SCHEME	2012-17		2017-22		2022-27		2027-32		2012-32	
	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR	TOTAL	PRIVATE SECTOR
Expressways	200	NIL	600	100	1,200	300	1,800	1,000	3,800	1,400
National Highways	2,150	600	3,150	800	4,200	1,150	5,700	1,450	15,200	4,000
Special Schemes (central sector)	250	NIL	400	NIL	500	50	600	50	1,750	100
Other special schemes (central sector)	100	NIL	150	NIL	200	NIL	200	NIL	650	NIL
State Highways	2,100	150	2,700	250	3,200	350	3,600	400	11,600	1,150
Major District Roads	1,000	NIL	1,300	NIL	1,600	NIL	2,100	NIL	6,000	NIL
Rural Roads including PMGSY	1,450	NIL	1,850	NIL	1,300	NIL	1,100	NIL	5,700	NIL
Total	7,250	750	10,150	1,150	12,200	1,850	15,100	2,900	44,700	6,650

regular intervals. At present, very limited information is available regarding the road inventory, available Right of Way (ROW), etc. A proper system shall have to be developed for creating the database based on actual ownership details supported by legally acceptable documentation and with support for periodic updating of the database. Formats should be developed to compile the information starting from Panchayat and block levels, and compiled for each state on GIS platform. The data should be available in electronic form with facility for real-time updating as and when land is acquired to augment the existing ROW. Further, there should be facility to add to the inventory in case of newly declared NH or Expressways, etc.

Various Finance Commissions also laid stress on maintenance management of the road network and recommended central grants for state roads besides

budgetary allocations by the state governments under the Non-Plan Head.

The road agencies are not the users of the road network. That might partially explain why there is weak planning and implementation of road maintenance operations. It is necessary to change this laissez faire attitude. Every road agency should prepare an Annual Asset Management Plan for roads within its jurisdiction, which as a minimum should include:

- Inventory of assets (pavements, bridges, safety appurtenances, etc.)
- Network condition, pavement serviceability index, bridge structural index
- Assessment of maintenance treatment required for each road link based on condition, traffic, importance of road
- Annual maintenance plan based on available/allocated budget
- Impact on deterioration and performance

Box 2.12

Commercial Management of A National Road Network: The Case of South Africa

Management of South Africa's national road network exemplifies successful implementation of asset management core prescriptions.

Ownership of all national roads is vested in a commercial company, SANRAL, which is wholly state-owned and accountable to the national government for the satisfactory performance of the assets (provincial and municipal roads are managed separately). The agency is governed by an 8-member board that comprises 2 government officials appointed by the Minister of Finance and Minister of Transport, 5 private members appointed by the Minister of Transport, and SANRAL's chief executive.

Spending is prioritized and justified by holistic economic life-cycle costing, using the HDM-4 model. Management of assets is financed by a blend of the national budget (13,050 km of network), and user toll revenues and borrowing (3,120 km of network), mostly secured by road assets and sovereign guarantees.

SANRAL is run as a semi-private company, operating under a shareholder agreement and a performance agreement to manage the national roads. It must adhere to the Public Financial Management Act (PFMA) because it is executing public funds, and must follow financial reporting requirements under the Companies Act. However, as a company it may operate with its own procurement rules that comply with PFMA, and human resource policies which permit performance incentives and market-based remuneration.

Government requires all agencies – SANRAL, provinces and municipalities – to prepare a multi-year business plan as the basis of their multi-year budget submission, and to manage their roads under a network management system, which includes regular monitoring and reporting of road conditions. SANRAL, with its clear business model and a comprehensive asset management system, has been consistently successful in achieving its performance targets.

Developed over twelve years, this institutional model has reached a maturity that enables it now not only to fund and manage existing national road assets, but also to sustainably finance major investment in expansion of the network to meet surging economic growth in the country. The South Africa National Road Agency Limited (SANRAL) was established in 1998 as a limited liability company, wholly owned by the government. This board reports to the Government through the Minister of Transport. SANRAL's functions and operations were defined in an act of parliament, which provides some protection from political pressures.

Source: World Bank paper for NTDP on Road Asset Management by Clell Harral et al. (May, 2011)

of the road network for which funds are not allocated.

For primary roads, there is need for non-engineering aspects as well. This would include land management by way of prevention of encroachment, control on ribbon development, regulation of access on existing highways and use of ROW by utility agencies. Incident management and highway police patrol are other activities that should become integral part of O&M provisions. The Control of NHs (Land & Traffic) Act, 2002 was promulgated giving quasi-judiciary powers to Highway Administrations. The provisions under this Act inter-alia delegates authority to remove encroachments, prevent occupation of or damage to NH land and control access on NH land. The Act stipulates punitive measures for the offences committed (which are deemed as cognizable) in violation of its stipula-

tions. However, there is lack of enforcement of the provisions of the Act, partly due to want of appropriate management and monitoring systems. Adequate support from state governments and law enforcement agencies is critical. It is of paramount importance that proactive support and assistance is available to the Highway Administrations from the District Administrations so that the provisions of these legislations can be effectively implemented. Similar frameworks may be evolved for all categories of roads on the lines of the Control of NHs (Land & Traffic) Act, 2002.

The government may also consider not to treat maintenance of roads as a non-Plan activity so that it does not suffer ad-hoc cuts as is the current experience. Plan funds should be used for maintenance of existing road assets to the extent necessary to bridge the gap between maintenance requirements and allocation.

Box 2.12A

Performance-Based Contracts for Road Rehabilitation and Maintenance: Argentina's Experience

At the start of the 1990s, Argentina had the lowest share of roads in good condition among upper-middle-income countries. Due to previous neglect and mismanagement, more than a third of the national paved network was in poor or even critical condition. Today, informed observers consider Argentina one of the best performers in Latin America in implementing sustainable maintenance and rehabilitation of a large part of the national road network.

To achieve this transformation, over the past fifteen years, the national roads department has put in place several effective policies aimed at this goal. A central instrument is the award of long-term contracts for rehabilitation and maintenance of main roads, with maintenance being paid for on the basis of performance standards met, rather than on the basis of inputs employed. Argentina's experience with this innovative approach, known as a 'rehabilitation and maintenance concession' (in Spanish 'concesión de rehabilitación y mantenimiento' or CREMA) has been very successful. It illustrates the following core prescriptions:

- Expenditure priorities determined by life-cycle analysis of road agency costs
- Sustained funding
- Outsourcing the execution of works to access the flexibility and incentives for efficiency of the private sector under contractual structures that closely align incentives with the public interest
- Clear accountability supported by quantitative performance measurements.

The concept underpinning CREMA was to contract out packages consisting of road rehabilitation followed by routine maintenance over a period of five years, to be paid for on a lump-sum basis against indicators of road condition. This concept was generated locally, from within the national roads department (known in Spanish as 'Vialidad'). This packaging of routine maintenance with rehabilitation followed a trial period, starting in 1994, of contracting out only routine maintenance. It embodied three principles: (i) long-term contract for routine maintenance; (ii) pay against results; and (iii) the basis for paying would reflect the road users' view of road condition.

The contracts specify several indicators, with penalties for non-performance. After the first three years, 600 certificates for non-compliance had been issued over the 60 contracts awarded, and penalties amounting to 1 per cent of the total amount of the contracts had been withheld from payments.

CREMA contracts now cover over 90 per cent of the whole national paved network, about 19,000 km, at a rate of about \$20,000 per km, for a total of about \$380 million per year. The total budget allocation for national roads in 2006 was about \$1.0 billion (0.5 per cent of GDP).

Source: World Bank paper for NTDP on Road Asset Management by Clell Harral et al. (May, 2011)

The states have been steadily reducing their gang labour and increasing maintenance works through private contractors. This has been the right approach. While existence of some gang labour may be useful particularly for emergency situations and disaster management under conditions of earthquakes, landslides, cyclones, etc, there is a need to move to standalone long-term performance-based maintenance contracts where capacity augmentation may not be required in immediate future. Box 2.12A gives an example of Argentina's experience on such contracts.

Currently, there is weak enforcement of maintenance performance standards on the roads particularly the primary road network being managed by the concessionaires. Enforcement of performance standards

by the government through a well laid down mechanism is essential and road agencies responsible for execution of maintenance works made accountable. The road agencies need to borrow a leaf out of the railway book with responsibility assigned to an Executive/Assistant Engineer for the upkeep of the road segment assigned to him. For enabling him to do so, sufficient funds should be made available to him together with supervision facilities.

The states should encourage citizen and user oversight through undertaking road user satisfaction surveys. To start with, structured questionnaire and analysis of response can bring out road user satisfaction index on various stretches of the primary road network. This should include the projects awarded to BOT concessionaires as well. This will strengthen

Box 2.13

Maintaining Rural Roads: Lessons from Around The World

Rural road co-operatives for maintenance—the Finnish experience

The Government of Finland has promoted rural road maintenance using road co-operatives. A road co-operative is a rural road maintenance organisation whereby people living along a road accept responsibility for its maintenance. The Finnish Government has provided a legal framework which stipulates the right-of-way, cooperative ownership, and the formula for distribution of maintenance costs amongst the road users and property holders along the road. Participation in the road co-operative is compulsory for property owners who use the road. The cost of road maintenance is shared amongst the members of the co-operative depending on the benefits to each member in the form of the size of the holding and the created traffic. Each co-operative holds an annual general meeting to decide the fees, to accept new members and to audit the previous year's accounts.

Routine maintenance by Community Based Micro-enterprises in Peru

In Peru, the Rural Roads Project (RRP) has set up a cost-effective routine maintenance system based on contracting out labour-intensive maintenance works to micro-enterprises, local co-operatives and other community based organisations. The composition of these entities varies according to the size of the road. Their average size is about 13 people and the average length of the road covered is about 36 km. Priority is given to unemployed people with prior experience in construction works.

The micro-enterprises are engaged through performance based contracts with the Peru Roads Department and paid on a monthly basis. The micro-enterprises are self-governing, and determine how the monthly payment is allocated to the various uses: wages, tools, rentals, transportation, savings and other investments.

Micro-enterprises carry out simple works continuously throughout the year, to clean the ditches and culverts, control vegetation, fill potholes and ruts, maintain the surface camber, remove small landslides, and undertake other emergency works. They have also demonstrated capacity to build retaining walls and small bridges and handle El Nino emergency works under the guidance of the highway authority.

Source: IDFC Infrastructure Report 2007

the government oversight on enforcing performance standards from the private sector.

There is a case for a dialogue with the contracting industry to support them in creating a dedicated band of contractors who specialise in undertaking O&M works on the road network. This will improve maintenance delivery on the ground and also act as a good resource partner of the BOT concessionaires during the operation period. For rural roads, local small contractors may be utilised in area-based contracts and gradually involve local community with technical support from road agencies. Box 2.13 gives examples from Finland and Peru.

SUMMARY AND CONCLUSIONS

- i Road development should not be seen in isolation but as part of an integrated modal

system of transport. For facilitating such a process, it is necessary to undertake regional traffic and transport surveys on regular basis—preferably every five years (to provide inputs to formulation of Five-Year Plans and mid-course correction of policy prescriptions formulated for long-term development goals) of the freight and passenger flows, transport pricing, resource costs and identify existence of distortions in the movement from point of view of a desirable/optimal intermodal mix and investment policy for different modes of transport. Database in the road sector is virtually absent. This needs serious attention. Setting up of a dedicated road data centre managed through a high level institution does not admit of any delay. This would help in reducing the current ad-hoc decision making in the road development planning process.

The existing policy of levy on two-lane roads needs to be done away with. A two-lane highway on the primary network should be viewed as a basic minimum facility and provided through the government budget

- ii Current system of road hierarchy and classification dates back to 1943 when the Indian Roads Congress formulated the first Long Term Road Development Plan. The road network is divided into five classes—National Highways, State Highways, Major District Roads, Other District Roads and Village Roads. It is recommended that the division of the network may be confined to three categories—primary, secondary and tertiary. Primary roads may encompass both national and state highways. Secondary roads may include current major district roads. Tertiary roads could be termed rural roads and comprise of both other district roads and village roads. Expressways need not be a separate class but these may be considered as part of primary road network since they are highways with features of full access control and limited to movement of motorised traffic. An independent road classification commission comprising of administrators, economists, geographers and road engineers under the umbrella of proposed Office of Transport Strategy should be set up. It should lay down clear, objective criteria for which authority holds the administrative mandate over a particular class of road. It should do so from a holistic network planning perspective that maximises the efficiency of each class. There is also need for introducing systematic numbering of different classes of roads as per international practice. For each class of road and traffic groupings, the standards should be uniform both in design and translation on ground.
- iii The existing network of National Highways and state highways may be expanded in tune with the economic growth and development of industrial hubs, special economic zones, ports, tourist centres and connectivity to international routes – linkage with Asian Highways and European Road Network. At the same time, since the main function of the primary system is mobility and enhanced productivity of road transport, stress should be laid on consolidation of this network in terms of capacity augmentation through multi-laning of existing highways and provision of access controlled expressway facilities. An overall length of 100,000 km of NHs and 200,000 km of SHs should be largely adequate for the country. This may also include about 20,000 km of access controlled expressways.
- iv For capacity augmentation of National Highways, the current programme of NHDP in seven phases is well conceived and its implementation may continue in the immediate term, i.e. the 12th Five Year Plan. Within these phases, the programme relating to widening of single lane roads to two lanes deserve to be accelerated for reasons of enhancing safety and energy efficiency. Six-laning of existing roads without access control has potential of being more accident prone. As such, the programme relating to six-laning of existing four-lane stretches need to be stopped and where traffic volumes are beyond four-lane capacity, consideration given to provision of expressway network. In order to improve transport efficiency and enhance safety, all four-lane and six-lane existing roads need to have service lanes to cater to the requirements of local (both motorised and non-motorised) traffic so as to bring in an element of partial access control on such facilities. Provision of wayside amenities along the highways is becoming an integral part of the road projects. Such facilities should be provided by the private sector.
- v For capacity augmentation of state highways, every state should formulate programmes on the lines of NHDP and undertake implementation as per priorities identified through traffic surveys, economic and financial analysis of individual project stretches on the SH network.
- vi Financing of these roads should rely on user charge principle in the form of tolls as direct beneficiaries and continuing with the existing Central Road Fund through additional levies on petrol and diesel. The existing policy of levy of toll on two lane roads needs to be done away with. A two lane highway on the primary network should be viewed as a basic minimum facility and provided through government budget including CRF. The accruals to the CRF may be enhanced by making levy of cess on fuel on ad valorem basis rather than the current system of a fixed amount of Rs 2.0 per litre, which was fixed in the year 2005. This may be enhanced to Rs 4.0 per litre to enhance the accruals to meet the project investment requirements. Some states have constituted state road funds to provide assured funding for the state sector road projects. This is a good strategy and worthy of upscale by other states as well.

- vii While preparing projects for capacity augmentation, the need arises for planning of bypasses around towns to ensure smooth movement of through traffic. In most cases, these bypasses also serve as a vehicle for development of the town along or on the other side of the bypass. Therefore, the alignment for such bypasses should be planned jointly by the road agency and the urban development agency. Further, these bypasses should be planned and provided as access controlled expressway type facilities with entry/exit at predetermined locations. For large size cities (population above one million), bypasses could also be provided in the form of peripheral expressways. The intersection points of bypasses with main highways may also serve as freight logistics parks on case to case basis.
- viii Another requirement relates to reconstruction of dilapidated and weak bridges which are showing signs of distress and crying for replacement. There are also missing bridges on large rivers needed for opening of the area.
- ix Special needs of connectivity to ports, airports, mining areas and development of power plants should be factored in development of the road programmes. In certain cases of power plants, movement of ODCs (Over Dimensioned Cargo) will be involved and this will require advance planning particularly for strengthening of bridges involved and improvement of curves in hilly areas.
- x It is difficult to hazard a precise estimation of physical and financial requirements for development of primary roads without a detailed study of traffic forecasts and inventory of existing road network. However, a broad assessment is presented based on projections by the Working Group on Roads and deliberations within the Committee.
- xi The Major District Roads run within the districts connecting areas of production with markets and serve as connecting link between the rural roads and the primary road network and are thus equally vital for agricultural and industrial development of the landscape. Somehow, these roads have not been receiving the desired level of attention and investments in the past. This gap has to be filled to ensure balanced development of all classes of roads and in all regions of the country. An overall length of 400,000 km as proposed by the Working Group on Roads is recommended as a target network of MDRs. The stress should be to accelerate the programme of widening of these roads to regular two lanes including bridges and provision of rail over/under bridges on heavily trafficked stretches. Priori-

The cess on fuel should be on ad valorem basis rather than the current system of Rs 2 per litre, which was fixed in the year 2005

ties may be governed by the traffic—current and projected. Some limited stretches may require four-laning also in later years depending upon the traffic growth witnessed.

- xii Considerable progress has been made and is continuing under the current Pradhan Mantri Gram Sadak Yojana for providing connectivity to villages with all-weather roads. This programme is being implemented by the states with good managerial and technical support by the Centre. For the first time, well-engineered roads are being provided in rural areas. Hundred per cent fund for construction is by the Centre. The states are responsible for subsequent maintenance. The programme covers rural roads required for new connectivity (one basic access to unconnected habitation) and upgradation of existing roads (requiring improvement to provide all-weather access). This programme is well-conceived and its implementation may continue. The main areas of concern emerging relate to assured maintenance and upgradation in areas that have witnessed high agricultural and other economic growth. These aspects need special attention. The Government of India has recently approved a scheme of PMGSY-II which envisages upgradation of existing major rural links to rural growth centres where cost of upgradation will be shared by states also. There is a need for expansion of the current mandate of PMGSY to achieve universal connectivity as these roads serve as entry point for poverty alleviation and provision of access to social infrastructure such as education and health besides market.
- xiii The overall investments required for the road infrastructure in the next 20 years is given in Table 2.35. Broad assessment of private sector financing is also shown. Annual investments of the order of Rs 1,450 billion in the 12th Five Year Plan to increase to Rs 3,000 billion in the 15th Five Year Plan are envisaged. Of these, private sector financing may be of the order of 10 to 15 per cent as only part of the road network can be taken up on PPP basis.
- xiv The road agencies are not the users of the road network. That might partially explain why there is weak planning and implementation of road maintenance operations. It is necessary to change this *laissez faire* attitude. Both the Central and state governments should declare as a policy that the roads would receive dependable

States should encourage citizen and user oversight through undertaking road user satisfaction surveys. This should include the projects awarded to BOT concessionaires as well. This will strengthen government oversight on enforcing performance standards from the private sector

and adequate allocation of funds on a continuous basis. A system of working out the replacement value of the road assets at the end of each financial year should be established by every road agency for roads under its jurisdiction. The information relating to road asset value should be put on a website in public domain. The government may also consider not to treat maintenance of roads as a non-Plan activity so that it does not suffer ad-hoc cuts as is the current experience.

- xv There is need to move to long-term performance-based maintenance contracts where capacity augmentation may not be immediately required. Projects under the PPP mode have in-built provision for maintenance and operation during the concession period. Enforcement of performance standards by the road agencies through a well laid down mechanism is essential and field engineers responsible for execution of maintenance works made accountable.
- xvi The states should encourage citizen and user oversight through undertaking road user satisfaction surveys. This should include the projects awarded to BOT concessionaires as well. This will strengthen the government oversight on enforcing performance standards from the private sector.
- xvii There is a case for a dialogue with the contracting industry to support them in creating a dedicated band of contractors who specialises in undertaking O&M works on the road network. This will improve maintenance delivery on the ground and also act as a good resource partner of the BOT concessionaires during the operation period.
- xviii Technology for maintenance also needs a quantum jump particularly in respect of primary and secondary roads.
- xix For primary roads, non-engineering aspects should include land management by way of prevention of encroachment, control on ribbon development, regulation of access on existing highways and use of ROW by utility agencies. Incident management and highway

police patrol are other activities that should become integral part of O&M provisions.

- xx The state transport authorities also need to support the road agencies in enforcing axle load limits of vehicles particularly trucks as overloading is seen to damage the roads prematurely.
- xxi Annual allocations required for maintenance should be worked out by each road agency for the roads under its jurisdiction based on asset management principles and traffic and road condition observed on the system. This should be a first charge on the available resources.

Delivery of Road Programmes

IMPLEMENTATION CHALLENGE

In evaluating the desired contours of India's road network, there are two basic questions that demand answers. First, is it possible to transport oneself or one's goods from points A and B within India? For the most part, the answer to this is, undoubtedly, yes. There will invariably be the extremely remote villages and settlements where the local terrain make it difficult for such habitations to be formally connected with the road network. Leaving these special cases aside, it does seem that India's road network in 20 years time will allow seamless transit between any two given points on the map. A more pertinent question that arises is how to enhance cost effectiveness and efficiency of delivery of the road development programmes without compromise on safety, quality and sustainability of assets. This would call for capacity building of the road agencies and the private sector, revisiting of road standards and sensitising road engineers so that road safety and environment mitigation measures become integral part of road design.

REVISITING THE MORTH

Currently, the Ministry of Road Transport and Highways is responsible for development and maintenance of National Highways on behalf of the central government. For implementation of works on the ground, there are three agencies: National Highways Authority of India, Border Roads Organisation, and State Public Works departments

The NHAI is the arm of the MoRTH for execution of NHDP. Works on National Highway stretches in the border areas of the country are entrusted to the BRO. The works on all other National Highways are executed by the Public Works departments in the states for the stretches within their respective jurisdiction. The designs and preparation of projects is handled by the state PWDs and their technical and

financial sanction as per plan programmes and budget earmarked are issued by the MoRTH. Thereafter, awarding of contracts and implementation are undertaken by the state PWDs on agency basis.

With the NHAI having become operational through successful implementation of the NHDP, there is need to review the current structure of the MoRTH and expand the mandate of the NHAI. The objective should be for the MoRTH to entrust all National Highways and National Expressways to NHAI with proper restructuring of NHAI and only planning, policy and budget functions should remain with the MoRTH.

HUMAN RESOURCE DEVELOPMENT

At present, there is an acute shortage of skills at all levels and in all spheres of activity related to road infrastructure development. Indeed, this paucity of skilled manpower is emerging as the weakest link in ensuring that India can efficiently deliver on the road network it needs. It is imperative that central and state governments attach high priority to building capacity in the highways sector.

TRAINING NEEDS ASSESSMENT

As a first step, a comprehensive survey of the training needs of all road agencies responsible for the delivery of various programmes is required. While undertaking this exercise, attention should also be focused on training of supervisors and junior engineers who have so far largely been neglected by formal skills enhancement programmes. Associations and federations of contractors also need to provide a similar assessment of the skills gaps extant in their areas of operation. The assessments should be undertaken both in headcount as well as in qualitative terms.

PLANNING FOR EDUCATION AND TRAINING

On induction to an organisation, every new staff member should be given a comprehensive orientation course on various responsibilities and duties expected. A specified proportion of mid level officers (at least 5-10 per cent every year) in road agencies of the states and the central governments should be encouraged to go in for M.Tech/Ph.D courses in various disciplines of highway engineering and construction management. We must target that at least 3,000 engineers belonging to road agencies in the Centre and the states have a minimum of M.Tech/Ph.D. qualifications. In order to utilize their talents, new positions will have to be created in the various departments which allow them to use their knowledge.

The Indian Academy of Highway Engineers (formerly known as the National Institute for the Training of Highway Engineers) is currently the apex Institution for training of highway engineers, functioning

under the aegis of the Ministry of Road Transport and Highways. Besides providing training to engineers of central and state governments, it imparts training to engineers of consultants and contractors (Box 2.14 for brief activities of IAHE). It also organises site visits to marquee construction sites and built projects. There is need for considerable investment in IAHE for enabling them to effectively discharge its mandate. A minimum of 20 to 30 full time faculty and commensurate support technical and secretariat staff should be in place. The faculty should comprise both educationists and practicing engineers. IAHE should also tie-up with business schools in the country and abroad so that our engineers may also be exposed to tailor-made management courses. The state governments should also strengthen their state level training centres with support of local academic institutions.

Attention should be paid to training needs of supervisors and junior engineers who have so far been neglected by skills programmes

To prevent ossification of skills in the face of continuously changing technologies and design principles, continuing education must form an essential part of every highway engineer's career. The requirement for specialisation and skill development of officers of the road agencies in core processes of planning, design, preparation of sound feasibility reports and detailed project reports, project development and financial appraisal for BOT projects, social and environment concerns, traffic studies, contract management, etc. should receive regular attention. The training plans should also include study tours of projects in India and abroad by a group of officers from different states and the central government; and post-graduation in various disciplines of highways from prestigious universities in UK, USA, Australia, etc.

It is very important that all road agencies of the states and the central governments make provision for lateral entry of professionals mid-career and senior levels through open competition. Relevant rules and procedures will have to be devised for this. In addition officers may be admitted on deputation from industry and academic institutions for periods of one to three years. It is possible that some of these professionals may opt for lateral entry into these departments eventually if they find the work more rewarding than at their parent institution. Similarly, officers from state and central road agencies should be encouraged to take up short-term deputations in academic institutions and the private sector.

Box 2.14 Indian Academy of Highway Engineers (IAHE)

An apex institution of excellence for training of highway engineers in road sector – both at entry level and during the service.

Mission: Bring in efficiency and value for money in planning, design, construction and maintenance of roads in the country and inculcate leadership quality, professionalism and commitment to excellence among the highway engineers.

Initiative of Ministry of Road Transport and Highways Established in 1983. Campus in NOIDA. Collaborative institute of the Central and State Governments.

Organises training for government, contractors and consultants at both national and state levels, also conducts programmes in various states (inset above).

Also imparts training to highway engineers from SAARC and African countries.

Has an excellent infrastructure: lecture halls, seminar halls, auditorium, hostel, Board room, office block, canteen, recreation facilities, library, computer lab, soil testing lab, staff quarters (spread over an area of around 10 acres)

Types of Training Courses

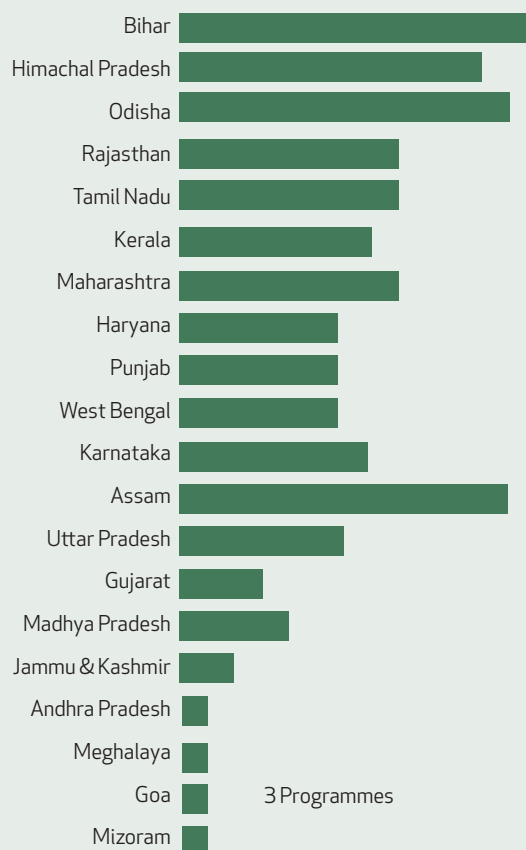
- Foundation Courses (for newly recruited Engineers)
- Refresher Courses
- Orientation Courses
- Specialised Areas of Highway Engineering
- Contract Management
- Highway Management and Administration Programmes
- Management Development Programmes

Mode of Training

- Lectures
- Case Studies
- Group Discussions
- Multimedia Presentations
- Site Visits & Field Attachments
- Laboratory Practice
- Software Packages
- Video Films



Programmes conducted in various states



Box 2.15

National Academy of Construction (Hyderabad)

(A Model Agency for Training in Construction)

Initiative: Government of Andhra Pradesh set up the Academy in 1998 as a Society; managed by Board of Governors chaired by the Chief Minister, Andhra Pradesh.

Mission: Improving efficiency and productivity of the Indian Construction Industry

Core Activity: Training of workmen, supervisors, managers, contractors and engineers in the field of construction.

Funding: 0.25 percent (recently reduced to 0.10 percent) deduction from the bill payments of contractors in the state.

Objectives:

- i Basic skill training for general/specialized construction trades
- ii Upgradation of skills in contract management practices of government, corporate and contractors managers.
- iii Quality supervision, stores management and surveying.
- iv Training of Trainers

Methodology:

- i Structured courses for training (theory and practice)
- ii Group discussions
- iii Workshops, seminars, conferences, symposia
- iv On-job experience, visit to project-sites

Faculty: Both core and guest faculty

Infrastructure: Spread over an area of 167 acres (land allotted by the state government), the Campus has a very good infrastructure consisting of class rooms, workshops, auditorium, seminar halls, office block, board room, hostel, canteen, recreation facilities, shopping centre, exhibition halls, etc.

Example of competencies provided to works supervisors

Surveying; marking out; estimating; costing and quantity surveying, roads and cross drainage works with quality control as per IRC/MORTH/MORD specifications, on-job experience with leading construction companies.

Certificate of Competency is awarded by NAC under authorization by the Ministry of Labour & Employment, Government of India

Training efforts directed at contractors' staff must be an essential part of the agreement signed between the contractor/concessionaire and commissioning agency. The government should support the construction industry in strengthening existing training centres and ITIs. For skill upgradation of construction workers, equipment operators and supervisors, an initiative was taken by the state government of Andhra Pradesh to set up National Academy of Construction in Hyderabad. Box 2.15 gives a snapshot of its activities. Such an example needs to be replicated in each state.

Some of the leading construction contractors like Larsen & Toubro have set up their own institutes and centres throughout the country (Box 2.16).

Once a critical mass of skilled engineers, construction workers, and equipment operators is assured, the construction industry should be encouraged to

adopt a formal system of apprenticing to provide a practical supplement to more academic training efforts. Box 2.17 brings out the skills development strategy for construction workers in the road sector that can be adopted.

FUNDING OF TRAINING PROGRAMMES

Sufficient funds must be budgeted by the various stakeholders—government, contractors and consultants—for training. Government road agencies should make a provision of 0.25 per cent of the project cost in each estimate towards staff training to cover course fees, travel to training centres, per diem allowances, and expenses of institutions in imparting training. In consultation with the Ministries of Finance and Labour & Employment, 0.25 per cent of the cess collected under the Construction Workers Welfare Cess Act, 1996, should be earmarked for training of construction workers.

Box 2.16

L&T Construction Skills Training Institute

Mission: Empowering and building careers for rural youth through skill training. Enhance productivity of men and machines in construction projects.

Objectives:

1. Train construction workforce to meet demand for construction skills in terms of safety and quality of workmanship.
2. Identify training needs and set standards for occupational competencies.
3. Testing and certification to validate competency levels.
4. Facilitate training by setting up modular training schools.
5. Serve social objective of channelizing the potential and strength of rural youth for producing employable construction workforce.

Courses offered: Formwork, carpentry, bar bending, masonry, electrical, scaffolding, pre-stressing.

Training period: 200 hours to 600 hours (one month to three months)

Methodology:

1. Preparation of skill standards, training modules
2. Trade Testing
3. Three distinct levels (level III basic, level II intermediate and level I high)
4. Coverage is 80 per cent practical and 20 per cent classroom

Mainstreaming: Via certification through approved National Certifying Authorities

Spread: Chennai, Mumbai, Ahmedabad, Bangalore, Delhi, Kolkata, Hyderabad and Cuttack

Source: L&T Limited, ECC Division

This will usefully benefit other construction-reliant industries as well.

SKILLS INVENTORY

There are several areas for training in the highway sector to which the stakeholders in the road sector should be exposed. An indicative list of possible areas for skill enhancement in the highway sector is given in Box 2.18.

TRAINING STRATEGY

MoRTH in consultation with the Ministry of Rural Development and state governments may take the lead in formulating a training strategy for the road sector in India. Such a strategy may cover:

- All stakeholders: Road agencies, contractors, consultants.
- Different aspects: Project management, quality assurance, legal, contract administration, dispute resolution, public private partnership approaches, social and environment aspects, safety.
- System of incentives: Weightage in construction contracts to workers and site engineers who hold competency certificate from accredited training institutions.
- Financing strategies: Both government budg-

et and private sector.

- Institutional framework: Strengthening and networking of existing training and academic institutions, collaboration with international agencies.

INDIAN ROADS CONGRESS

Currently, the IRC mandate is to evolve standards, specifications, manuals, guidelines for planning, design, construction and maintenance of different categories of roads. There are several similar professional bodies across the world like American Association of State Highway and Transportation Officials in USA; Permanent International Association of Road Congresses in Paris; National Association of State Roads in Australia; Japan Roads Association in Tokyo; International Road Federation in Geneva, etc. which are engaged in various activities connected with planning, design, construction, maintenance and operation of highways and development of codes, standards and specification. The Indian Roads Congress is already in touch with some of these organisations. The IRC should take advantage of such agencies in continuously keeping abreast of latest practices. There is a need to review design standards on a regular basis so that these are in line with international practices duly taking into account our own milieu.

Skills Development Strategy

For the 12th Plan (2012-17), preliminary exercises suggest an investment level of Rs 45,000 billion in infrastructure. As a modest estimate, about 40 per cent of these investments would directly contribute to construction activities. This includes a significant component of roads. For construction workers in the road sector, there is huge demand for trades like surveyor, excavator operator, grader operator, stone crusher operator, laboratory technician, road roller operator, skilled, semi-skilled and unskilled workers. Very few opportunities for skill development are currently available for these trades as most ITIs and polytechnics have bypassed them. There are hardly any organised training providers to train the construction equipment operators or quality assurance technicians. The Government of Andhra Pradesh took the initiative of setting up National Academy of Construction in Hyderabad for training of construction workers a few years back. This is a joint effort of the state government and contractors associations. This is an excellent example for being replicated in several regions of the country with due focus on road sector demands.

The framework for skill development of workers of workers in the road sector should include the following key features:

- Demand driven short-term training courses based on modular employable skills to be decided in consultation with the construction industry, viz contractors and consultants;
- Testing and certification of prior learning (skills of persons acquired informally);
- Flexible delivery mechanism (part time, weekends and full time);
- Different levels of programmes (foundation level as well as skill upgradation) to meet demands of various target groups;
- Optimum utilization and enhancement of existing training infrastructure to make training cost effective and purposeful;
- Testing of skills of trainees by independent assessing bodies who would not be involved in delivery of the training programmes.

Source: Road Sector: Skills Development Strategy by Mukesh C. Gupta, International Labour Organisation, New Delhi. IRC Discussion Paper No. 565, October 2010.

The current system of formulating design codes and manuals needs a total overhaul.

Eventually the standards should have statutory standing and become the responsibility of the Standards Departments of the proposed Indian Institute for Intercity Road Transport, Indian Institute for Urban Transport, and National Road Safety and Traffic Management Board (see chapters on Safety and Research and Human Resource Development). The Standards Departments in these institutions will have the authority to propose, evaluate and establish relevant standards that will have statutory status. The procedure followed will have to be similar to those established by Bureau of Standards in India and abroad with domain experts in charge of specific standards.

ROAD DESIGN INSTITUTE

Except for a few technical officers in the road agencies who staff design cells in the states and the Centre, there is no dedicated institute for undertaking designs for the various components of the road projects. There is a compelling need for a dedicated Indian Institute for Intercity Road Transport and Indian Institute for Urban Transport for the road

sector that should function under the umbrella of MoRTH. It should have around 400 to 500 professionals at various levels covering various disciplines such as transport planning, traffic and safety engineering, transport economics, pavement design, bridge structure design, maintenance technology, geo-technical engineering, material engineering, IT related interventions, tunnel engineering, social and environment engineering, etc. Similar institutes should be set up in each state PWD and Rural Roads Agencies. Every state should have at least 40 to 50 professionals covering various disciplines.

RESEARCH, DEVELOPMENT AND TECHNOLOGY INITIATIVES

The basic purpose of research in the highway sector is incorporation of technology innovations for:

- Achieving cost efficiencies, speed in construction, increased durability and performance,
- Providing technical underpinning to evolving standards, and
- Developing a pool of scientists and engineers having knowledge of latest developments around the globe.

Highways-Related Skills Inventory

- **Introductory issues**
 1. Current issues in highway development, financing and administration
- **Project design and evaluation**
 1. Undertaking best-practice feasibility and detailed project reports
 2. Cost-benefit and commercial analysis of highway projects; quantifying project benefit; selecting between construction alternatives
 3. Traffic forecasting
 4. Financing methods: standard PPP models, road user charges, Road Funds, tolls and tolling methodology
 5. Environment management plans
 6. Land law and acquisition schemes; resettlement and rehabilitation policy
 7. Highway legislation including NH Act, NHAI Act, Control of National Highways (Land & Traffic) Act, CRF Act, States Highways Act, Motor Vehicles Act
 8. World Bank and ADB guidelines for construction projects
- **Project management**
 1. Procurement planning and preparing bid documents
 2. Contract management
 3. Tailoring MCAs and drafting standard bidding documents
 4. Evaluating bid proposals and awarding tenders
 5. Liaising with supervising and monitoring concessionaires
 6. Managing construction consortia
 7. Managing construction site safety
 8. Dispute resolution and negotiation
- **Highway design and regulations**
 1. Road safety measures including use of signs, markings, crash barriers
 2. Pavement design: flexible and rigid pavement; international practice
 3. Geotechnical investigations and landslide protection measures
 4. Road geometry and alignments
 5. Bridge design
 6. Hill road design—special considerations
- **Highway construction and engineering**
 1. Pavement construction
 2. Design and construction of high embankments, ground improvement methods, soil reinforcement structures
 3. Bridge construction including foundations, sub-structures, superstructures, aesthetics
 4. Construction of flyovers and interchanges
- **Maintenance**
 1. Designing and monitoring road performance measures; pavement evaluation techniques; road maintenance management systems
 2. Planning, norms, financial and institutional issues
 3. Maintenance of road asset inventory and condition history
 4. Bridge inspection and distress diagnosis; bridge management system
- **Expressways**
 1. Planning and alignment
 2. Design of pavement, bridges and interchanges
 3. Construction and operations and management
- **Highway management**
 1. Monitoring axle weights, traffic data, origin-destination surveys, traffic forecasting
 2. New materials and construction technologies

Central Road Research Institute, New Delhi: A Snapshot

(An apex institution for research in Road Sector)

Established: 1952 as National Laboratory under CSIR**Mandate:** Explore emerging areas in road sector; provide guidance to highway profession, support development of cost effective standards and specifications of roads of various categories**Research Areas**

- Road Development Planning and Management
- Traffic Engineering Safety and Environment
- Pavement Engineering and Materials
- Geotechnical and Natural Hazards
- Bridge Engineering and Management
- Instrumentation

Beneficiaries

- Government Road Organisations
- Indian Roads Congress (IRC)
- Contracting and Consultancy Sector
- Oil Companies, Cement Manufacturers
- Testing Equipment Manufacturers

Landmark Achievements

- Road user cost study (input to World Bank HDM-III, HDM-4)
- Land slide mitigation strategies (hill regions)
- Consolidation of marine clay (coastal belts)
- Soil stabilization techniques
- Pavement deterioration prediction models
- Use of flash and other industrial waste in roads
- Road Safety Audits, Traffic Management Measures
- Non destructive testing of bridges
- Road Condition Evaluation Devices, Bump Integrator
- CC block pavement in deserts and mountains
- Training Highway Engineers (10,000 so far)

Current Activities

- Road Information System
- Slope protection strategies in hills
- Maximizing use of marginal/waste material
- Engineering safety measures
- Highway Capacity Manual for Indian Conditions
- Refining pavement condition prediction models
- Diagnostics of distressed bridges
- Pilot testing of innovative materials
- Skill enhancement of highway professionals

Spectrum of Activities

- Basic Research
- Applied Research
 - Sponsored
 - Collaborative
- Technical Services
- Principal Technical Agency, PMGSY
- Testing, Calibration
- Skill Enhancement
- Think Tank of IRC

International Collaboration

- Transportation Research Board, USA
- Transport Research Laboratory, UK
- Australian Road Research Board, Australia
- LCPC, France
- PIARC (World Roads Congress), Paris
- International Road Federation (IRF), Geneva
- CSIR, South Africa

Support Infrastructure

- Good Size Campus
- Wide pool of talented Scientists and Engineers
- Support Staff
- World Class Testing Equipment and Labs
- Test Tracks
- Library
- Computer/Data Centre
- Software Packages (in-house and international)
- Seminar Halls
- Hostel

Box 2.20

Thrust Areas for Research, Development and Technology Innovations

- A. Areas relevant to PPP and government funded projects on main highways
 1. Blending/stabilization techniques to maximise use of locally available and marginal materials. (Pilot projects be undertaken throughout the country).
 2. Determining design service volumes at various levels of service for 2-lane, 4-lane and 6-lane roads.
 - with/without paved shoulders
 - with/without service roads in both urban and non-urban areas.
 3. Accelerated bridge construction technologies to achieve faster construction (precasting techniques, concrete-steel superstructures, etc.). Also evolve standard designs.
 4. Condition assessment of existing bridges and distress diagnostics of superstructures, substructures and foundations of bridges
 5. Evolving pavement performance predication models for determining rate of deterioration of road pavements and riding quality with time, traffic and weather (including rural roads). Develop non-destructive evaluation and inspection techniques (quick results possible as CRRI has acquired an APT facility)
 6. Evolving bio-engineering and other measures for improving slope stability in hills (including rural roads)
 7. Recycling techniques (hot/cold) of bituminous pavements. Evolve guidelines for promoting their use as it would ease the burden on use of aggregates and reduce carbon footprint
- B. Areas relevant to rural roads
 1. Identification of locally available materials at district level and determining their strength characteristics and promoting stabilization techniques
 2. Use of soil cement, cement blended granular material, brick ballast and other marginal materials
 3. Use of bituminous emulsions, chip sealing and surface dressing
 4. Evolve low cost water crossing structure designs
 5. Evolve low cost drainage and erosion control measures
 6. Evolve designs for fabricating low-end technology equipment for construction and maintenance

Source: Report of the Working Group on Roads for the NTDP – May 2012.

The early development planners of the country had clearly recognised the need for national research and development in all branches of science and technology. The establishment of the chain of National Laboratories under the Council of Scientific and Industrial Research (CSIR) was a major step in this direction. The Central Road Research Institute (CRRI) was one such Laboratory set up for the road sector in the early 1950s in New Delhi. The CRRI has been doing pioneering service to the highway engineering profession (Box 2.19)

The MoRTH and IRC have created a mechanism for accreditation of innovative materials and technologies for the road sector to promote their utilisation on ground. However, despite these measures, there is a time lag between research findings and application on ground. Moreover, the level of R&D in the highway sector is currently low in relation to the investments on road development

being made by the Central and state governments. We need to provide opportunities to the road construction industry to introduce cost effective materials, specifications and technologies to satisfy requirements of performance and durability and achieve fast construction and reduced carbon footprint.

Thrust areas for knowledge development are given in Box 2.20.

In order to give further push to the technology initiatives, centres of excellence should be set up in the existing IITs, IIMs, NITs and other academic institutions on various topics related to road sector viz. PPP, safety, highway administration and management, trucking operations, construction management, pavement design, environment concerns, energy conservation, urban transport, bridges, tunnels, disaster management, expressways, low volume roads.

Technology Initiatives under PMGSY: Lab to Land

1. Main Drivers of Technology

- Political: Awareness and commitment
- Bureaucracy: Appreciation and encouragement to scientists
- Scientists/professionals: Innovation effort
- Practitioners: Pilot/experiments on ground

2. Advantages

- Enhanced durability and performance
- Reduced initial or life cycle cost
- Reduced environment degradation

3. Strategies Adopted

- All India Workshop of Stakeholders
- Group of scientists, academia, technocrats constituted by Ministry
- Guidelines proposed by Group deliberated among SRRDAs, STAs, PTAs
- Guidelines considered and approved by Ministry
- Guidelines issued to state governments for implementation
- Oversight on implementation through regional reviews

4. Salient Features of Guidelines

A. For proven technologies

- Field officers, academic institutions capacity building
- Contractors to be guided during execution
- CRRRI + IITs + NITs to map the availability of marginal materials and their strength characteristics
- Minimum 15 per cent projects to use these technologies
- No sub-contracting till critical mass of contractors created in execution of such technologies
- Defects Liability Period: Six months, thereafter Employer, Contractor not held responsible. Checks and balance with respect to strict quality control during execution.

B. For potential technologies

- Pilot projects on ground
- Obtain warranty for performance and cost-containment from Technology Provider
- MOU with Technology Provider for providing material and technology guidance and support during execution
- On successful performance, treat them as Proven Technology

Focus

- Marginal Materials
- Industrial Wastes
- New Materials
- Green Technologies

Source: Prepared from the Ministry of Rural Development, National Rural Roads Development Agency Guidelines on Technology Initiatives issued to States in May, 2013.

The government should promote transfer of proven R&D technologies from lab to land through well considered pilots for implementation by BRO, NHAI, NRRDA, state PWDs and SRRDAs, etc. At pilot stage of testing performance, a liberal view would need to be taken of some unintended non-performance or failure of such pilots, with of course a laid down mechanism for supervision and monitoring during execution. See Box 2.21 for the recent initiative taken by the Ministry of Rural Development in mainstreaming technology initiatives under PMGSY.

QUALITY AUDIT

The National Rural Roads Development Agency, an arm of the Ministry of Rural Development, has instituted a three-tier quality monitoring system for construction of PMGSY rural roads. The first tier is at the Project Implementation Unit level where the Junior Engineer, Assistant Engineer and Executive Engineer have been made responsible for

exercising quality control checks during execution and before authorising payments to contractors for the work carried out. Second tier is the system of State Quality Monitor (SQM). At the state head-quarter level, one Chief Engineer or Superintending Engineer is designated to exercise sample checks and oversight on the quality at various predefined stages. At the third tier is the system of National Quality Monitors (NQM) whereby the retired CE/SE with high credentials, based on recommendation of the state government are empanelled by the NRRDA (Ministry of Rural Development, Government of India). These NQMs visit the states as per the direction of the NRRDA and provide independent report on quality of construction of PMGSY road to both NRRDA and the State Implementing Agencies.

The NHAI and some of the state PWDs also undertake third party independent technical audit of their projects through reputed private sector and academ-

The MoRTH should entrust all National Highways and Expressways to the NHAI and only planning, policy and budget functions should remain with the ministry

ic/ research agencies. However, there is no well laid down system in place except for the quality control checks exercised by the 'Engineer' of road agencies or of the Construction Supervision Consultant engaged for contract administration. Road agencies need to institute a credible system of third party audit to enhance quality in execution of projects in the road sector on the lines of NRRDA.

SUMMARY AND CONCLUSIONS

- i The current system of formulating design codes and manuals by the Indian Roads Congress needs an overhaul. there is need to reduce the delays currently experienced in finalisation and updating of design codes, etc. Funds for such purposes should be provided by the government out of R&D budget. Eventually, the standards should have statutory standing and become the responsibility of the Standards Departments of the proposed institute for Intercity Road Transport, Institute for Urban Transport and Traffic Management Board.
- ii Except for a few technical officers in the road agencies who are manning design cells in the states and the Centre, there is no dedicated institute for undertaking designs for the various components of the road projects. There is compelling need for a dedicated institute for the road sector that should function under the umbrella of MoRTH. It should have around 400 to 500 professionals. Similar institutes should be set in each state PWD and Rural Roads Agencies. Every state should have at least 40 to 50 professionals covering various disciplines.
- iii With the NHAI having become operational through successful implementation of the NHDP, there is need to review the current structure of MoRTH and expand the mandate of the NHAI. The objective should be for the MoRTH to entrust all National Highways and National Expressways to NHAI with proper restructuring of NHAI and only planning, policy and budget functions should remain with the MoRTH.
- iv The existing road agencies in the Centre and the states are gearing themselves to the needs of accelerated road sector programmes. However, capacity and performance of these agencies need further enhancement depending upon the current weaknesses in each agency.
- v Staff at various levels should receive regular training in various aspects of the road projects. Each road agency should have its training plan and calendar for both short-term and long-term. Such a plan should cover sponsoring officers for undertaking M.Tech programmes in various branches of highways, bridges and tunnels.
- vi There is a huge backlog of training at the cutting edge level of supervisors, junior engineers and assistant engineers for which special programmes need to be evolved and provided. A few states have set up their own training institutes for this purpose. These institutions need strengthening and provision of state of art training infrastructure. Such training institutions should come up in all states.
- vii The government also needs to support Indian Academy of Highway Engineers (IAHE), other training institutes at state level and academic institutions to improve their infrastructure for training of road agencies.
- viii Consultancy in the road sector has played a significant role in supporting the road agencies. However, due to quantum jump in the volume of work, weaknesses in their output become evident in some cases. There is need for a system of internal quality audit by the consulting firms before they submit their outputs to the road agencies. The government should also tighten the current performance evaluation system to bring in more accountability of the consultants.
- ix With the push given by the World Bank and the Asian Development Bank since the mid 1980s, the contracting industry in the road sector has come up reasonably well in terms of mechanisation and acquisition of professional site engineers and project managers. However, the sheer increase in volume and size of projects bring offered by the government in the road sector has created several challenges and constraints in this industry. Major constraints relate to poor productivity and substandard quality due to non-availability of

The Government of India have instituted a system of Results Framework Document for various sectoral ministries and are also encouraging the state governments for similar initiatives. The road agencies may consider self-evaluation or undertake capacity analysis through domain management expert agencies to identify enhancement measures required to improve their capacity and performance.

skilled construction workers, and equipment operators and site supervisors. Both the government and the construction industry need to address this concern. Advantage should be taken of the skill development initiatives being launched by the Government of India to assess the magnitude of requirements of the road sector and consider a three pronged strategy, viz. at the vocational level through industrial training institutes, at the diploma level through polytechnics and at the state level through setting up construction academies.

- x There is an urgent need for quantum jump in the R&D and technology upgradation effort in the road sector covering pavements, bridges, tunnels, safety and traffic management for knowledge acquisition and knowledge development in our own context and situation.
- xi The R&D schemes having immediate practical relevance in the context of the initiatives of the government to develop the road sector in the country needs to be taken up on priority. In this context, consideration needs to be given to evolving country specific highway capacity manual, models for prediction of pavement performance with traffic, distress diagnostics of bridges and strategies for maximizing use of locally available marginal materials including recycling of existing pavements and promoting use of industrial waste materials and by-products where found useful.
- xii Centres of Excellence should be created on different aspects of roads and road transport including safety in IITs, NITs, other engineering institutes and IIMs to accelerate the research and capacity building activities.
- xiii The government should promote transfer of proven R&D technologies from lab to land through well considered pilots for implementation by BRO, NHAI, NRRDA, State PWDs and SRRDAs, etc. At pilot stage of testing performance, liberal view would need to be taken of some unintended non-performance or failure of such pilots, with of course a laid down mechanism for supervision and monitoring during execution.
- xiv A provision of one per cent of the total road investments should be earmarked for capacity building of the stakeholders involved and technology innovations in the road sector.

ROAD TRANSPORT

NEED FOR TRANSHIPMENT FACILITIES

Freight transport is the backbone of the economy. For reoptimisation of modal mix, a critical infrastructure need is transshipment facilities, both rail and road transshipment and the use of 'transport nagars'. Such nagars can be positioned on suitable locations on the periphery of large cities and pick-up and delivery services on the hub-and-spoke model.

Other integration that is needed is synchronisation of short haul movement by road and long haul movement by rail for both export / import cargo through containers and long haul freight movement to / from destinations in remote areas not connected with rail network.

MODERNISING THE TRUCKING INDUSTRY

The trucking industry can be broadly characterised as being highly fragmented and unorganised. According to statistics provided by Transport Corporation of India, 90 per cent of the industry consists of entities that have less than five trucks, contributing 80 per cent of gross revenues. The remaining 10 per cent that comprises the organised sector, consists of small numbers of fleet operators who have the flexibility to operate trucks of varying payloads over a distributed network, and are primarily employed in supply chain management and for other formal logistics purposes. However, the bulk of the unorganised fleet is used for general goods transportation with operators working on a "hub and spoke" model. With transportation companies that run big fleets gradually moving from asset-based to contractual models, it is widely recognised that the dependence of small fleet operators and small operators on brokers will continue to have impact on the physical as well as the financial performance of the sector. There is a case for regulating trucking firms for suitable incentive structures (Box 2.22).

One per cent of the of the total road investments should be earmarked for capacity building and technology innovations

The approach of government departments to the trucking industry has been to regard it as a source of revenue at every stage: excise duties; sales tax on purchase of vehicles; road tax on owning and using; licence fees and permits for operating; octroi or entry tax by local authorities; not to speak of taxes and duties on petrol, lubricants and spares. As a result, over 30 per cent of the initial cost and about 50 per cent of the operating costs are due to these multiple burdens⁹. So there is little incentive to invest in better vehicles, improved maintenance or well-trained and well-paid operating crew. The industry is characterised by very low levels of technology. The main reason for this situation is market failure – the market is not transmitting the signals

9 Asian Institute of Transport Development: Journal on Trucking Industry, 2000.

Box 2.22

Regulating for Suitable Incentive Structures

Single truck owners make up as much as 50 per cent of the trucking firms; economists will consider the prevailing situation as one which comes close to perfect competition. That is, there is a large number of producers of trucking services and none of them is big enough to influence the price line. As a result, the industry today is essentially controlled by intermediaries, because a large number of truck owners themselves are too small as firms to acquire critical market information.

The inability of poorly capitalised firms to gather information about cargo has resulted in the growing domination of brokers who need to be brought under the purview of regulation keeping in mind the fact that while trucking firms will have to pay for information about consignments, this asymmetry must not be allowed to become the fulcrum around which the industry revolves.

Usually, it is possible to strike a balance between the demand and the supply side of any activity. But in trucking, the fiduciary nature of the activity has to be kept in mind. This suggests an important approach to regulating trucking, namely, that the thrust of regulation has to be on the seller of trucking services.

The creation of an efficient marketplace, similar to a stock exchange or a commodity exchange, to bring together customers and transport vendors in this largely unorganised sector could bring about the desired change in the trucking landscape.

Source: Asian Institute of Transport Development: Journal on Trucking Industry, 2000

required for technology upgradation. There is a multiplicity of taxes, variations both in the basis and rates at which these are levied, high incidence of these taxes and the absence of guidelines for the tax authorities. An ideal tax system is one which is neutral, efficient in allocation of resources, administratively expedient and avoids cascading effect in the economy.

There is a relatively high percentage of light trucks on Indian roads when compared internationally. Indian trucks largely consist of a chassis that is supplied by a truck manufacturer. Specialist after-market 'body' carpenters and other constructors then build a complementary cab and a tray or hold according to the purpose for which the truck will be used. There is considerable variation in the final versions of the trucks and buses turned out by these constructors, guided as they are by regional preferences and individual idiosyncrasies. Unlike elsewhere, there is comparatively little use of the tractor-trailer model wherein a tractor may be hitched to various trailers as dictated by demand. This means that Indian trucks often carry goods in generic trays and boxes which may not be expressly suited to the job at hand. This jerry-built nature of Indian trucks is perhaps understandable given that road surface conditions mandate robust, easy-to-fix trucks. Lately, however, multi-axle vehicles have grown in significant numbers on the back of growth in NHDP-funded highways that encourage their use.

The Indian trucking industry is characterised by low levels of technology¹⁰. This is in spite of the fact that both truck manufacturers and trucking firms are in the private sector. This suggests that the main reason for the low level of technology is market failure: the market is not transmitting the signals required for technology upgradation. The duopoly on the supply side and the peculiarities of the cost structure on the demand side seem responsible for this. Unless these distortions are rectified, it may not be possible to speedily raise the level of technology in this industry. Overall, it will be necessary for policy-makers to forge a stronger link between profitability and technology because at present this link is quite weak. The thrust of the policy should be to alter the structure of costs so that fixed costs play a less important role in determining the profitability of trucking operations. This can be done by making available finance more liberally.

The profitability of truck operations depends on the following factors: capacity utilisation; freight trips; fuel prices and fuel efficiencies; and other operating costs. In order to maximise profitability from their inefficient vehicle fleet, truck operators will increase revenue by overloading vehicles, resulting in excessive road wear and tear, a reduction in the economic life of the vehicle itself, and a higher propensity for road accidents

10 Asian Institute of Transport Development: Journal on Trucking Industry, 2000

Table 2.36
Role of CVO in Seamless Interstate Freight Movement in The United States

CVISN	APPLICATION	IMPACTS CAPABILITY
Safety Assurance	Safety Information Exchange	Has provided inspectors with electronic access to carrier and vehicle safety information from previous inspections.
	Automated Inspection	Identifying of faulty equipment on carriers facilitated by remote testing.
Electronic Screening	Safety Screening	In-vehicle transponders are used to facilitate communications with inspection stations to pre-screen trucks for safety records.
	Border Clearance	By applying in-vehicle transponders, truckers are able to communicate with customs checkpoints to pre-screen their trucks for safety records, border clearance and proper credentials.
	Weight Screening	Weigh stations and in-vehicle transponders are able to communicate to pre-screen trucks for compliance with weight regulations. Weigh-in-motion (WIM) scales and Automatic Vehicle Classification (AVC) systems have reduced delay at checkpoints by allowing carriers to pass inspection without stopping.
	Credential Checking	Weigh stations and customs check-points are able to communicate with in-vehicle transponders, to pre-screen trucks for proper administrative credentials.
Credentials Administration	Electronic Payments	Facilitates electronic business and transfer of registration fees between carriers and the revenue collection agency.
	Electronic Registration/Permitting	The internet applications and other electronic means facilitate the exchange of credential data between licensing/permitting agencies and the carriers. This reduces time taken for permit approval.
Security Operations	Asset Tracking	The location and condition of fleets can be monitored for security purposes by using surveillance and detection technologies.
	Remote Disabling Systems	Theft and unauthorized use of commercial vehicles can be prevented by employing ITS technologies.

Source: World Bank Paper for NTDP on Institutional and Regulatory Frameworks for Free Movement of Commercial Highway Vehicles Across States/Provinces by Kumares C. Sinha et al. (June, 2011)

The major policy issues with respect to modernising the trucking industry then have to do with industrial organisation and market consolidation; modernising the trucking fleet by encouraging the use of modern tractor-trailers; encouraging fuel efficiencies through the supply of cleaner fuels and advanced engine technologies. The first of these depends as much on labour laws, increasing educational standards, emergence of alternative investments and on labour and capital market deepening as anything else. It will also depend on increasing levels of supply chain sophistication, such as the requirement for specialist automobile delivery lorries and refrigerated trucks. These must also function alongside rail haulage facilities and ser-

vices. These advanced logistics will naturally become the preserve of more complex entities that are capable of managing larger, more technologically advanced fleets. (See Chapter 4, Volume II on Integrated Transport: Strategy and Logistics)

ENHANCING PRODUCTIVITY OF COMMERCIAL VEHICLES

Cumbersome documentation, detention at check posts and bureaucratic hassles have adversely affected the productivity of the trucking industry. As a result, a truck on a highway is able to clock only 300 to 500 km per day. Trucks in the developed countries are able to cover double this distance. Commercial vehicles should be treated as rolling

Due to cumbersome documentation, detention at check posts and bureaucratic hassles, a truck on an Indian highway clocks only 300-500 km per day. Trucks in developed countries cover double this distance

stock of the road transport infrastructure as they are carrying the economy on wheels. All efforts must therefore be made to improve productivity of precious assets. The use of intelligent transportation systems (ITS) in commercial vehicle operations can significantly enhance regulatory processes and this can make interstate truck movement seamless. Electronic registration and issue of permits by state agencies allows carriers to register online, decreasing the turnaround time associated with permit approval. Electronic processing of driver and vehicle safety information can eliminate or minimise inspection and enforcement requests at state borders. At check stations, enforcement personnel can use the national database clearing houses to confirm carrier regulatory compliance data and cross check safety assurance information. A commercial vehicle can thus travel seamlessly through state boundaries, once it is inspected and cleared at the origin state and the information is electronically transmitted to other states along the proposed trip. In this context, reference is invited to the Commercial Vehicle Information System And Networks (CVISN) as a component of the Commercial Vehicle Operations (CVO), designed by the US Federal Motor Carrier Safety Administration. Table 2.36 captures the role of CVO in seamless interstate freight movement.

The following measures need to be introduced to achieve seamless movement of commercial vehicles in the country.

- i Promote use of ITS in commercial vehicle operations to enhance regulating processes making interstate truck/bus movement seamless. Electronic screening promotes safety and efficiency since trucks or buses equipped with low-cost in-vehicle transponders can communicate with check stations. Communication equipment at the roadside can automatically query regulatory data as they approach these stations and issue a red or green light on in-vehicle transponders, so drivers know whether to continue or report to the check stations for inspection.
- ii Electronic processing of driver and vehicle safety information can eliminate or minimise inspection and enforcement requests at state borders. Once a vehicle is inspected and cleared at the origin state and the information is electronically transmitted to other states

along the intended trip, the travel can be seamless. The US Federal Motor Carrier Safety Administration have designed the commercial vehicle information system and networks (CVISN) as a component of the commercial vehicle operation. The information systems, therein, are owned and operated by the state governments, motor carriers and other parties. Similar system can be easily evolved and adopted in the country.

- iii Apart from cooperation of respective state governments, it will be advisable for the MoRTH to undertake outreach programmes and facilitate development such ITS backed commercial vehicle operations and information networks to enable full advantage of NHDP being reaped by the industry.

INSPECTION AND MAINTENANCE OF VEHICLES

Even though the new technology vehicles meet the emission and safety standards, there are a lot of old vehicles (cars, buses and trucks) operating on the roads. The MV Act obligates the motor vehicle users to carry out periodic checks and maintenance to ensure that they are both road worthy and non-polluting. Presently, only commercial vehicles are required to undergo fitness test for road worthiness. Private vehicles are required to undergo pollution under control checks at periodic intervals. For ensuring safety, road worthiness and emission performance, all motor vehicles should be covered. The inspection and certification regime practiced by the State Transport Departments need to be modernised and strengthened with automated test equipments as per international practices. These aspects have been elaborated in Chapter 7 Volume II, on Energy and Environment.

BUS TRANSPORT SERVICES IN RURAL AREAS

The share of passenger traffic by road continues to be high. However, despite that rural areas are still poorly served by bus transport. As per an assessment by the MoRTH, about 70 per cent of villages are not connected by organised public transport. These villages are currently served by autos, jeeps, jugads and private buses which may not be reliable and affordable. The government is likely to undertake a pilot project where buses will be owned and operated by private enterprises with predefined service levels and government financial support will be provided as Viability Gap Funding. The bidding parameter is proposed to be net cost VGF. The outcome of this pilot needs to be watched.

END OF LIFE VEHICLES (ELV)

End of Life Motor Vehicles (ELV) are a significant contributor to waste volumes. The number of ELVs arising each year is likely to increase with the

expanding automobile sector. The recycling of recoverable materials at end-of-life of vehicles would lead to considerable energy savings. It will be necessary to establish collection centres so that the last owner of the end-of-life vehicle hands it over to the centre. The issue is discussed in more detail in the Chapter on Energy and Environment.

ICT FOR ROAD TRANSPORT

ICT in road transport will help in

- Increasing safety
- Enhancing uniformity and interoperability
- Improving operational performance
- Enhancing mobility
- Delivering environmental benefits
- Boosting productivity and economic growth

In order to ensure uniformity and interoperability throughout the country, the Government has sanctioned a project for creation of National Register and State Registers of Driving Licences (DL) of Drivers and Registration Certificates (RC) of Motor Vehicles. The objective is to capture the functionalities as mandated by Central Motor Vehicles Act, 1988 as well as state motor vehicle rules. Along with the National Register, a National Transport Portal has also been launched. This is a very good initiative as this would help not only in interoperability between states but will also improve enforcement and instant verification of Driving Licences and Registration Certificates.

The Regional Transport Officer is the 'aam aadmi's' interface with the road transport administration. Sharing of data by the RTOs with each other, traffic police and insurance agencies would help in dealing with defaulting drivers. Further, computerisation of check posts would help in cutting down delays and revenue leakage.

Other areas for ITS applications proposed are

- i Advanced Traffic Management Centres
- ii Electronic toll collection along with Central Toll Clearing House
- iii Advanced Public Transport System
- iv Fully integrated vehicle to infrastructure and vehicle to vehicle communication, vehicle tracking mechanism, commercial vehicle operations
- v Weigh-in-motion systems for control on overloading

ENHANCING FUEL EFFICIENCY AND FUEL QUALITY

Policies for energy efficiency in road transport should be targeted to both new vehicles and in-use

The recycling of recoverable materials at the end of life of motor vehicles would lead to considerable energy savings

on-road vehicles. Based on current national practices and international experience (refer Box 2.10), there are five core policy areas where practicable strategies need to be evolved. The following measures merit consideration.

- i Financial Measures
 - Differential taxes and charges based on fuel efficiency and greenhouse gas emissions
 - Internalisation of external costs of highway energy consumption by increasing fuel taxes.
 - Support to automotive industry for development of vehicles that use alternative fuels.
 - Support for Research and Development for fuel technologies
- ii Fuel Efficiency Standards
 - Foster mandatory vehicle fuel efficiency and CO₂ emission standards
 - Establish automotive industry agreements on fuel efficiency and emission norms
 - Fuel efficiency labels/ratings at point of sale/purchase
- iii Inspection and Maintenance Programmes
 - Enforce operational efficiency of on-road vehicles through periodic inspection and maintenance programmes
 - Encourage retirement of old vehicles and establish age limits for retirement
- iv Enhancing Awareness
 - Fuel consumption labelling and data in vehicle advertisements
 - Communicating range of operational efficiency of vehicles
- v Traffic Management
 - Advanced Traffic Management Centres on high traffic corridors
 - Adopt demand management strategies and programmes
 - Provide minimum two lanes to reduce use of earth shoulders for passing and overtaking
 - Encourage highway and intersection designs that foster smooth flow of traffic.

OPTIMISATION OF AXLE LOADS OF COMMERCIAL VEHICLES

There has been demand from the trucking industry to permit higher axle loads to increase their productivity and earning capacity. This would, however, result in accelerated deterioration of road pavement and require heavy investments in road infrastructure for construction, maintenance and rehabilita-

Optimisation of Axle Loads of Commercial Vehicles

1. There is a strong correlation between pavement design standards and carrying capacity of vehicles due to static and dynamic forces generated in the course of the movement of the vehicles. It is because of this correlation that countries prescribe maximum permissible gross vehicle weight and maximum allowable axle loads.
2. The notified axle loads in India are: front single axle load of 6 tonnes with single tyres and a rear single axle load of 10.2 tonnes with twin-mounted tyres, although most roads have been designed for an axle load of 8.16 tonnes. Tandem and multiple axles fitted with additional tyres are allowed higher tonnage. Restrictions on the front axle load apply primarily because the vehicle has to meet the requirements of steering torque.
3. The Indian standards do not differentiate between a driven and non-driven or steered axle. European standards, however, make such a distinction. Thus, in their case, the permissible axle load is 11.5 tonnes for single-driven axle and 10 tonnes for single non-driven axle, irrespective of the number of tyres. An additional tonne per axle is permitted if the same is fitted with pneumatic or equivalent suspension.
4. The total transport costs (road user costs plus the road agency costs of construction, maintenance and rehabilitation) are minimised at an axle load of 11 tonnes, as against the prescribed limit of 10.2 tonnes. This limit of 11 tonnes may be taken as the optimal axle weight for purposes of pavement design.
5. Higher dynamic loads cause higher rates of pavement deterioration. For example, increase in designed axle load of 8.16 tonnes to 12 tonnes for a two-axle truck results in a four-fold increase in the vehicle damage factor (VDF). In the case of a multi-axle truck, the increase in VDF is much less for the same tonnage.
6. Reduced rates of pavement deterioration lead to significant reductions in total costs, arising mainly from vehicle operating costs, while increased rates of deterioration lead to significantly increased costs, arising from the same source.
7. The road network suffers from a host of deficiencies in terms of pavement thickness, distressed bridges, etc. Approximately 80-90 per cent of the national and state highways are not suitable for the permissible axle loads of 10.2 tonnes.
8. Massive investments are needed to strengthen the network for the currently prescribed axle loads. It is, therefore, premature to revise upwards the axle load limit for commercial vehicles. However, after the network is strengthened, consideration should be given to increasing the axle load limits to 11 tonnes.
9. The use of improved vehicle technology offers great potential for reducing pavements costs. It is well known that Indian trucks are a product of an outdated technology—two-axle rigid trucks fitted with steel leaf-spring suspension. There is need for research in various aspects of interaction between vehicle design and road surface, an area that has so far been neglected.

Source: Optimisation of Axle Loads of Commercial Vehicles, World Bank sponsored study conducted by the Asian Institute of Transport Development, New Delhi, 2004.

tion. A study on optimum axle loads for commercial vehicles was undertaken by the Asian Institute of Transport Development sometime back. The study concluded (Box 2.23) that the total transport costs—road user costs plus road agency costs of construction, maintenance and rehabilitation are minimised at an axle load of 11 tonnes. However, about 90 per cent of the road network is not suitable for the permissible axle load of 10.2 tonnes and massive investments are needed to strengthen the network for even the currently prescribed loads. It is, therefore, premature to revise upwards the axle load limits for commercial vehicles.

CONTROL ON OVERLOADING

Various studies conducted on the effect of axle loads on road pavements have established that damage to road pavement occurs in proportion to the fourth power law; e.g. an axle load of 16.32 tonnes (which is two times the equivalent standard axle load of 8.16 tonnes) causes (2)⁴, i.e. 16, times more damage to a road. Axle load surveys are conducted for assessing vehicle damage factors (VDF) when designing a new pavement.¹¹ As an alternative to axle load surveys, indicative values are available from IRC guidelines, though these should be updated to reflect changes in trucking technology and the business environment.¹²

Axle load surveys conducted on various stretches of National Highways have revealed that a VDF in the range as high as 10-15 for multi-axle vehicles is not uncommon. This implies that there are rampant violations of the legally permissible axle and gross vehicle weight limits by the commercial carriers of goods.

Thus, overloading of trucks is causing premature death of roads resulting in loss of investments and undue burden on rehabilitation of roads. Besides, overloading is resulting in deaths of vulnerable road users—pedestrians and cyclists as they share the same carriageway. The wilful overloading observed on roads suggests that the imposed fine does not discourage owners and operators. Both the private sector and public sector agencies as consignors indulge in pushing the transporters in overloading of trucks. It will require strong political and bureaucratic will for enforcement.

Buses and light vans frequently carry passengers in greater numbers than they are designed to safely accommodate. It is a matter of some concern that many of these vehicles are either owned by or ply on behalf of the state transportation authorities.

A far stricter regime needs to be put in place for control on overloading. The following measures need to be adopted to exercise control on overloading:

- a The main road corridors should be dotted with Weigh-In-Motion (WIM) stations along with static weigh stations and space for off-loading of excess cargo. Excess load must necessarily be offloaded before allowing the vehicle to proceed further. The infrastructure—WIM stations, static weigh scales, hardware, software, etc—can be provided even under public-private partnership mode and legal procedures of weight check, penalties and off-loading taken care of by the enforcement staff.
- b The consigner should be held guilty of violation.
- c Awareness campaigns be held to improve self-discipline by the truck owners and drivers. They should themselves decline (refuse) to drive the vehicle in case it is overloaded.
- d The policy of weight-distance charges being implemented for HGVs in Europe should be introduced in the country. (see Box 2.6)
- e In respect of buses and light vans, the state transport authorities must exercise due care and concern on their own part, and greater vigilance over contracted firms.

MOTOR VEHICLE WORKSHOPS

Manpower needs for Motor Vehicle Workshops: For ensuring effective maintenance of vehicles, motor vehicle repair workshops must have trained mechanics, proper equipment and procedure, and quality assurance checks. Therefore, there is an urgent need for the upgradation of workshops. The authorised agents of dealers of vehicles—cars, buses and trucks—should set up workshops and also be responsible for certification of workshops. The certification will enable individual vehicle owners and vehicle fleet owners to make informed choices in engaging workshops for the maintenance of their vehicles to ensure vehicles working in good condition with respect to emission and safety.

DRIVING TRAINING INSTITUTIONS

It has been estimated that about 0.5 million commercial vehicles are being added every year, resulting in an annual requirement of the same number of commercial vehicle drivers. Assuming that one training establishment can turn out 25 trainees every month, 1,660 drivers' training schools are needed for commercial vehicles alone. Meeting this requirement will be quite a challenge. While the licensing of training institutions for driving may continue to be with the state governments, the law may be amended to require them compulsorily to adhere to an accreditation and quality assurance system. An important element in the strengthened regulation of training institutions for transport vehicle drivers

¹¹ VDF multipliers convert the number of commercial vehicles of different axle loads and axle configuration to the number of equivalent standard axle load repetitions.

¹² A capacity constrained business environment is likely to see more trucks taking to the roads with heavier loads than normal.

Road signs have to be legible and understood in time to permit a proper response. The current situation in India on this is dismal

will be to ensure that these institutions have adequately trained staff. For this purpose adequate facilities need to exist for training of trainers. MoRTH should carry forward the scheme for establishing model driver training institutes across the country for addressing the training needs of driving motor vehicles. The central task of these institutes should be to produce training instructors.

HUMAN DIMENSION

The employment generated by the trucking industry is quite substantial—4,500,000 or so in direct operation and many times more in all the up-and-downstream activities. Yet, the human element in the industry is often overlooked. Take the case of a truck driver, who is perhaps the most critical link in the road transport chain. But in terms of infrastructural support, social status and compensation package, he is way behind his counterparts in other modes of transport. Overall, his quality of life is poor. A survey conducted some time ago showed¹³ that more than 25 per cent of the drivers could return to their base only after eight days of duty. About 40 per cent of the drivers returned to base between five and eight days, 20 per cent between three and four days, while only 10 per cent returned in less than two days. The incidence of HIV and other such diseases is known to be high among professional truckers. Clearly, the most effective way to make the job more attractive is to reduce the length of trips to 400-500 km so that drivers can spend more time with their families. There is a need to set up terminals at these distances so that he can hand over to another driver, Pony Express style. Containerisation of goods will facilitate this much desired operational practice.

STANDARD ROAD SIGNS

The basic requirement for road signs is that they are legible and understood in time to permit a proper response. The current situation in the country is dismal in the matter of road signs on the road network. Apart from being inadequate, the existing signs are not in conformity with the existing Code of Practice. It hardly needs emphasis that uniformity of application is as important as standardisation with respect to design and placement of road signs. The decision to use a particular sign at a particular location should be based on proper traffic engineering study by knowledgeable professionals.

A standard signage system should be introduced across all highways in the country for intercity

roads, roads in urban areas and for rural roads serving the villages and connecting markets, agriculture mandis, etc. The Indian Roads Congress is understood to have recently updated its old Code of Practice on road signs and revised it in line with international standards and in conformance with the Vienna Convention on international signs. As recommended by the Sundar Committee on amendments of Motor Vehicles Act, 1988, this Code should be regularly updated by the IRC so that it is kept in line with developments taking place round the globe. Side by side, a mechanism for enforcement needs to be in place. This is a serious gap at present.

SUMMARY AND CONCLUSIONS

- i The Motor Vehicles Act is in need of amendment to respond to the demand of road transport for the current century. The Sundar Committee has suggested the needed amendments. These need to be carried out.
- ii Freight transport being the backbone of the economy, apart from reoptimisation of the modal mix between road and rail, transshipment facilities by way of transport nagars and synchronisation of short haul movement by road and long haul movement by rail for both import and export cargo through containers would be required.
- iii For modernisation of trucking industry, continued emphasis is needed for higher energy efficiency and lower emission levels with suitable incentive structure for multi-axle vehicles. Further, the industry is controlled heavily by intermediaries who need to be brought under the purview of regulation. The thrust has to be on the seller of services. The trucking industry is also characterised by low levels of technology. A strong link needs to be forged between profitability and technology. Financing for acquisition of modern trucks should be more liberal.
- iv Use of Intelligent Transport Systems can significantly enhance regulatory processes and streamline seamless movement in inter-state movement of commercial vehicles. Advantage should therefore be taken of such technologies so that once a vehicle is inspected and cleared at the origin state and the information is electronically transmitted to other states along the proposed trip, there is seamless travel. The commercial vehicle should be treated as mobile infrastructure since they are carrying the economy on wheels. All efforts should be made to improve the productivity of these precious assets.
- v The Inspection and Certification regime prac-

¹³ Asian Institute of Transport Development: Journal on Trucking Industry, 2000.

ticed by the State Transport Departments should be modernised to reduce human intervention and it should gradually cover all motorised vehicles, not just commercial vehicles alone.

- vi There is need to establish collection centres for end-of-life vehicles to retrieve scrappage material as this would ultimately help in considerable energy savings.
- vii Passenger transport services in rural areas are still lacking and this requires a special focus of the state transport departments. Possibility of public-private partnership needs to be explored by providing viability gap funding to the private operators for such services.
- viii Information and communication technology needs to be used to improve operational performance of road transport including traffic management, electronic toll collection, vehicle tracking, overloading control and “aam aadmi” interface with the transport administration.
- ix Policies for energy efficiency in road transport should be targeted for both new and in-use on-road vehicles. There are five core policy areas—financial measures, fuel efficiency standards, inspection and maintenance regime, awareness raising and traffic management—for which practicable strategies need to be evolved and implemented.
- x There is need for uniform applicability of road signs as per international standards across highways throughout the country.

SUSTAINABILITY

A well-designed road network must convey goods and passengers in reasonable time between desired locations. However, it must also ensure that transportation is safe, mitigates environmental harm, socially responsible, and minimises other externalities. All of these considerations may be broadly captured under measures that promote the ‘sustainability’ of the network. In turn, ‘sustainability’ can be taken to mean a composite of:

- Buy-in from citizens, both those directly affected by road construction and improvement, those who will benefit from the eventuating infrastructure, and those who pay direct and indirect costs;
- Putting in place processes and procedures that address the issues arising from land acquisition, utility shifting/relocation, adverse environment impact, risks of accidents, etc.

LAND ACQUISITION

Road alignments need to be finalised early from environmental and social perspectives to avoid land acquisition problems

A major reason for delays in executing projects is the time taken to ensure that the necessary land is acquired and made free from encumbrances. For PPP projects, the current practice that 80 per cent of the required land should be available at the time of award of the projects should continue. Further, it should also be ensured that the remaining 20 per cent is made available to the concessionaire within a period reasonable enough so as not to delay the implementation of the projects as per the stipulations of the contract and concession agreements.

It is necessary to go in for land acquisition proceedings well in advance. For this, the first requisite is the finalisation of the road alignment for each project from technical, environment and social perspectives. Whenever the road alignment happens to pass through protected forests, it is essential for the road agencies to interact with the concerned environment authorities for jointly finalising the road alignment.

The Government has taken up the initiative for amendment of the Land Acquisition Act, 1894, and this is in advanced stages of finalisation. It needs to be ensured that the land acquisition clauses as per the provisions of the NH Act, 1956 are also amended accordingly. There may be need to move towards acquiring land for roads through the system of negotiated rates to accelerate the process. Further, the concept of land bank may also be explored.

The given land resources of the country have to meet myriad requirements of its large population. Ever-increasing economic activities are putting greater pressure on this scarce resource. Hence, there is an imperative need to have a closer look at the requirements of land for transport projects. Expressways, particularly greenfield projects, consume large swathes of land. Rail corridors use much less land and provide much greater capacity. Intermodal choices need to factor in this also, besides inherent characteristics of each mode.

In the foreseeable future, the acquisition of land would become a difficult and time consuming process. It would therefore be prudent to build land banks. Time lags can thus be minimised.

REHABILITATION AND RESETTLEMENT

The rehabilitation and resettlement (R&R) of persons whose livelihoods or habitations are affected by

Utility agencies are not the owners of Right of Way. For any operation, they should enter into an agreement with the concerned road agency for use of the stretch of road in question, and pay a reasonable rent for this

road development projects varies widely, depending on whether projects are implemented through external aid or loan assistance, or whether they are publicly funded or PPP projects. It is also dependent on the nature of the project and the area through which it passes.

There is further variance in R&R policies between state and Central governments who are each responsible for constructing, improving and maintaining different kinds of roads. A uniform R&R policy is desirable to ensure that compensations for project affected persons (or families) are equitably rationalised.

UTILITY SHIFTING

It is often the case that various utility networks piggyback on existing road networks. This includes electric and telephonic cables, water mains, gas and other pipelines. The rationale is obvious. There is an existing right of way, the localised terrain is already made manageable by the road, and there are no costs associated with further land acquisition. Further, the roads themselves provide easy access to the utility agencies for construction, repair and maintenance. On the whole, this piggybacking is desirable as it can help manage construction costs of both road and utility, and also does not require duplication in land that is reserved as right of way. However, these utility networks that skirt the margins of the roads are problematic when roads need to be widened or improved. A complex set of permissions and sign-offs are needed from any number of concerned authorities. Further, specialist technicians must undertake the work of relocating the utility network along the margins of the new, wider, road. Overall, seeking the necessary permissions and arranging for temporary alternatives during the construction period and then for permanent realignments once works are complete is a slow and onerous task, and one that often contributes to delayed road infrastructure projects.

There is a more general argument to be made with respect to roads and utilities. Land acquisition and creating usable rights of way is a central issue to the planning of any kind of network, though is undoubtedly most crucial for road infrastructure.

Utility agencies need to recognise that they are not the owners of the Right of Way. As such, for any operation, they need to seek prior permission of the road agency within whose jurisdiction the particular stretch lies. They should enter into an agreement with the concerned road agency for use of the ROW of the road stretch in question. Where such utilities need to cross the road, this should be at mutually agreed locations. For use of the right of way, a reasonable rent should be payable by the utility agency to the road agency to compensate the latter for the cost incurred in acquiring the ROW. The agreement should also stipulate obligations on the part of the utility agencies for laying and thereafter restoring the road embankment, etc in its original condition and with least delay. The entire cost of relocation of existing utilities should be borne by the utility agency irrespective of whether this is due to road upgradation or due to requirement of utility agency itself. For any new locations, the utility agencies should acquire their own right of way.

ROAD SAFETY

It is essential that a new paradigm for road safety is adopted in India wherein all stakeholders and participants, from legislators through to regulators, administrators, engineers, contractors, constructors and ultimately, road users acknowledge the role that they must play in ensuring road safety, and execute actions to achieve this. Based on the report of the Sundar Committee on Road Safety, the MoRTH has already introduced a Bill in Parliament to create a Road Safety and Traffic Management Board as an umbrella agency in this regard. The major areas of attention can be grouped into: engineering measures on roads and vehicle design incorporating safety features; education and awareness; enforcement; and emergency medical care. There are several financing options for funding road safety such as the road fund; surcharges on fuel or vehicle licences; corporate social responsibility initiatives on the part of public and private agencies; and automobile industry contributions.

SUNDAR COMMITTEE ON ROAD SAFETY AND TRAFFIC MANAGEMENT

The wide-ranging recommendations of the Sundar Committee on Road Safety and Traffic Management should be adopted. The centrepiece of the Committee's recommendations was to set up a Road Safety and Traffic Management Board together with a National Road Safety Fund. In consultation with the government, which will also retain powers to issue directions, the Board will have wide-ranging powers to promote road safety and improve traffic management in India. The Board should consist of a chairperson and three to five experts in road engineering, traffic engineering, vehicle engineering, traffic laws and enforcement, and accident-related

healthcare. A summary of the functions of the Board is provided in Box 2.24.

POST ACCIDENT EMERGENCY MEDICAL CARE

An area of critical concern is the post-accident emergency medical care. A new safety initiative (post-accident initiative) called “Golden Care” is recommended to reduce fatalities in the event of an accident on National or State Highways. The golden hour is a term used in emergency medicine and refers to the time immediately following a traumatic injury, when prompt medical attention is most likely to prevent death. Under the Golden Care Initiative, when an accident occurs, medical care should be provided to the victims within the golden hour. Administrators should ensure that whenever an emergency situation occurs in the highways, the victims are rushed to a nearby medical centre within 10 minutes of accident (Figure 2.3).

The administrators can get the relevant details of the vehicle and driver through an online database (blood group, medical history if needed etc). Meanwhile nearby ambulances (using GPS technology etc) can be called to transport victims to the nearby medical centre. Automation technologies and communication technologies can be used to provide right-of-way to ambulances while transporting passengers during emergency situations. This can be linked with the existing system that uses the phone number 108 for emergencies.

ROADS AND THE ENVIRONMENT

As described on several occasions in this report, trucks on roads account for the vast bulk of freight carted across India. Rising mode-share for road, vis-à-vis rail-based freight transport, is undesirable on several counts and a central theme of this report has been to argue in favour of reversing this trend. Be that as it may, road transport will remain a central element of both freight and passenger transportation for the period under consideration, and it remains essential that its environmental impact is evaluated and mitigated to the furthest possible extent.

ENERGY USE

The transport sector derives nearly all of its energy requirements from petroleum products, using about 27 per cent of total oil and oil products available in India in 2006-07. Of the total energy employed by transport, roads account for the lion's share at 78 per cent, a figure which is only projected to increase over the next 20 years (see Figure 2.4). With India importing most of its petroleum products, any efficiencies in energy use that may be wrung from the road transport sector will be enormously beneficial.

The single most influential measure to constrain energy use is to maintain or even increase the share of public transportation

Given the relative efficiencies of public over private transportation modes for passenger traffic (Table 2.37), the single most influential measure at constraining the road transport sector's energy use is to ensure that public transportation shares are maintained or even increased.

For each mode, proper economic incentives should price passenger-kilometres at the true inherent marginal social costs. The implications of this are profound, including an unravelling of fuel subsidies, at least on the basis of their justification today. Better quality fuels are usually more expensive to refine but offer better energy efficiencies in turn.

Newer engines offer technologies such as variable valve timing, variable compression ratios, friction reductions etc that improve fuel economies. Appropriate incentives should be in place to encourage faster migration to the use of these engines. The quality of road pavement and the generally free-flow of traffic—which can be aided by two-laning and the provision of earth shoulders—also impact fuel efficiencies. In summary, better fuels, better engines, and better roads can all contribute to dampening the incessant increase in demand for energy from the road transport sector.

EMISSIONS

Emissions of greenhouse gases are directly related to the quality and quantity of petroleum products used in the sector. These gases contribute to the warming of the climate. The important gases in this regard are carbon monoxide, nitrogen oxide, nitrogen dioxide, and sulphur dioxide and methane. Emissions also take the form of unburned hydrocarbons, which are collectively called PM10 (particulate matter than is less than 10 microns in diameter). This particulate matter greatly affects the air quality and, at excessive levels, poses severe health complications.

The quantity of emissions drastically increases with reductions in motor speeds, therefore measures aimed at easing congestion will not only result in reduced journey time but also in reduced emission of pollutants into the atmosphere.

The standard methodology for managing emissions is through the use of vehicle emissions standards. Implemented with varying stringencies worldwide, these standards have become progressively tighter over time as technologies and fuel qualities have improved. The standards relate to both the quality of fuels and vehicles made available for sale in relevant jurisdictions. Once, Indian standards were nearly 15 years behind emissions norms in Europe;

Functions of Road Safety and Traffic Management Board

1. Road related measures

- Set safety standards in conjunction with the IRC for the design, construction and operation of National Highways
- Conduct or commission road safety audits of National Highway projects through all phases to monitor adherence to prescribed standards and issue directions, and where necessary, to take corrective action
- Recommend minimum safety standards for the design, construction and operation for roads other than National Highways
- Recommend traffic calming and other similar measures

2. Vehicle related measures

- Set standards for safety features for all mechanically propelled vehicles
- Conduct or commission audits to monitor adherence to standards
- Set minimum conditions for the safe usage of mechanically propelled vehicles and safety standards for vehicular traffic on various types of roads
- Recommend minimum safety features for non-mechanically propelled vehicles and promote safe carriageways for such transport and vulnerable road users

3. Road safety research

- Identify subjects and institutions for research in different areas of road safety
- Establish centres of excellence in road safety research and education
- Create links between research centres at central, state and local levels
- Maintain a comprehensive database on safety-related matters
- Establish a procedure and methodology for data collection, storage and dissemination

4. Traffic law

- Recommend guidelines to state governments for computerizing information regarding vehicle and driver licensing
- Recommend guidelines for training, testing and licensing of drivers

5. Public awareness

- Promote best practices in road safety and traffic management
- Identify and recognise NGOs working towards road safety and assist where possible

6. Medical care

- Lay down guidelines for establishing and upgrading trauma care systems
- Create a grid of medical, allied medical and rehabilitation facilities to provide first aid, care during transportation, emergency care

7. Other functions

- Advise the central government on administration of provisions under Central Motor Vehicles Act, 1988
- Provide technical assistance to state boards and other agencies engaged in road safety
- Liaise with international agencies and organisations
- Liaise with other agencies like education and health boards, healthcare providers

Source: Report of the Sundar Committee on Road Safety and Traffic Management – February, 2007.

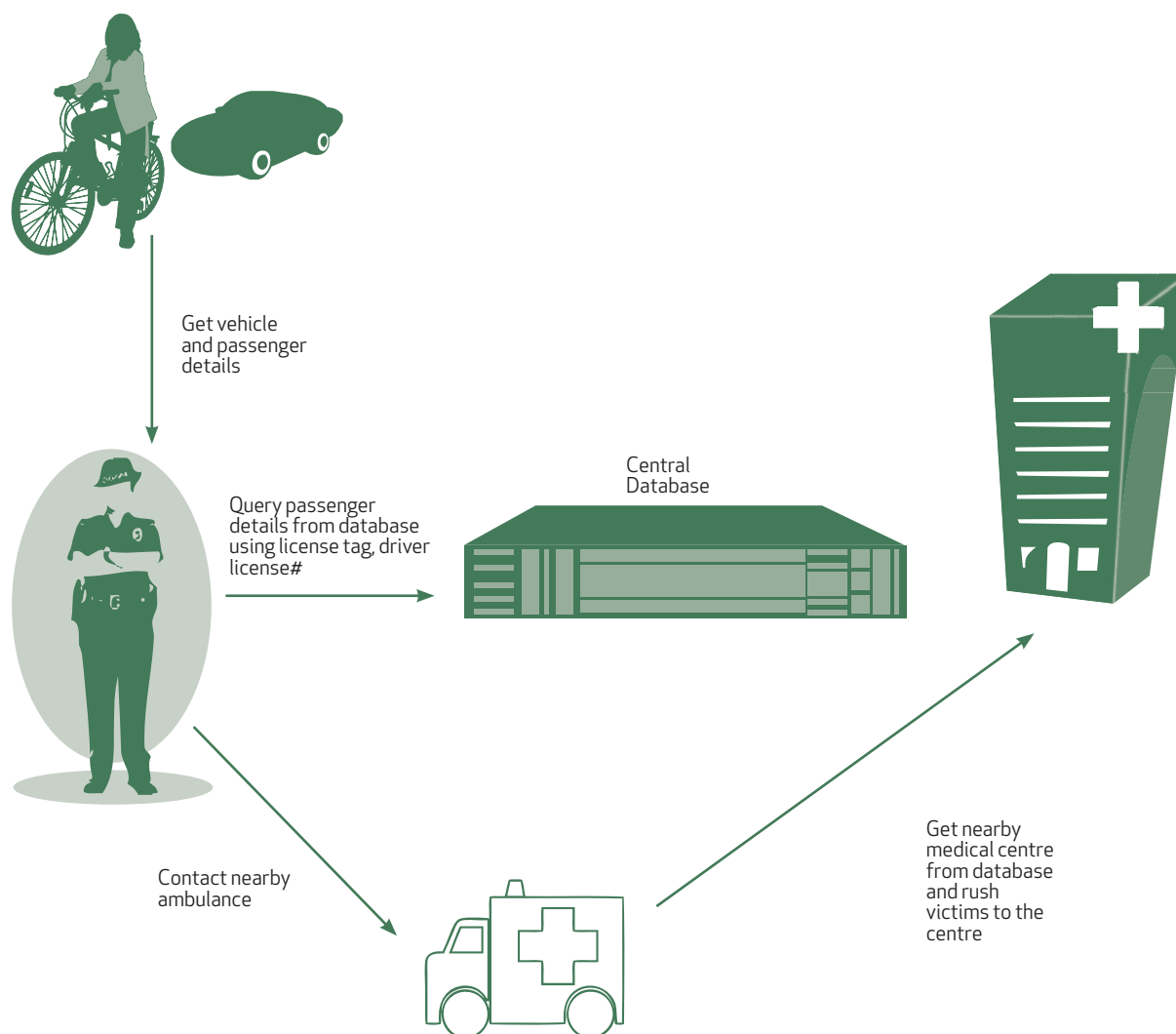
today, much progress has been made and this lag is now only five years. However, there is some disparity in that different norms apply in metropolitan urban areas and in the rest of the country. This is at least partially connected with the difficulties of ensuring adequate quantities of better quality fuels, e.g. low-sulphur diesel. Over the next five years, India must introduce uniform fuel quality and emissions standards throughout the country and make emissions monitoring a key component of the vehicle inspection and certification process.

This issue has been dealt with in detail in Chapter 7 Volume II, on Energy and Environment.

INTER-AGENCY COORDINATION:

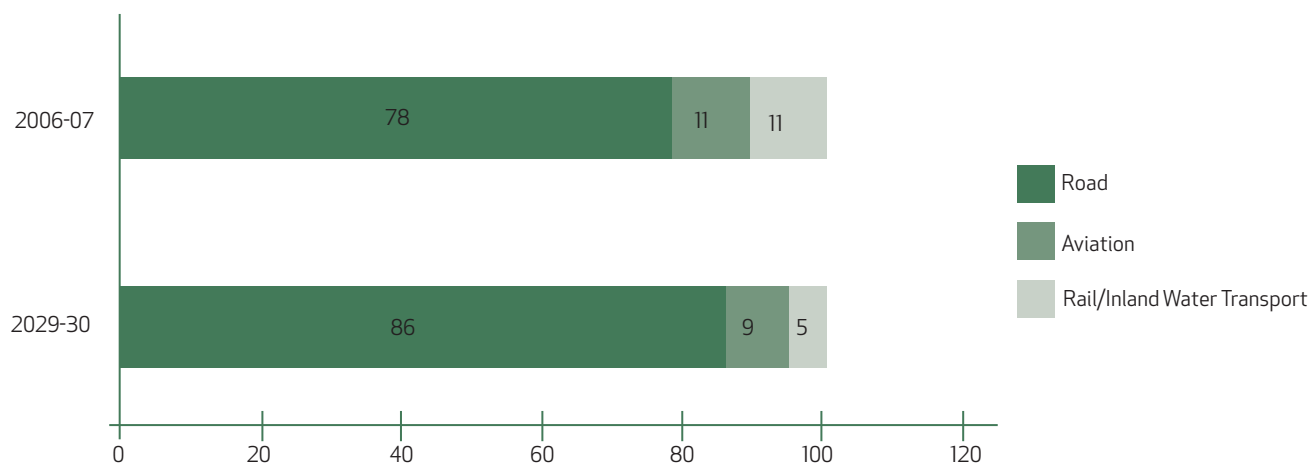
There are multiple agencies both in the Centre and the states for the development of the road transport sector. In such a situation, more often than not, each agency formulates and implements its own plan for development without any regard to the plans of other agencies. This leads to sub-optimal network development and results in higher resource cost of transportation. In Chapter 5 Volume II, Institutions for Transport System Governance, setting up of the Office of Transport Strategy (OTS) has been recommended. This organisation would develop a larger coordinated plan for all modes of trans-

Figure 2.3
Golden Care



Source: Infosys Research

Figure 2.4
Mode-Wise Energy Shares in The Transport Sector
[Per cent]



Source: Report of the Working Group on Roads for NTDP, May 2012

Table 2.37
Relative Fuel Efficiencies of Various Road Transport Modes

MODE	FUEL TYPE	FUEL EFFICIENCY (KM/L)	ENERGY INTENSITY (L/PKM)	RELATIVE ENERGY INTENSITY
Bus	Diesel	4.3	0.006	1.0
Two-wheeler	Petrol	44.0	0.015	2.5
Three-wheeler	Petrol	20.0	0.028	4.7
Car	Petrol	10.9	0.038	6.3

Note: pkm = passenger kilometre, l = litre
Source: Report of the Working Group on Roads for NTDP, May 2012

portation including road transport. Within the framework of this plan, each organisation may formulate plans and policies. If necessary, OTS may issue suitable guidelines and assist the agencies in this regard.

SUMMARY AND CONCLUSIONS

- i Delays in land acquisition affect the implementation of road projects. It is necessary to go in for land acquisition proceedings well in advance. There may be need to move towards acquiring land for roads through the system of negotiated rates to accelerate the process.
- ii Ever-increasing economic activities are putting greater pressure on the scarce resource of land. Hence, there is an imperative need to have a closer look at the requirements of land for transport projects. Expressways, particularly greenfield projects, consume large swathes of land. Rail corridors use much less land and provide much greater capacity. Intermodal choices need to factor this in also, besides inherent characteristics of each mode.
- iii A uniform policy for rehabilitation and resettlement of project affected persons is desirable so as to ensure equitable compensation across state and Central government agencies.
- iv Utility agencies need to seek prior permission of the road agencies for their operations and should be required to pay a reasonable rent for use of the right of way. The entire cost of relocation of existing utilities should be borne by the utility agency irrespective of whether this is due to road upgradation or due to requirement of the utility agency itself.
- v The wide-ranging recommendations of the

Sundar Committee on Road Safety and Traffic Management should be adopted. A Road Safety and Traffic Management Board should be set up, together with a National Road Safety Fund. In consultation with the government, which will also retain powers to issue directions, the Board will have wide-ranging powers to promote road safety and improve traffic management in India. The Board should consist of a chairperson and three to five experts in road engineering, traffic engineering, vehicle engineering, traffic laws and enforcement, and accident-related healthcare.

- vi Given the relative energy efficiencies of personalised vehicles and public transport, it is necessary to enhance the share for the latter. Apart from this, better fuels, better engines and better roads would also help contain the incessant increase in demand for energy for road transport. This would also help in containing the emission levels to acceptable norms.

FINANCING ROADS

As seen earlier, the projected investments for roads in the next 20 years covering the 12th, 13th, 14th and 15th Five Year Plans are huge. To recapitulate, Table 2.38 shows the requirements of funds to respond to the traffic demand and providing universal connectivity to our villages.

FINANCING STRATEGIES

It is not too far into the past, when the sole method available for financing road infrastructure was the government budgetary allocation of each year, made according to a five-year investment plan. Some of the budgetary allocation would be directly funnelled

from revenue sources such as fuel taxes, vehicle and passenger taxes, other road taxes, and named cesses. Recent attempts at private sector involvement in provision of road infrastructure have brought enormous changes, and made possible greater quantities of better new roads available faster than they otherwise might have. However, these partnerships between the public and private sectors have not proved to be uniformly successful. Even so, there can be no escaping the conclusion that private sector involvement is essential over the next 20 years. Hence, government focus must also be on lessons learnt from the current concession projects and incorporate the same in designing mode of delivery of road infrastructure so as to ensure value for money invested.

ROAD TAX AND FUEL CESS REFORM

Taxes on petroleum and high speed diesel oil are earmarked for road construction programmes. For the Central Road Fund, the current policy is to charge a fixed cess of Rs 2 per litre. In an environment of rapidly increasing oil prices (which it must be recalled, immediately influence road construction costs), these cesses comprise decreasingly lower shares of fuel retail prices. This policy should be replaced with fuel taxation on an ad valorem basis. As noted earlier, the cess was fixed at Rs 2.00 per litre on petrol and diesel in 2005. At that time, the price of petrol was around Rs 40/per litre and that of diesel around Rs 30/per litre. Current prices are Rs 70/- and around Rs 50/- (highly subsidised). The cess can be enhanced to Rs 4.00 per litre now and be increased with time. The CRF accruals would get enhanced to about Rs 400 billion a year. Apart from this fund, several states have created state road funds for development and maintenance of state roads. Such initiatives can be adopted by other states as well.

Furthermore, road taxes are inconsistent and seemingly disconnected from the desired economic outcomes they ought to relate to. Myriad taxes at varying rates on varying tax bases apply on vehicle purchase, on the operation of motor vehicles, and on parts and tyres. There are fees associated with registration and transfer and on permits for commercial vehicles to ply on interstate routes. Finally, there are periodic vehicle taxes, and operational fees payable, such as lease taxes, and passenger and goods taxes. The idiosyncrasies of the taxation regimes across the states mean that it is difficult to account for how these revenues are actually used. There is need for rationalisation of road taxes on motor vehicles (Chapter 9, Volume II on Fiscal Issues, for details). These differing taxation regimes also act as a deterrent to the free movement of freight, hampering economic productivity and growth. The uncertainty and confusion caused by the taxation policies of the states must be rationalised with the guiding principle being a clear mapping between the economic

A uniform policy for rehabilitation and resettlement of project-affected persons is desirable so as to ensure equitable compensation

rationale for the tax, the tax itself, and how the resulting revenues are deployed.

There is a case for significant increase in taxes on personalised vehicles so that they can be ploughed back to generate resources for strengthening public transport.

In addition to road taxes and tolls, some states have also been generating financial resources through market committee fees on agriculture produce and share out of royalties from mining.

PPP IMPLEMENTATION

With limited public funds and a pressing need to rapidly develop India's infrastructure, the government has, in recent years, sought private participation in major infrastructure projects. Typically, the government (at the central or state or joint levels) negotiates terms with a consortium of private enterprises under which each contributes a certain amount towards the construction of the project. The terms also govern how the project is to be operated and maintained over a defined period, how risks and revenues are shared, what guarantees are supplied by both parties to each other, and what happens to the asset at the end of the defined period.

The current policy framework for undertaking road infrastructure projects through the PPP mode has been well laid down and needs to continue. The standard documents prepared by the Planning Commission and the Indian Roads Congress are world class. While implementing projects through the PPP, a few problems have, however, arisen. Box 2.25 brings out issues and experiences in implementation of three projects as case examples.

The initial exuberance that private enterprise would prove to be a bedrock on which the road network of the future could be built seems to have dampened to some extent in recent months. Much of the low-hanging fruit in the form of the most profitable, i.e. highly trafficked, highways has been picked. Projects that are less attractive to the private sector, but no less important for the nation, have struggled to find suitors. Several PPP-funded projects have suffered from want of pre-construction preparation in the form of securing land, permissions, and adequate provisions for resettlement and rehabilitation. More generally, the balancing of risks between government and private enterprise remains desirous of a consistent framework that is fair, rational, and sustainable. While it is necessary to design agreements that are

Table 2.38
Projected Investments for Road Infrastructure
 (Rs billion)

SCHEME	2012-17	2017-22	2022-27	2027-32	2012-32
Expressways	200	600	1,200	1,800	3,800
National Highways	2,150	3,150	4,200	5,700	15,200
Special Schemes SARDP-NE + Arunachal Package (central sector)	250	400	500	600	1,750
Other Special Schemes (central sector)	100	150	200	200	650
State Highways	2,100	2,700	3,200	3,600	11,600
Major District Roads	1,000	1,300	1,600	2,100	6,000
Rural Roads Includ- ing PMGSY	1,450	1,850	1,300	1,100	5,700
Total	7,250	10,150	12,200	15,100	44,700

flexible enough to accommodate the concerns of the entrepreneurs, it is equally incumbent on the road agencies to exercise due diligence in conceptualising the scope of work for the PPP projects. See Box 2.26.

The following suggestions merit consideration for provision of road infrastructure through PPP.

- i Undertake studies of several PPP road projects with a view to distilling good practices and problems faced and how they were resolved. The reports based on such studies should be put on the web and discussed with road agencies to improve delivery of future projects.
- ii Continue with the current strategy of phased development for capacity augmentation—neither too much too early nor too little too late. Provide capacity for a minimum of 10-12 years initially. Land width should of course be planned and provided initially itself. It is necessary to ensure that land acquisition conforms to the letter of the law and institutional arrangements are made to address grievances

and adequate provisions are made for rehabilitation and resettlement of project affected persons.

- iii The road agency must provide a value-for-money analysis for each project not only at the time of procurement but also post construction. The post construction value-for-money analysis should also capture time and cost overruns, variations in revenue realised compared to initial forecasts and quality of service achieved.
- iv It is also to be appreciated that PPP projects are vulnerable to both the financial and the real impact of the economic downturn. Drop in GDP growth rate in the recent past has directly affected the traffic growth rate and thereby revenue potential of road projects. Due to the lower revenue potential, viability of highway projects took a hit. The lenders found that the original revenue projections given by the project developers were not being met and debt servicing was not upto the levels originally projected. Due to this, lenders reduced their interest and exposure towards

road sector projects. Effects of down turn on PPP projects are evident. There is need for the government to invest in knowledge acquisition, especially in respect of traffic forecasting, pavement performance and deterioration prediction and highway capacity norms. This would help both the government and the concessionaire in more informed financial appraisal, transparency in PPP finances and reduced risks arising from uncertain outcomes. Even the current risk sharing mechanism may need review to provide reasonable comfort to the concessionaire and the lender.

- v The Annuity Model is nothing but a deferred budget form of delivery and has the potential of casting a heavy burden on contingent liability of the government. It is clearly unsustainable in the long run as the entire traffic risk is transferred to the government. The government would do well to stop this mode of delivery in its present form. Where this mode of delivery is proposed, there should be a cap, say no more than 15 per cent of the annual road budget to defray year-by-year contingent liability by way of annuity payments. Further, such projects, being prohibitively expensive, should be subjected to a more rigorous value-for-money analysis and compared with the public sector delivery option. Another modification that has potential to soothen contingent liability in the future would be for the government to provide 40 per cent of the construction cost upfront and the balance cost of construction plus maintenance to be paid back through annuity payments. There is also need for stricter scrutiny of annuity payments demanded by the bidders on the parameter of reasonableness of demand. Otherwise, it would be more cost-effective to undertake projects instead as EPC contracts.
- vi Given that for some projects in the past, the concessionaires did not evince interest in BOT (Toll) and preferred BOT (Annuity), it is evident that there is less appetite for bearing full traffic risk by private players. It would be advisable to revisit the strategy for traffic risk sharing in BOT (Toll) model. The government needs to share both the upside and downside of a predecided/ predetermined traffic band and address the concern of competing facility so as to provide the requisite comfort to the private sector.
- vii The government is already aware of the problems arising due to lack of progress on pre-construction activities covering land acquisition, shifting of utilities and environmental clearances. Arrangements should be made for bringing these activities under control before project award and streamlining the system of various clearances and State support in facilitation of these clearances as also in law and

order and toll operations.

- viii The level of service and riding quality are seen to be poor on several projects. There is need for a stricter regime for enforcement of performance standards during operation and management of projects by the concessionaires. The agencies should be held accountable for any deficiency in performance of the concessionaires.
- ix PPP projects necessarily involve a user-pays element. In several parts of the country, the local population has balked at the idea of paying to use a road that is constructed on land that is considered their own. Occasionally, it has proved sound politics to stoke this civil disobedience. Wider acceptance of this model is required to reduce the social and political risks associated with PPP-funded projects. This can be done by ensuring that land acquisition conforms to the letter of the law, setting up institutions to address grievances, providing for adequate resettlement and rehabilitation efforts, and by demonstrating direct benefit and value for money. This last factor depends on timely construction, assured maintenance, smooth toll collection, and predictable toll escalation.

THE WAY FORWARD

PPP has introduced much-needed private funding for provision of public infrastructure. Amongst the various sectors, the influence of PPP on roads has been especially strong. This can be attributed to strong political leadership for promoting user charge principle, a supportive institutional environment and sound legal framework with fair risk sharing mechanisms, a clear mandate, a capable champion and enabler in the road agencies, and an incentive structure that welcomes private investment. However, for PPP funding to continue to contribute to the development of the Indian road network, there is a strong case for learning from the achievements made so far and undertake further reforms to enhance the level of private financing.

REVIEW OF TOLL POLICY

There is need for review of the current policy of user fees (tolls) on National Highways. A two-lane road should be considered a minimum facility to be provided out of government budget in respect of primary roads (National Highways and state highways) with no direct user charge. Toll should be levied on multi-lane highways, both access-controlled and non-access controlled, as also spot improvement projects such as bridges, tunnels, flyovers, bypasses.

Issues & Experiences in Implementation of PPP Road Projects

i **Delhi-Gurgaon Project on Golden Quadrilateral: Better Project Preparation**

The project was conceptualised in 1999 as a part of the Golden Quadrilateral project. It was awarded to the consortium of Jaypee Industries and DS Constructions Ltd. in 2002. It was also the first project to be awarded on negative grant basis. The project could be opened to traffic only in 2007 after five years of its award.

In between, following issues were observed:

1. NHAI relied on old traffic data which resulted in a situation with high traffic levels causing heavy queuing at the toll plaza.
2. The project required various approvals from 15 government/civic bodies, which was a complex and time consuming process. Such delays can be avoided through a single window clearance mechanism or a clearer approval process that should be standardised across states and agencies.
3. The original project cost envisaged was Rs 548 crore. However, actual cost to the concessionaire turned out to be more than Rs 1,000 crore. There were substantial changes in the original design to provide for future requirements and the convenience of commuters. Out of a total of 11 structures, nine had significant design modifications. Also, various government agencies demanded changes in the project alignment and design resulting in change in scope, project cost and consequent delay.
4. The project also faced issues in land acquisition. There were certain small parcels of land which were difficult to acquire.

Experience in this project highlights the importance of reliable and up to date traffic data, single window clearance for large projects, deeper stakeholder consultations for design finalisation during project preparation, especially in urban areas, and the need to closely monitor project performance as well as to ensure that audited results reflect the true performance of the project.

ii **Ahmedabad-Vadodara (NH-8) 6 laning project combined with Ahmedabad-Vadodara Expressway: Innovative Structuring**

Ahmedabad-Vadodara Expressway (NE-1) was constructed by NHAI and was operated under an SPV owned by NHAI. Recently, when the need for six-laning of the Ahmedabad-Vadodara NH-8 section was realised, its project structuring faced issues relating to a competing facility in the form of the existing Expressway. Also, there was an issue of correct estimation of traffic on the NH-8 section and thus there was risk of developers allocating high risk premium in their bids.

Consequently, the Expressway and the NH-8 sections were clubbed under one project for bidding out. This reduced the risk perception and also improved viability of the project.

This experience highlights the importance of innovative project structuring leading to win-win situations.

iii **Mumbai-Pune Expressway: Importance of Establishing Revenue Streams for PPP Projects on Toll Basis**

This project, developed by the Government of Maharashtra, involved a full new alignment with attendant traffic risk and significant uncertainty in initial years. The Government of Maharashtra allowed the project to first establish a definite revenue stream over a few years and then awarded the project on operations and maintenance contract with tolling rights. This experience highlights the need of a reliable and established revenue stream for PPP projects to be successful on toll basis.

Source: Report of the Working Group on Roads for NTDP- May 2012

Sub-Prime Highways

- Banks have been lending far in excess of the duly approved TPC (Total Project Cost) in case of several PPP highway projects under the NHDP, leading to a situation where the concessionaire may not only spend beyond reasonable costs, but also siphon out funds at public expense. A question arises as to whether these are in the nature of sub-prime loans that can expose public finances to undue risk.
- Disproportionate grants by the government for construction of PPP road projects combined with permitting the concessionaire to sell its equity and exit from the project after two years of completing the construction reduces its incentive to build a project that would last longer and can leave government with low-quality assets. Need to identify and eliminate potential risks to public interest.
- Bids received for some of the annuity projects also seem to be very high and unjustified. This arrangement does not seem to represent value for money from the perspective of the exchequer.
- There seems inadequate appreciation of the fact that annuity payments are essentially a form of deferred budgetary payments which will pre-empt future development by committing the expected cess revenues for 15 to 18 years. This is not only unprecedented but also unsustainable.
- The standards laid down in the IRC Manuals are being routinely exceeded and excessive costs continue to be incurred by adding elements that lack justification.

Source: Sub-prime Highways: An Issues Paper by Gajendra Haldea, June 2010 (For internal use of Planning Commission).

The government is already considering reduction in user fees after recovery of capital costs and dispense with charging of toll when the project is under construction. This would be a step in the right direction. In addition, the government may also consider incentivising toll rates for multi-axle vehicles as they carry more tonne km per litre of fuel.

Due to multiplicity of vehicle taxes being paid by the commercial vehicles (buses and trucks), there have been occasional threats and concerns expressed in the past by the road transport industry for linking the rates of tolls with the savings in time, fuel consumption and vehicle operating costs. It is necessary to immediately launch a highway allocation study to decipher the costs occasioned by cars, buses and trucks in use of roads covering both construction and maintenance costs and benefits occurring due to capacity augmentation in terms of savings in road user costs. This will provide the much-needed rationale for review of the current toll rates.

While the open system of toll collection needs to continue in respect of non-access controlled multi-lane roads, there is need to move to closed system of toll collection on expressways so that users are charged based on the length of road

utilised for the journey. In the open system also, there have been cases where the users have been required to pay much heavier toll amount in relation to the use of the highway because of irrational location of toll plazas. This requires a more reasonable approach in deciding location of toll plazas.

There is need to adopt the electronic toll collection system as per recommendations of the Nandan Nilekani Committee. To enhance transparency, each toll plaza should display cost of project, and amount of toll collected up-to-date.

PUBLIC SECTOR FINANCING

Private sector financing in the highways would remain confined to the commercially viable and high traffic density stretches. Rural roads are being built with the government financing utilising the CRF and RIDF window of the NABARD funding. While the private sector would continue to serve an important segment of the road network, sizeable investments in the road sector are required to develop the balance road network of even primary and secondary roads. It will be prudent, therefore, to enhance the availability of public sector funding sources to bridge the current gap between the availability of funds and

The government is considering reduction in user fees after recovery of capital costs and dispense with tolls when the project is under construction. In addition, it should also consider incentivising toll rates for multi-axle vehicles as they carry more tonne-km per litre

the road development requirements. Further, public sector delivery also is in need of enhanced efficiency and value engineering.

SUMMARY AND CONCLUSIONS

- i The current policy framework for public-private partnership in roads has been well laid down and should continue. However, the government must focus on lessons learnt from the current concession projects and ensure value for money invested.
- ii Recently, there has been somewhat poor response from the private sector. There is need for the government to invest in knowledge acquisition, especially in respect of traffic forecasting, pavement performance and deterioration prediction and highway capacity norms. This would help both the government and the concessionaire in more informed financial appraisal and reduced risks arising from uncertain outcomes. Even the current risk sharing mechanism may need review to provide reasonable comfort to the concessionaire and the lender.
- iii The Annuity Model is nothing but a deferred budget form of delivery and has potential of casting a heavy burden on contingent liability of the government. It is clearly unsustainable in the long run as the entire traffic risk is transferred to the government. The government would do well to stop this mode of delivery in its present form. Where this mode is proposed, there should be a cap, say no more than 15 per cent of the annual road budget to defray year-by-year contingent liability by way of annuity payments. Further, such projects should be subjected to a more rigorous value-for-money analysis and compared with the public sector delivery option. Another modification that has potential to soothen contingent liability in future would be for the government to provide, 40 per cent of the construction cost upfront and the balance cost of construction plus maintenance to be paid back through annuity payments. There is also need for stricter scrutiny of annuity payments demanded by the bidders on the parameter of reasonableness of demand. Otherwise, it would be more cost-effective to undertake projects instead as EPC contracts.
- iv Given that for some projects in the past, the concessionaires did not evince interest in BOT (Toll) and preferred BOT (Annuity), it is evident that there is less appetite for bearing full traffic risk by private players. It would be advisable to revisit the strategy for traffic risk sharing in BOT (Toll) model. The government needs to share both the upside and downside of a predecided/predetermined traffic band and address the concern of competing facility so as to provide the requisite comfort to the private sector.
- v The government is already aware of the problems arising due to lack of progress on pre-construction activities covering land acquisition, shifting of utilities and environmental clearances. Arrangements should be made for bringing these activities under control before project award and streamlining the system of various clearances.
- vi The level of service and riding quality are seen to be poor on several projects. There is need for a stricter regime for enforcement of performance standards during operation and management of projects by the concessionaires. The road agencies should be held accountable for any deficiency in performance of the concessionaires.
- vii PPP projects necessarily involve a user-pays element. In several parts of the country, the local population has balked at the idea of paying to use a road that is constructed on land that is considered their own. Occasionally, it has proved sound politics to stoke this civil disobedience. Wider acceptance of this model is required to reduce the social and political risks associated with PPP-funded projects. This can be done by ensuring that land acquisition conforms to the letter of the law, setting up institutions to address grievances, providing for adequate resettlement and rehabilitation efforts, and by demonstrating direct benefit and value for money. This last factor depends on timely construction, assured maintenance, smooth toll collection, and predictable toll escalation.
- ix It is to be realised that the private sector financing in the highways would remain confined to the commercially viable and high traffic density stretches. Rural roads are being built with the government financing utilising the CRF and RIDF window of the NABARD funding. While the private sector would continue to serve an important segment of the road network, sizeable investments in the road sector

are required to develop the balance network of even primary and secondary roads. It will be prudent, therefore, to enhance the availability of public sector funding sources to bridge the current gap between the availability of funds and the road development requirements. Further, public sector delivery also is in need of enhanced efficiency and value engineering.

DATA AND INFORMATION TECHNOLOGY

Better decisions on road infrastructure can only stem from better understanding of the underlying structure of current and expected traffic on our roads. This understanding, which in turn is dependent on better data, can help ensure that outlays deliver infrastructure that actually addresses the core concerns of mobility and accessibility, while not being wasteful. As a simple example, consider a situation where the citizens of a medium-sized town report an access road to be perpetually congested. Solutions to this problem can range from widening the access road, constructing a bypass around the town, boosting rail capacity into the town, constructing a transport nagar on the outskirts, amending city bylaws, and many others. The point is that the most efficient and cost-effective solution hinges crucially on an in-depth understanding of why the road is congested and the pattern and characteristics of the types of traffic plying on the road. Such evidence-based decision-making and monitoring of resulting outcomes is reliant on extensive, relevant and robust data.

EXISTING DATA COLLECTION AND DISSEMINATION

The existing system of planning and management of various categories of roads involves some level of judgment and empiricism due to the lack of a fit-for-purpose database on existing condition of roads, traffic data, vehicle fleets, level of service, accidents and so on. Even for National Highways, only limited data is available on the inventory of bridges and overpasses. Traffic censuses are based only on seven-day counts carried out twice a year, falling well short of delivering a complete picture of year-round use. Much useful data collected by both Central and state governments stay unused for want of being accessible from a centralised system in a standardised format.

PHYSICAL INFRASTRUCTURE

Data on physical infrastructure at the Central and state level is collected in Basic Road Statistics, a publication issued by MoRTH. All classes of roads are covered, though with a substantial time lag. With ambitious targets for road building that are often expressed in terms of km per day, it would be immensely useful for performance monitoring purposes if data were published regularly and frequently. This will require overhauling and streamlining of the data collection system that relies on a multiplicity of agencies and often fea-

The government needs to share both upside and downside risks so as provide the requisite comfort to the private sector

tures incomplete and inconsistent data that frustrate timely publication.

VEHICLE FLEET STATISTICS

The Road Transport Yearbook collates data on India's vehicle fleet from the governments of states and union territories. Disaggregated data is also available for many of the largest cities. The headline data item is the total of the registered motor vehicle fleet in each jurisdiction, though this is more finely distinguished by: vehicle classification, passenger load for public transport vehicles, engine size, public and private ownership of buses, and so on. However, with road transport primarily under state purview, the quality and coverage of this data is largely dependent on state-level funding and effort. A major limitation of this data is that registered vehicles are a superset of vehicles actually in use. Thus, there is considerable overestimate of the number of vehicles that are on the road. Other missing features of this data concern the vehicle km travelled by both private and public transport vehicles, the degree to which they conform to design rules and pollution controls, and whether or not they are fit for use on the road network.

OTHER STATISTICS ON ROAD TRANSPORT

The Road Transport Yearbook also includes other important data such as the applicable rates of registration fees and tax on different types of vehicles, the rates of tax on goods and passenger transport, revenues realised from motor vehicle taxes, physical and financial performance of state road transport undertakings, some road accident data and Plan outlays and expenditure in the road sector.

Other sources such as the Reserve Bank of India, and Central Excise and Customs also publish data pertaining to the roads sector. For example, in its survey of state finances, the RBI provides data of revenue raised from motor vehicles, passenger and freight taxes. Meanwhile, Customs publishes excise data on motor vehicles and parts. The Planning Commission is the central repository of data on Plan allocation and expenditure on roads under the various central and state schemes. It also brings together some data on how the road sector interacts with other transport modes, though this data is neither periodic nor standardised.

DATA REQUIREMENTS

Indicators for the road transport sector need to be identified so that data on these is compiled and analysed for benchmarking, performance monitoring

Performance and outcome-based indicators are not being captured for roads, leading to an incomplete picture of the impact of new or better roads on traffic carried, congestion alleviation, environmental effects, and quality of life. Collection of this data is essential

within the sector, and for intermodal comparison. Good progress is being made in compiling data on physical achievements. However, performance and outcome-based indicators are not captured, leading to an incomplete picture of the impact of new or better roads on traffic carried, congestion alleviation, environmental effects, and quality of life. Data on these outcomes-focussed measures are equally essential for all categories of roads.

As noted above, a major limitation of the data on vehicle fleets is that it focuses on the registration rather than on vehicles actually in use. This can be addressed through a specially created Motor Insurance Database wherein all insurance companies provide details of the first insurance policy as well as for renewals for each vehicle covered.

Road accident data has already been addressed, but it is worth re-iterating that more extensive data on the circumstances peculiar to each accident can help identify long-term trends and patterns which can be used to inform safer road design, improved laws and regulations, and more stringent enforcement where necessary.

Maintenance work on roads is especially hampered by lack of knowledge on the real-time condition of a road in terms of the level of service it is capable of providing. Data is needed on the pavement quality as measured by rut depth, the extent of road cracks, number of potholes, bridge condition and so on. Maintenance treatments can be prioritised by combining this information with other data that compares observed average traffic speeds with design speeds and accident histories amongst others.

There is no organised data on non-motorised transport modes, although it is known that they serve an important need in both urban and non-urban areas by catering to short trips and providing access to public transport catering to long trips.

With respect to passenger bus services in the public sector, much useful information is available on fleet utilisation, vehicle productivity, staff productivity, staff bus ratio, fuel consumption for state-owned transport companies. But there is virtually no data available on private bus operators even though they constitute a major share of total public transport. This information should be collected and should be made available in electronic form for public use.

There is no mechanism for undertaking systematic origin-destination studies for freight moved by road. It is widely acknowledged that goods vehicles face substantial delays at state borders and other check posts, and at inter-modal junctions. However, there is little data that can be used to substantiate and then address this phenomenon. In order to collect data on the movement of freight, a random survey should be conducted every five years. Figure 2.5 shows the kind of data on freight that will be required. This method can be used to track industries which contribute significantly to freight movement such as manufacturing, retail, mining, fuel, electronic shopping etc. We expect the following industries to be included in the survey: food; petroleum products; coal; chemicals; primary metal manufacturing; machinery; wholesale dealers in fuels; and warehousing and storage.

Figure 2.6 shows the process to be used for obtaining the data. It shows the various groups of participants which should be included in the survey. After obtaining data from the surveys, a database needs to be built. Various analytical studies can then be carried out and the results shared with users to get their feedback. If there seem to be major discrepancies or gaps in the data based on the feedback, then design of the freight database will need to be modified.

In order to ensure that all the necessary data is accurately represented in the database and to facilitate data entry for the surveyors, it will be important to develop standards for the format of the various kinds of data. Figure 2.7 shows the categories of data that will be included in the database and for which data standards and formats will need to be agreed upon, and developed if not already available. There will be a wide variety of data that will need to be collected and a great deal of work will need to be done before the surveys are started to arrive at a consensus on the data formats and standards. Recent traffic surveys carried out by RITES for total transport system studies would give the basic framework for data formats which would also help in analysis of inter-modal choices and needed policy corrections.

The existing programme of traffic census that is carried out to support certain studies must be urgently supplemented by permanent traffic count stations at several hundred important locations on the network. These counts can be used to monitor the overall health of the network, to identify choke points and to direct new infrastructure spending to where it may be most beneficial. With an increasing number of projects funded through PPP arrangements, these counts would also enable more reliable traffic growth forecasts, besides helping in proper planning, design, construction and operational phases of the contract. More accurate traffic counts lead to better estimates of future road use, project revenues, and required government subsidies.

MANAGING DATA

Notwithstanding the data collection gaps identified above, an equally pressing problem is the management and dissemination of the data that is already being collected. At substantial cost to both government and private agencies, a large number of traffic censuses, feasibility studies, detailed project reports and the like have been carried out to support the construction of new road infrastructure. These reports normally include much useful information such as assessment of localised network features, soil conditions, unit costs, manpower, machinery and material requirements, traffic volumes, and the impact of a project on the network and local catchment area. However, there is currently no organised system to access the data generated from these efforts.

MoRTH has financed several studies and research and development with a view to improving the strategy and management of all categories of roads. It would be expedient to establish a Road Data Centre for the collection of data from various sources, its storage, retrieval and analysis for the use of other interested agencies. The Data Centre should ensure that the data collected and distributed conforms to standard measures of data integrity: timeliness, accuracy, and coverage. Data should be periodically updated, and stored in a format that permits easy electronic access. The Data Centre should make available both raw data at the highest level of granularity possible, and also seek to construct meta-measures such as quality-adjusted or hedonic cost indices. Table 2.39 provides a listing of important statistics that should be collected, constructed and disseminated and put on the web so that is in public domain.

PAVEMENT AND TRAFFIC MANAGEMENT SYSTEMS

A pavement preservation strategy must be devised based on statistically valid data on the performance of various types of pavement compositions under varying traffic, geographic, and climatic conditions. Special care must be taken to ensure that this data accounts for the stresses that the Indian climate and topography places on road pavement.

A Pavement and Bridge Management System (PBMS) needs to be developed so that the pavement preservation strategies may be optimally implemented. This system will record detailed current inventories of road assets, thereby ensuring that road maintenance and overhaul programmes can be tailored for maximal efficiency. The PBMS ought to be part of a wider, more comprehensive database called a Road Information System that will effectively provide details not just on the 'quality' of the road at a given point

in time but also on its extent, reach and possibly traffic flows (if permitted by technology).

An Advanced Traffic Management System (ATMS) should be progressively introduced especially on National Expressways and four-lane NHs. The ATMS is a broad collection of technologies that work together to ensure a better and safer traffic flow. Such systems include facility and traffic control centres, emergency call boxes, variable message signs, video surveillance and incident detection, and meteorological sensors. They may also lend support to commercial mobile communication systems. Finally, automatic traffic counting and classifying systems can aid greatly in managing traffic, and in providing ready data for several purposes such as identifying bottlenecks and future road design.

The current programme of traffic census must be urgently supplemented by permanent traffic count stations at several hundred important locations on the network

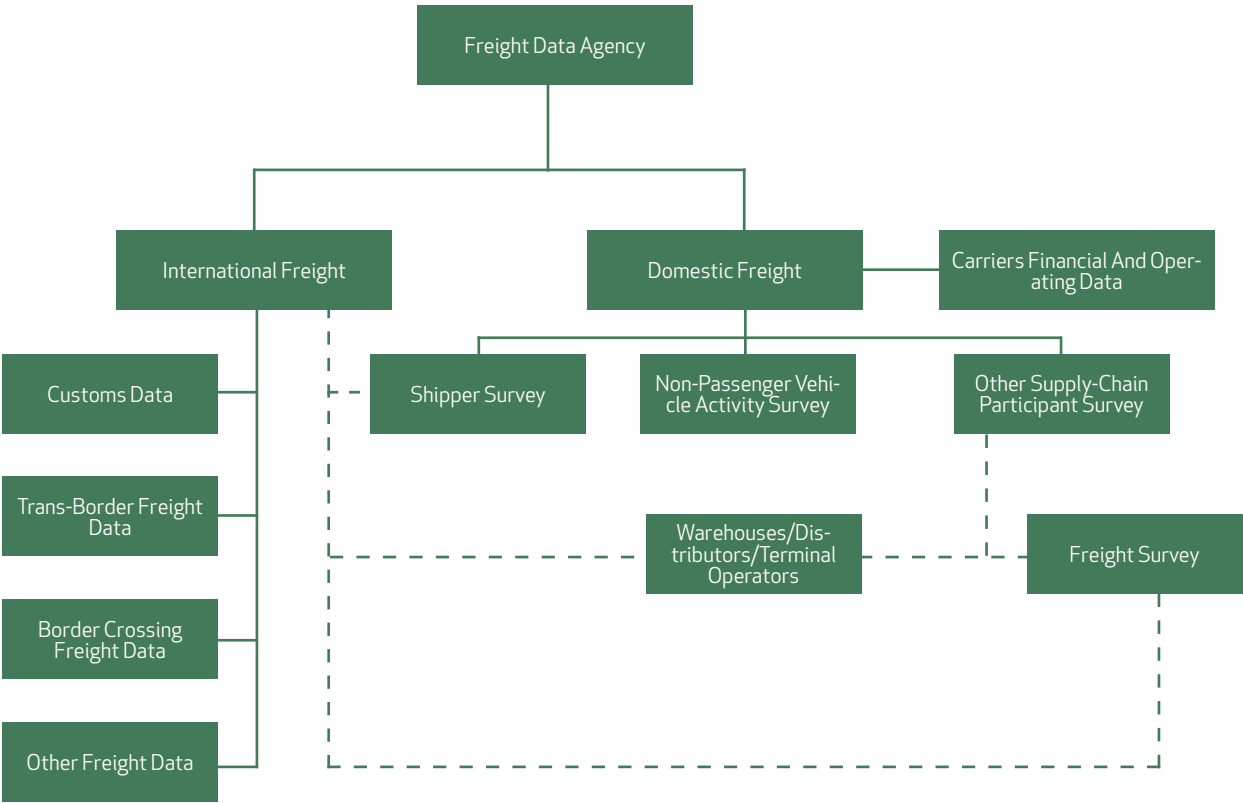
ELECTRONIC TOLLING

The integration and standardisation of toll collections across the country will greatly aid faster and smoother traffic flows. Collecting tolls electronically from freely moving traffic has seen good international success. The Nilekani Committee on this subject has recommended Radio Frequency Identification (RFID) technology for this purpose on the grounds that it is cheap, robust, easy to use, maintenance-free, scalable, and reliable. The case is convincing. The system consists of cheap tags that, affixed to a windscreen, uniquely identify a vehicle. The tags are readable by special sensors located at toll plazas. Tolls may be pre-paid and appropriate amounts are deducted whenever the vehicle passes a toll plaza. In order to manage the financial transactions relating to toll collection, the Nilekani Committee recommends a central clearing house. Because a tag uniquely identifies a vehicle, the RFID system has additional advantages in the sense that it can be easily used for vehicle tracking, parking and traffic enforcement, etc. Box 2.27 gives the implementation strategy proposed by the Apex Committee constituted by the MoRTH.

GOVERNANCE

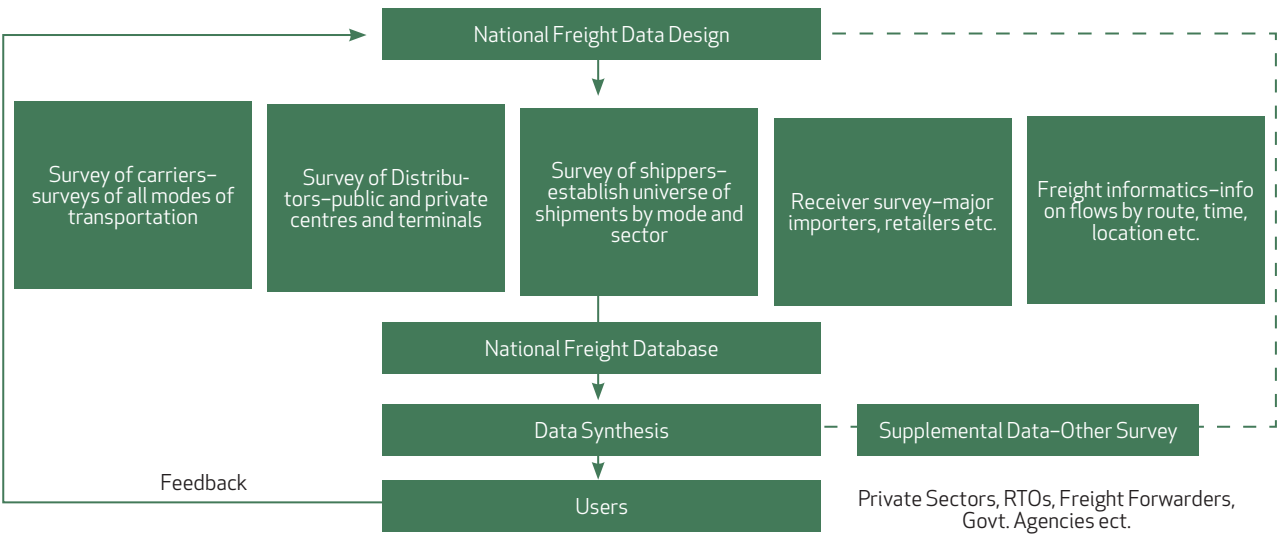
Regulation of the road sector in India, as in other countries, has been largely through contracts. The Concession Agreements that are entered into with BoT concessionaires or the EPC contracts awarded to the construction contractors spell out the rights and obligations of the two parties involved, the concessionaires and the governments/road agencies. Such contracts attempt an equitable allocation of

Figure 2.5
Data Requirements on Freight Movement



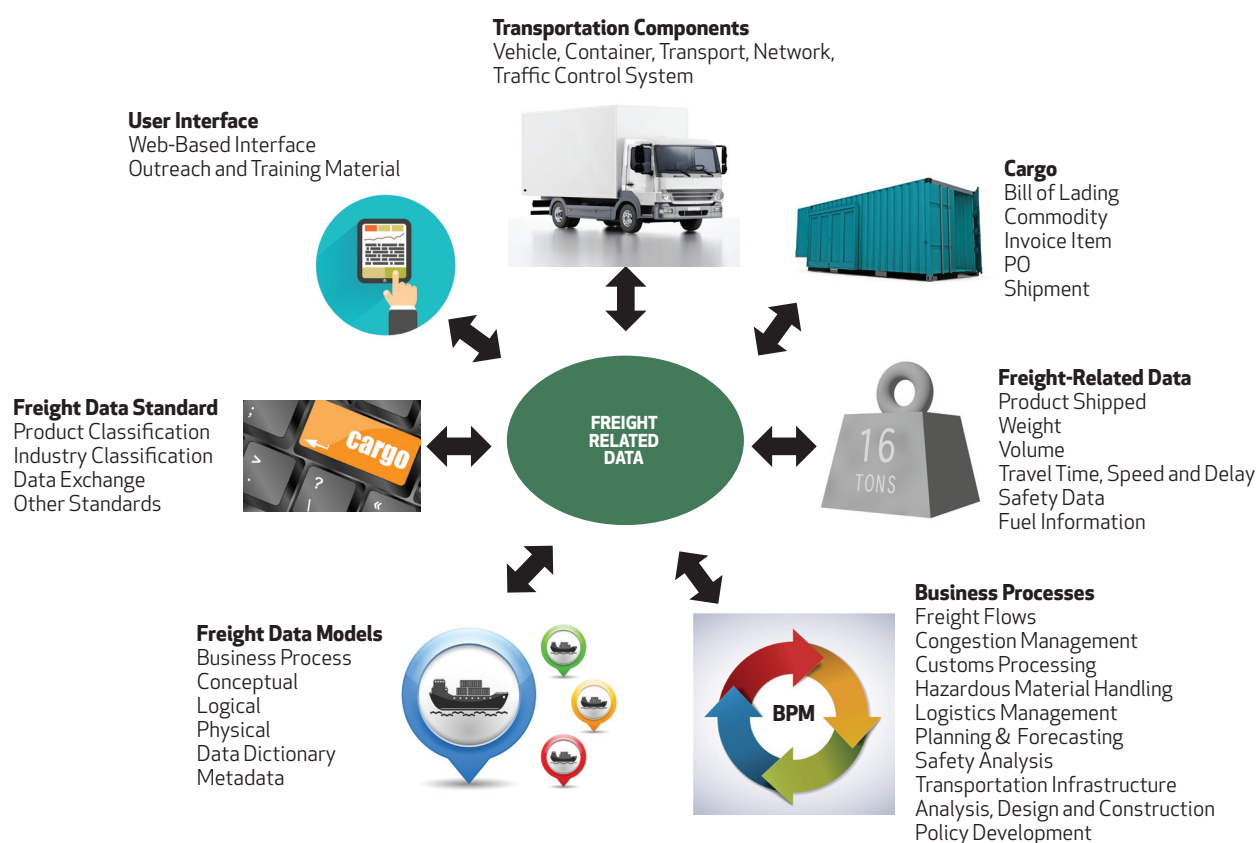
Source: Infosys Research (adapted from BTS)

Figure 2.6
Process for Developing Database



Source: Infosys Research (adapted from BTS)

Figure 2.7
Required Data Formats and Standards



Source: Infosys Research (adapted from BTS)

risks. A well drafted concession agreement together with adequate contract management skills in the government/road agencies would constitute a satisfactory mechanism for regulating road development either through contract or concession agreement. In fact, as stated earlier, in most countries of the world, road development is regulated through contracts and not through a commission or a regulatory authority. There is no example of a road regulator anywhere in the world.

At best, the argument of a road regulator rests on the premise that concession agreements are for lengthy periods of time, say 20-30 years, and it is not possible to predict events that might occur and impact the project during that period; a road regulator could help in addressing such events. However, even such a contingency can be duly provided for in a binding agreement. It is essential to improve governance whereby the road agency enforces performance of the contractor/concessionaire as per the obligations

set out in the contract agreement. The road agency is also to perform its own obligations set out in such agreements.

Recent experience in respect of PPP projects in the road sector by the NHAI has shown that contract negotiations become necessary not only since eventualities occur after a long period of time but because of lack of clarity on the rights and obligations of the parties in the concession agreements. A number of disputes appears to have arisen between road concessionaires and NHAI because of unsatisfactory contract or poor contract management. The clamour for the road regulator seems to have arisen because of these disputes. It now appears that government is now considering a mechanism to resolve contractual disputes in PPP project across all sectors. Once this mechanism is established and PPP disputes are addressed, there would be no need for the road regulator to resolve disputes between PPP developers in the road sector. The Model Concession Agreements,

Table 2.39
Data: Metrics and Sources

CATEGORY	PARTICULARS	POSSIBLE AGENCIES
Network	<ol style="list-style-type: none"> 1. Total length 2. Length by classification 3. Width of carriageway 4. Ownership 	<ul style="list-style-type: none"> • Road agencies at central and state level
Inventory and Condition	<ol style="list-style-type: none"> 1. Width of right of way 2. Width of road formation, carriageway 3. Location and span of culverts, bridges rail overpasses and crossings 4. Roughness 5. Rut depth 6. Area of cracks 7. Subgrade strength of soil 8. Bridge conditions and distress 	<ul style="list-style-type: none"> • Road agencies at the central and state level • Private O&M agencies • Privately commissioned surveyors
Traffic	<ol style="list-style-type: none"> 1. Classified traffic counts—motorised and non-motorised—by section 2. Axle load spectrum 3. Permanent traffic counts 4. Speed surveys 5. Origin-destination surveys at selected points 	<ul style="list-style-type: none"> • Road agencies at the central and state level • Academic institutions may be funded to undertake certain delegated surveys
Vehicle Fleet	<ol style="list-style-type: none"> 1. Number of motorised vehicles of various categories registered state-wise 2. Vehicle age and usage status 	<ul style="list-style-type: none"> • State-level transport departments
Passenger Movement	<ol style="list-style-type: none"> 1. Frequency 2. Purpose 3. Fare per km 4. Km per journey 5. Km per mode 6. Fleet utilisation 7. Vehicle productivity 8. Staff productivity 9. Staff-vehicle ratio 10. Fuel consumption 	<ul style="list-style-type: none"> • ASRTU • AIMTC • Federation of Bus Owners' Associations
Freight Movement	<ol style="list-style-type: none"> 1. Commodity-wise tonne-km 2. Freight movement by vehicle class, including non-motorised transport 	<ul style="list-style-type: none"> • AIMTC • Federation of Truck Owners' Associations • Sample surveys through agencies like RITES, CRR
Accidents	<ol style="list-style-type: none"> 1. Fatalities 2. Injuries: grievous, minor 3. Property damage 4. Location of accidents 	<ul style="list-style-type: none"> • Traffic police and state departments • Academic institutions

CATEGORY	PARTICULARS	POSSIBLE AGENCIES
Revenue: Taxes and Tolls	<ol style="list-style-type: none"> 1. Statewise taxes on various categories of passenger and freight vehicles 2. Number of toll plazas and booths 3. Collection of tolls from each plaza 	<ul style="list-style-type: none"> • Transport departments • Regional Transport Authorities at state levels • Road agencies in the centre and states • Concessionaires
Financial	<ol style="list-style-type: none"> 1. Investments in various categories of roads with public-private sector breakdowns, and disaggregation by schemes: capacity augmentation, bypasses, bridges, etc. 2. Expenditure on maintenance of various categories of roads 3. Unit construction and maintenance costs 4. Cost indices 	<ul style="list-style-type: none"> • Road agencies in the centre and the states
Connectivity	<ol style="list-style-type: none"> 1. Number of habitations connected by all-weather roads 2. Number that remain to be connected 	<ul style="list-style-type: none"> • NRRDA • SRRDAs
Material	<ol style="list-style-type: none"> 1. Bitumen use per km 2. Steel use per km 3. Aggregates use per km 4. Cement use per km (Disaggregated for various construction categories and maintenance)	<ul style="list-style-type: none"> • Contractors • Consultants • Road agencies at central and state levels
Manpower	<ol style="list-style-type: none"> 1. Technical staff by level and agency 2. Non-technical staff by level and agency 3. Educational qualifications of staff 	<ul style="list-style-type: none"> • Road agencies at central and state levels

standard construction bidding and EPC contracts should be live documents, amenable of being modified based on feedback or learnings from projects being implemented.

Ultimately, drafting appropriate contract agreements, managing contracts, resolving disputes etc are all part of good governance. There is considerable scope for improving governance in the road sector and good governance is possible only when there is adequate capacity to provide the necessary support. Road engineers, as a tribe, are not thorough with contractual terms, negotiations and management. Capacity building amongst road engineers should be given high priority. There is also a tendency in the NHAI/ government to be

more concerned and focused on awarding contracts without bringing under control preconstruction activities such as acquisition of land, resettlement and rehabilitation of project affected persons, shifting of utilities, tree cutting and other environmental clearance. Government should consider taking a more market oriented approach both in awarding contracts and resolving disputes so that road construction and development can take place rapidly without getting caught in a quagmire of disputes and time/cost overruns. Periodic user surveys should be carried out on the NH and SH corridors to capture the concerns of users, which should be duly considered for corrective measures and an instrument of feedback on road agency performance.

Box 2.27

Electronic Toll Collection: Implementation Strategy

- The Committee headed by Nandan Nilekani recommended adoption of passive RFID technology for electronic toll collection (ETC) at toll plazas in India, considering user convenience, rate of acceptance and ease of implementation. The system involves a self adhesive tag on the wind-shield of the vehicle which is read by transreceivers installed at the toll plaza.
- A key component for implementation of nationwide RFID based ETC is interoperability, which requires that the tag on the vehicle can be read by all the transreceivers and at the same time all tags can be read by a particular transreceiver. This implies that both the tags and the transreceivers together with Automatic Vehicle Identification should have certain common specifications. This has to be a mandatory requirement of the ETC system.
- The main functions of the ETC system are:
 - Tag distribution
 - Toll road user registration and recharge
 - Toll transactionFor managing these functions, a virtual hub called the Central ETC system (CES) is proposed to be created.
- ETC being a relatively new concept in the country, at least for the initial phase, services of domain expertise would need to be procured from the international market.
- Simultaneously, it will be essential to identify possible violations and enforcement elements against the same. Some countries use a video system to track violations.

Source: Report by Apex Committee for ETC Implementation, Government of India, September 2011.

RECOMMENDATIONS

POLICY AND PLANNING

TRAFFIC SURVEYS AND DATA CENTRE

Transport operations in the road sector being basically in private hands, there is a high level of customer focus. However, at the same time, this mode is much less energy efficient and environment friendly besides being more unsafe and requiring more land. As such, road development should not be seen in isolation but as part of an integrated modal system of transport. For facilitating such a process, it is necessary to undertake regional traffic and transport surveys on regular basis—preferably every five years (to provide inputs to formulation of Five-Year Plans and mid-course correction of policy prescriptions formulated for long-term development goals) of freight and passenger flows, transport pricing, resource costs and to identify existence of distortions in the movement from point of view of a desirable/optimal intermodal mix and investment policy for different modes of transport. Database for the road sector is virtually absent. This needs serious attention. Setting up of a dedicated Road Data Centre managed through a high level institution does not admit of any delay. This will help in reducing the current ad-hoc decision making in the road development planning process.

CAPACITY AUGMENTATION

The entire transport system, including roads, is facing capacity constraints. The economic and environmental costs of a saturated transport system are high. Strangulation of railway capacity is unduly burdening the road sector. Railways need to regain their share. This cannot happen until their capacity is enhanced and they learn from road transporters to provide a better customer focus. It is to be realised that congested roads lead to lower transport productivity, increased energy consumption and pollution. Lack of road and vehicle maintenance adds to undesirable industry competitiveness in the international market besides resulting in high inventory costs. Once the role for roads and road transport is identified within the overall transport system, it is necessary to identify and carve out road development and maintenance programmes which not only meet the expected traffic demand and improve transport productivity but also ensure that such programmes reduce in their wake the negative externalities of energy inefficiency, environment pollution and accident hazards.

RURAL CONNECTIVITY

Integrated rural development has been another area of focus by the Government for considerations of social justice, national integration and economic uplift. For this, there is all-round recognition of rural roads serving as one of the key elements of

rural infrastructure as they help in increasing accessibility to schools, health centres and in creating more employment opportunities. Rural roads serve as an entry point for poverty alleviation. These roads also provide physical mobility of raw materials, farm produce, promote specialisation and increased size of market. Further, these roads influence the process of growth by facilitating dispersal of knowledge and reduction of inequalities. The states have already prepared district level Core Road Network master plans in due consultation with the Panchayati Raj Institutions and local MLAs and MPs. These plans could be reviewed every five years to account for both agricultural and industrial growth in each district. The current programme of PMGSY needs to be expanded to achieve universal connectivity to all habitations on a time-bound basis.

SOCIAL ASPECTS

Another area of concern is finding ways and means of reducing the burden of land acquisition where it affects the communities. Ever increasing economic activities are putting greater pressure on the scarce land resources. There is an imperative need to have a closer look at the requirements of land for transport projects including roads. Road design standards should account for this social factor as well.

ROAD CLASSIFICATION

Current system of road hierarchy and classification dates back to 1943 when the Indian Roads Congress formulated the first Long Term Road Development Plan. The road network is divided into five classes—National Highways, State Highways, Major District Roads, Other District Roads and Village Roads. It is recommended that the division of the network may be confined to three categories—primary, secondary and tertiary. Primary roads may encompass both national and state highways. Secondary roads may include current major district roads. Tertiary roads could be termed rural roads and comprise both other district roads and village roads. Expressways need not be a separate class but these may be considered as part of primary road network since they are highways with features of full access control and limited to movement of motorised traffic. An independent road classification commission comprising administrators, economists, geographers and road engineers under the umbrella of proposed Office of Transport Strategy should be set up. It should lay down clear, objective criteria for which authority holds the administrative mandate over a particular class of road. It should do so from a holistic network planning perspective that maximises the efficiency of each class. There is also need to introduce systematic numbering of different classes of roads as per international practice. For each class of road and traffic groupings, the standards should be uniform both in design and translation on ground.

Government should take a more market-oriented approach, both in awarding contracts and resolving disputes so that road development does not get caught in a quagmire of time/cost overruns

EXPRESSWAYS

Facilities like expressways are highly capital intensive and need a long lead time for planning of alignment, acquisition of land, rehabilitation and resettlement of people affected and other pre-construction activities including environment clearances. The Central Government has identified a network of about 18,000 km. However, there is inadequate information on characteristics of road links, traffic volumes and traffic patterns. This network should be subjected to a consultation process with the states as well. There should be a minimum threshold traffic to consider provision of an expressway: 40,000 PCUs per day is recommended. Access-controlled highways effectively divide the countryside, necessitating provision of flyovers and interchanges to permit cross movement. This involves high capital investments. Priorities should be determined based on the needs of the economy and progress of railway network capacity augmentation. Some of the existing four-lane roads under the NHDP may be considered for conversion into access control facilities by providing service lanes all through for local and non-motorised traffic as an immediate step. User charge principle would be amply justified in provision of such facilities. Strategy of constructing 2,000 to 3,000 km initially through the government budget and borrowings, and thereafter handing over such stretches to the private sector for its O&M and leveraging the revenue earned to expand the network could be another promising option.

SPECIAL NEEDS OF NE REGION

The government has been focusing special attention to the transport development needs of the North-East Region and other isolated areas. It is necessary to formulate and implement a comprehensive master plan for the NE region covering all modes of transport including roads. Chapter 6 in Volume III is devoted to this issue.

AUTO INDUSTRY

The vehicle-manufacturing sector has shown some improvement in technology upgradation to bring in efficiency in fuel consumption and reduction in environment pollution. There is steady increase in production and operation of multi-axle vehicles for movement of freight. Such developments do help in increasing tonne-km per litre of fuel. Bus design is in need of overhaul to improve boarding and riding comfort. There is need for continuous upgradation of technology in the auto industry, especially the

Access-controlled highways involve high capital investments. Therefore, priorities for these should be determined based on the needs of the economy and progress of railway network capacity augmentation

commercial vehicle sector, to meet the objectives of better comfort, productivity, energy efficiency, safety and emission standards in line with international practices and standards.

ROAD DEVELOPMENT

CURRENT INITIATIVES

The two decades covering the period 8th to 11th Five Year Plans (1992-2012) proved momentous for the road sector as it was marked by a heavy dose of road investments by the government and its strategy of promoting PPP in development of National Highways, state highways and revamping of road fund through additional excise duty to serve as a window for viability gap funding. International agencies like the World Bank and the Asian Development Bank also supplemented the resources. A part of the Central Road Fund and NABARD ensured availability of dedicated funds for rural roads under the Pradhan Mantri Gram Sadak Yojana. The entry of international lending agencies helped in enhancing the capacity of contractors and consultants in the delivery of the development programmes and road projects. Private sector entry in financing got facilitated through introduction of direct user charge in the form of tolls, liberalised economic policies, increased transparency, open competition and reasonable apportionment of risks between the various stakeholders—government, concessionaire and lenders. It will be advisable to continue multiple strategies for development of the road network during the next two decades upto 2032, building on the current focus during the 12th Five Year Plan (2012-17). Private sector financing in the highways would remain confined to the commercially viable and high traffic density stretches. It will be prudent, therefore, to enhance the availability of public sector funding.

STRATEGIES FOR PRIMARY ROADS (NATIONAL HIGHWAYS AND STATE HIGHWAYS)

- i The existing network of National Highways and state highways may be expanded in tune with the economic growth and development of industrial hubs, special economic zones, ports, tourist centres and connectivity to international routes—Asian Highways and the European Road Network. At the same time, since the main function of the primary system is mobility and enhanced productivity of road transport, stress should be laid

on consolidation of this network in terms of capacity augmentation through multi-laning of existing highways and provision of access-controlled expressway facilities. For projects of four-laning through PPP mode, a phased development approach can be adopted by initially reserving the full land width for 20 to 25 years' traffic needs, but providing number of lanes to meet demand for 10 years in the first instance and further widening in the second phase. An overall length of 100,000 km of NHs and 200,000 km of SHs should be largely adequate for the country. This may also include about 20,000 km of access-controlled expressways.

- ii For capacity augmentation of National Highways, the current programme of NHDP in seven phases is well-conceived and its implementation may continue in the immediate term, i.e. the 12th Five Year Plan. Within these phases, the programme relating to widening of single lane roads to two lanes deserve to be accelerated for reasons of enhancing safety and energy efficiency. Six-laning of existing roads without access control has potential to be more accident-prone. As such, the programme relating to six-laning of existing four-lane stretches need to be stopped and where traffic volumes are beyond four-lane capacity, consideration given to provision of expressway network. In order to improve transport efficiency and enhance safety, all existing four-lane and six-lane roads need to have service lanes to cater to the requirements of local (both motorised and non-motorised) traffic so as to bring in an element of partial access control on such facilities. Provision of wayside amenities along the highways is becoming an integral part of the road projects. Such facilities should be provided by the private sector.
- iii For capacity augmentation of state highways, every state should formulate programmes on the lines of NHDP and undertake implementation as per priorities identified through traffic surveys, and economic and financial analysis of individual project stretches on the SH network.
- iv Financing of these roads should rely on the user charge principle in the form of tolls as direct beneficiaries and continuing with the existing Central Road Fund through additional levies on petrol and diesel. The existing policy of levy of toll on two-lane roads needs to be done away with. A two-lane highway on the primary network should be viewed as a basic minimum facility and provided through government budget including CRF. The accruals to the CRF may be enhanced by making

levy of cess on fuel on *ad valorem* basis rather than the current system of a fixed amount of Rs 2.0 per litre., which was fixed in the year 2005. This may be enhanced to Rs 4.0 per litre to enhance the accruals to meet project investment requirements. Some states have constituted state road funds to provide assured funding for the state sector road projects. This is a good strategy and worthy of upscale by other states as well.

- v While preparing projects for capacity augmentation, the need arises for planning of bypasses around towns to ensure smooth movement of through traffic. In most cases, these bypasses also serve as a vehicle for development of the town along or on the other side of the bypass. Therefore, the alignment for such bypasses should be planned jointly by the road agency and the urban development agency. Further, these bypasses should be planned and provided as access-controlled expressway type facilities with entry/exit at predetermined locations. For large-sized cities (population above one million), bypasses could also be provided in the form of peripheral expressways. The intersection points of bypasses with main highways may also serve as freight logistics parks on case to case basis.
- vi Another requirement relates to reconstruction of dilapidated and weak bridges which are showing signs of distress and crying for replacement. There are also missing bridges on large rivers needed for opening up of the area.
- vii Special needs of connectivity to ports, airports, mining areas and development of power plants should be factored in development of the road programmes. In certain cases of power plants, movement of ODCs (Over Dimensioned Cargo) will be involved and this will require advance planning, particularly for strengthening of bridges involved and improvement of curves in hilly areas.
- viii It is difficult to hazard a precise estimation of physical and financial requirements for development of primary roads without a detailed study of traffic forecasts and inventory of existing road network. However, a broad assessment is presented based on projections by the Working Group on Roads and deliberations within the Committee. An investment of Rs 21,400 billion for National Highways and Rs 11,600 billion for state highways, at current prices, spread over 20 years upto the year 2032 could be required. Targets for private sector financing are also proposed.

Private sector financing in the highways would remain confined to the commercially viable and high traffic stretches. Thus, it will be prudent to enhance availability of public sector funding

STRATEGIES FOR SECONDARY ROADS (MAJOR DISTRICT ROADS)

- i These roads run within the districts connecting areas of production with markets and serve as a connecting link between the rural roads and the primary road network and are thus equally vital for agricultural and industrial development of the landscape. These roads have not been receiving the desired level of attention and investments. This gap has to be filled to ensure balanced development of all classes of roads and in all regions of the country. An overall length of 400,000 km as proposed by the Working Group on Roads is recommended as a target network of MDRs. Currently, these roads are mostly single-lane with weak road pavement and bridges in need of immediate strengthening. A large percentage of these roads is reported to be in bad shape. This is posing a threat to even optimal use of PMGSY roads which are often in much better condition. The situation is further aggravated due to movement of overloaded vehicles. Presence of railway level crossings causes undue delay to traffic movement on one side and lowering of speeds to the rail movement on the other. Therefore, the stress should be to accelerate the programme of widening of these roads to regular two lanes including bridges and provision of rail over/under bridges on heavy trafficked stretches. Priorities may be governed by the traffic-current and projected. Some limited stretches may require four-laning also in later years depending upon the traffic growth witnessed.
- ii Besides two-laning, attention would also be required for strengthening of pavement of existing single-lane roads and provision of hard shoulders to enable safe movement of vehicles and preventing such stretches from getting damaged beyond repair and rehabilitation. Programmes of improvement in riding quality with partial strengthening need to be planned and implemented.
- iii Some isolated bridges on the MDR network which show signs of distress would also require reconstruction as standalone works.
- iv As per a broad assessment, an investment of Rs 6,000 billion, at current prices, spread over

Attention must be paid to strengthening of pavement and provision of hard shoulders to enable safe movement and preventing road damage beyond repair and rehabilitation

the next 20 years, is envisaged.

- v Currently, the Central Government is providing some funds for these roads out of the CRF but it needs a quantum increase in order to make up for the continued neglect by the states.

STRATEGIES FOR RURAL ROADS (OTHER DISTRICT ROADS AND VILLAGE ROADS)

- i Considerable progress has been made and is continuing under the current PMGSY. This programme is being implemented by the states with good managerial and technical support from the Centre. For the first time, well engineered roads are being provided in rural areas. The entire funds for construction come from the Centre. The states are responsible for subsequent maintenance. The programme covers rural roads required for new connectivity (one basic access to unconnected habitation) and upgradation of existing roads (requiring improvement to provide all-weather access). The programme being implemented for the last over 10 years, is well conceived and its implementation may continue. The main areas of concern emerging relate to assured maintenance and upgradation in areas that have witnessed high agricultural and other economic growth. These aspects need special attention. The Government of India has recently approved a scheme of PMGSY-II which envisages upgradation of existing major rural links to rural growth centres where cost of upgradation will be shared by states also.
- ii The state governments have also been making their own investments in provision of rural roads to connect other villages/habitations not eligible under the PMGSY or Bharat Nirman. This has helped in accelerated development of rural areas served by such roads. The implementation of rural roads programmes need to continue as per the district level core road network plans of the state governments. The current mandate of PMGSY should be expanded to achieve universal connectivity as these roads serve as the entry point for poverty alleviation and provision of access to social infrastructure such as education and health besides market.
- iii Basically, these roads can stay as single-lane roads in view of the low volume of traffic like-

ly to prevail. However, some roads under this category could witness traffic volumes that may justify widening to intermediate or two-lane. Provisions should be made accordingly.

- iv Fiscal federalism theory would suggest that since rural roads serve as a prime redistributive tool in the government's armoury, they should continue to be funded by grants from the Centre. It is proposed that for financing of these roads, the current CRF accruals and RIDF window of NABARD may need to be augmented. The strategy of some states to raise funds through market committee fees on agricultural produce is commended for being emulated by other states as well. Some funds for earth work for example can be leveraged from MGNREGA schemes.
- v An investment of Rs 5,700 billion, at current prices, spread over the next 20 years, is envisaged.

MAINTENANCE AND ASSET MANAGEMENT

The current replacement value of the existing road network defies precise estimation, given that there is no sustainable system of condition assessment of roads and bridges at present. A ballpark figure of Rs 10,300 billion is claimed by some experts as a broad asset base of the road network. Even if such an assessment would be and could be debatable, for a policy dialogue, there can be no two opinions that the current assets are huge and justify both preservation and maintenance.

The vicious cycle of build, neglect and rebuild has to be broken. While PPP approaches have helped in taking care of operation and maintenance needs during the concession period which extends to 15 to 20 years, this addresses the issue for only part of the road network. The various Finance Commissions have also laid stress on maintenance management of the road network and recommended central grants for state roads besides budgetary allocations by the state governments under the Non-Plan head. Timely and adequate maintenance of the existing road network does not admit of any laxity. It is an economic necessity as otherwise, erosion of asset base will get accelerated. It will be advisable for the states to institute road network asset management systems so that there is scientific condition assessment and priorities for maintenance interventions are fixed on a rational basis.

Both the Central and state governments should declare as a policy that roads would receive dependable and adequate allocation of funds on a continuous basis. A system of working out the replacement value of the road assets at the end of each financial year should be established by every agency for

roads under its jurisdiction. The information relating to road asset value should be put on the web in public domain.

The government may also consider not to treat maintenance of roads as a non-Plan activity so that it does not suffer ad-hoc cuts as is the current experience.

The states have been steadily reducing their gang labour and increasing maintenance works through private contractors. This has been the right approach. While existence of some gang labour may be useful, particularly for emergency situations and disaster management under conditions of earthquakes, landslides, cyclones, etc, there is a need to move to standalone long-term performance-based maintenance contracts where capacity augmentation may not be required in the immediate future. Enforcement of performance standards by the government through a well laid down mechanism is essential and field engineers responsible for execution of maintenance works made accountable.

States should encourage citizen and user oversight through undertaking road user satisfaction surveys. To start with, structured questionnaires and analyses of response can bring out road user satisfaction index on various stretches of the primary road network. This should include the projects awarded to BOT concessionaires as well. This will strengthen the government oversight on enforcing performance standards from the private sector.

There is a case for a dialogue with the contracting industry to support them in creating a dedicated band of contractors that specialises in undertaking O&M works on the road network. This will improve maintenance delivery on the ground and also act as a good resource partner of the BOT concessionaires during the operation period. For rural roads, local small contractors may be utilised in area-based contracts and gradually involve the local community with technical support from road agencies.

Technology for maintenance also needs a quantum jump, particularly in respect of primary and secondary roads. There is a need to evolve long-lasting pavements which can help in increasing the current four-five year renewal cycle to a 12-15 year cycle. Mobile maintenance units need to become a normal practice.

Non-engineering aspects need to be focused on as well. This would include land management by way of prevention of encroachment, control on ribbon development, regulation of access on existing highways and use of ROW by utility agencies. Incident management and highway police patrol are other

The vicious cycle of build, neglect, rebuild has to be broken. While PPP approaches have helped in taking care of operation and maintenance needs during the long concession periods, this addresses the issue for only part of the road network

activities that should become integral part of O&M provisions.

The state transport authorities also need to support the road agencies in enforcing axle load limits of vehicles, particularly trucks, as overloading is seen to damage the roads prematurely.

Annual allocations required for maintenance should be worked out by each road agency for the roads under its jurisdiction based on asset management principles and traffic and road condition observed on the system. This should be a first charge on the available resources.

CAPACITY BUILDING FOR ENHANCING DELIVERY EFFICIENCY

INDIAN ROADS CONGRESS

- i Currently, the IRC mandate is to evolve standards, specifications, manuals, guidelines for planning, design, construction and maintenance of different categories of roads. Many of the standards are outdated. Design standards need to be reviewed on a regular basis so that these are in line with international practices duly taking into account our own milieu.
- ii The current system of formulating design codes and manuals needs an overhaul. Base papers for each topic need to be prepared through identified academic, research or professional agencies or even international domain experts. These outputs should then be subjected to peer review by domain experts and thereafter by the members of the committee. This would considerably reduce the delays currently experienced in finalisation and updating of design codes, etc. Funds for such purposes should be provided by the government out of R&D budget. Eventually, the standards should have statutory standing and become the responsibility of the Standards Departments of the proposed institute for Intercity Road Transport, Institute for Urban Transport and Traffic Management Board.
- iii The IRC needs to expand its mandate to cover a systematic assessment of road transport operations and their impact on the road network with a view to reviewing the existing standards and guidelines so that the roads

Annual allocations required for maintenance should be worked out by each road agency based on asset management principles and traffic and road condition. This should be a first charge on the available resources

- iv The IRC can draw lessons from international bodies like American Association of State Highway and Transportation Officials (AASHTO), Permanent International Association of Road Congresses (PIARC), National Association of State Roads of Australia (NASRA), Japanese Road Association (JRA), International Road Federation (IRF) to further enhance its capacity.

ROAD DESIGN INSTITUTE

Except for a few technical officers in the road agencies who are manning design cells in the states and at the Centre, there is no dedicated institute for undertaking designs for the various components of the road projects. While some capability is available in the academic institutions and the private consulting firms, there is no system of adequate oversight on their output. The current experience of time and cost overruns on major road projects is indicative of the weaknesses in the preparation of DPRs and lack of proper design focus in the first instance. There is a compelling need for a dedicated road design institute for the road sector that should function under the umbrella of MoRTH. It should have around 400 to 500 professionals at various levels covering various disciplines such as transport planning, traffic and safety engineering, transport economics, pavement design, bridge structure design, maintenance technology, geotechnical engineering, material engineering, IT-related interventions, tunnel engineering, social and environment engineering, etc. Similar institutes should be set in each state PWD and Rural Roads Agency. Every state should have at least 40 to 50 professionals covering various disciplines.

ROAD AGENCIES

- i With the NHAI having become operational through successful implementation of the NHDP, there is need to review the current structure of MoRTH and expand the mandate of the NHAI. The objective should be for the MoRTH to entrust all National Highways and National Expressways to NHAI with proper restructuring of NHAI and only planning, policy and budget functions should remain with the MoRTH.
- II The existing road agencies in the Centre and the states are gearing themselves to the needs of accelerated road sector programmes.

However, capacity and performance of these agencies need further enhancement. The Government of India has instituted a system of Results Framework Document for various sectoral ministries and is also encouraging state governments for similar initiatives. The road agencies may consider self-evaluation or undertake capacity analysis through domain management expert agencies to identify enhancement measures required to improve their capacity and performance. A set of suggestive indicators have been given in the Report based on a recent study of the highway agencies in the South Asia Region by the World Bank. At a minimum, the road agencies must have core competence in monitoring output of consultants, public private partnership models, contract procurement and administration, quality control and monitoring, adherence to design standards, safety engineering, maintenance planning, social and environment impact assessment, etc. Some selected officers need be encouraged to go in for graduate programmes in various disciplines of highway engineering.

- iii Staff at various levels should receive regular training in different aspects of road projects. Each road agency should have its training plan and calendar for both short-term and long-term. Such a plan should cover sponsoring officers for undertaking MTech programmes in various branches of highways, bridges and tunnels.
- iv There is a huge backlog of training at the cutting edge level of supervisors, junior engineers and assistant engineers for which special programmes need to be evolved and provided. A few states have set up their own training institutes for this purpose. These institutions need strengthening and provision of state of art training infrastructure. Such training institutions should come up in all states.
- v The government also needs to support the Indian Academy of Highway Engineers (IAHE), other training institutes at state level, and academic institutions to improve their infrastructure for training of road agencies.
- vi Study tours should be undertaken both within the country and abroad for raising awareness among road agencies staff about good national/international practices in implementation of road projects.

CONSULTANTS

- i Consultancy in the road sector has played a significant role in supporting the road agen-

cies in various stages of road development projects and programmes—be it feasibility studies, preparation of DPRs, bidding documents for procurement of construction contracts and BOT projects, supervision of works during construction or review of designs or quality audits as third party. With the entry of multinational firms and their setting up India-specific subsidiaries, domestic firms have also graduated to international stature. Larger firms have not only experienced professionals on their roster but also they are equipped with state-of-art instruments and software. However, due to the quantum jump in the volume of work, weaknesses in their output become evident in some cases. One area of deep concern is the poor quality of DPR and bid documents being prepared by the firms. This results not only in avoidable variations in design and scope-of-work changes during execution but also in time and cost overruns. A number of disputes raised by the contractors also emanate from poor bid documentation. There is a need for a system of internal quality audit by the consulting firms before they submit their outputs to the road agencies. The government should also tighten the current performance evaluation system to bring in more accountability of the consultants.

- ii The personnel of the consulting firms can also avail of the training facilities and infrastructure available in the IAHE, CRRI and other engineering and management institutes in the country for keeping abreast of the latest national/international practices.
- iii For complex projects, the current practice of third party review of consultants' design may continue, but such a role should ideally be performed by the Road Design Institute referred to earlier. We should also utilise the academic institutions depending upon the special expertise residing therein. For this, the government may permit entrustment of such assignments on negotiated basis.

CONTRACTORS AND CONCESSIONAIRES

- i Thanks to the push given by the World Bank and the Asian Development Bank since the mid 1980s, the contracting industry in the road sector has responded reasonably well in terms of mechanisation and acquisition of professional site engineers and project managers. However, the sheer increase in volume and size of projects being offered by the government in the road sector has created several challenges and constraints in this industry. Major constraints relate to poor

productivity and substandard quality due to non-availability of skilled construction workers, and equipment operators and site supervisors. Both the government and the construction industry need to address this concern. Advantage should be taken of the skill development initiatives being launched by the Government of India to assess the magnitude of requirements of the road sector and consider a three-pronged strategy—at the vocational level through industrial training institutes, at the diploma level through polytechnics, and at the state level through setting up construction academies. For the latter, an excellent initiative has been taken by the government of Andhra Pradesh. The National Academy of Construction set up in Hyderabad is a joint effort of the state government and the contractors' association. For financing the academy, an amount of 0.25 per cent is deducted from the bill of every contractor in the state and earmarked for the functioning of the academy. The contractors' association has developed the campus and road agencies depute their senior level officers in managing the affairs of the academy. Such an example needs to be multiplied in other states.

- ii Another area that holds promise is promoting the concept of equipment bank. Private entrepreneurs could venture into this arena and provide equipment to small and medium-sized contractors on lease/hire. Study tours should be undertaken both within the country and abroad to raise awareness among staff about good national/international practices
- iii There is need to recognise that contractors and concessionaires are partners in progress. The road agencies also need to provide proper environment for their performance. Various approvals/decisions are required at various stages of the project. A healthy decision support system and dispute resolution mechanism would contribute a great deal in improving the performance of the contractors and the concessionaires.
- iv The senior and middle level staff of the contractors should also avail of the training facilities of the central and state government for enhancing their capacity and capability.

FINANCING FOR CAPACITY BUILDING

A provision of one per cent of the total road investments should be earmarked for capacity building of

An area that holds promise is promoting the concept of equipment banks. Private entrepreneurs could venture into this area and provide equipment to small and medium-sized contractors on lease/hire

the stakeholders involved and technology innovations in the road sector.

RESEARCH, DEVELOPMENT AND TECHNOLOGY INITIATIVES

There is an urgent need for a quantum jump in the R&D and technology upgradation effort in the road sector covering pavements, bridges, tunnels, safety and traffic management for knowledge acquisition and knowledge development in our own context and situation. R&D vision and strategy need to be developed for the next 20 years by the Highway Research Board with support of MORTH, MORD, MOUD, CRRI, NHAI, NRRDA, BRO, state governments, academia and regional research centres.

The R&D schemes having immediate practical relevance in the context of the initiatives of the government to develop the road sector in the country needs to be taken up on priority. In this context, consideration needs to be given to evolving country-specific highway capacity manual, models for prediction of pavement performance with traffic, distress diagnostics of bridges and strategies for maximising use of locally available marginal materials including recycling of existing pavements and promoting use of industrial waste materials and by-products where found useful.

The equipment industry should sponsor and support research in development of technologies for accelerated construction of bridges, tunnels, flyovers, etc and increased mechanisation in maintenance operations.

Centres of Excellence should be created on different aspects of roads and road transport including safety in IITs, NITs, other engineering institutes and IIMs to accelerate the research and capacity building activities.

The government should promote transfer of proven R&D technologies from lab to land through well-considered pilot projects for implementation by BRO, NHAI, NRRDA, state PWDs and SRRDAs, etc. At pilot stage of testing performance, a liberal view would need to be taken of some unintended non-performance or failure of such pilots, with of course a laid down mechanism for supervision and monitoring during execution.

PRIVATE FINANCING INITIATIVES

The Government has put in place a sound policy, institutional and legal framework to deliver the NHDP and state highways upgradation projects. This includes a menu of fiscal and financial incentives to enhance commercial viability of road projects. However, it is time to undertake case studies of a few PPP projects on a random sample basis to draw lessons for future projects. Such a study should include dialogue with the concessionaires, contractors, consultants, financing institutions and road agencies.

The government would do well to stop the policy of undertaking projects through BOT (Annuity) Model as it is not a sustainable option. Where this mode of delivery is proposed, these should be a cap say 15 per cent of the annual budget to defray contingent liability year by year. Further, such projects should be subjected to rigorous value-for-money analysis and compared with public sector delivery option.

One area of concern that the Committee noted relates to the undue haste in award of such projects without bringing under control the pre-construction activities covering land acquisition, rehabilitation and resettlement of people affected, environment clearances, shifting of utilities.

Support of state governments would be needed for effective control on ribbon development along the high-density corridors.

ROAD TRANSPORT

The Motor Vehicles Act is in need of amendment to respond to the demand of road transport for the current century. The Sundar Committee has suggested the needed amendments. These need to be carried out.

Freight transport being the backbone of the economy, apart from reoptimisation of the modal mix between road and rail, transshipment facilities by way of transport nagars and synchronisation of short haul movement by road and long haul movement by rail for both import and export cargo through containers would be required.

For modernisation of trucking industry, continued emphasis is needed for higher energy efficiency and lower emission levels with suitable incentive structure for multi-axle vehicles. Further, the industry is controlled heavily by intermediaries who need to be brought under the purview of regulation. The thrust has to be on the seller of services. The trucking industry is also characterised by low levels of technology. A strong link needs to be forged between profitability and technology. Financing for acquisition of modern trucks should be more liberal.

Use of Intelligent Transport Systems can significantly enhance regulatory processes and stream-

line seamless movement in inter-state movement of commercial vehicles. Advantage should therefore be taken of such technologies so that once a vehicle is inspected and cleared at the origin state and the information is electronically transmitted to other states along the proposed trip, there is seamless travel. The commercial vehicle should be treated as mobile infrastructure since they are carrying the economy on wheels. All efforts should be made to improve the productivity of these precious assets.

The Inspection and Certification regime practiced by the State Transport Departments should be modernised to reduce human intervention and it should gradually cover all motorised vehicles, not just commercial vehicles.

There is need to establish collection centres for end-of-life vehicles to retrieve scrappage material as this would ultimately help in considerable energy savings.

Passenger transport services in rural areas are still lacking and this requires a special focus of the State Transport Departments. Possibility of PPP needs to be explored by providing viability gap funding to the private operators for such services.

Information and communication technology needs to be used to improve operational performance of road transport including traffic management, electronic toll collection, vehicle tracking, overloading control and “aam aadmi” interface with the transport administration.

The Motor Vehicles Act is in urgent need of amendment to respond to demands of road transport for the 21st century. The suggested amendments are with the Government

ROAD SAFETY

It is essential that a new paradigm for road safety is adopted wherein all stakeholders—legislators, administrators, engineers, contractors, police, transport department, road users acknowledge the role they must play in ensuring road safety. Safety engineering measures should become an integral part of road design and construction.

The wide-ranging recommendations of the Sundar Committee on road safety and traffic management should be implemented by the government on a priority basis to contain the accident situation which is going from bad to worse.

GOVERNANCE

There is need for enhanced governance to improve quality of contract agreements and contract administration to achieve higher performance levels in delivery of road programmes and projects rather than a separate regulatory body. Nowhere in the world is there a regulator for the road sector. However, the Model Concession Agreement, construction and EPC contracts should not be static documents. Rather, they should be live documents, being modified based on feedback or learnings from projects being implemented.

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3. CIVIL AVIATION





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3. CIVIL AVIATION

If the path outside one's home provides the basic means of accessibility to the outside world, then aviation services are, for the most part, at the other end of the connectivity spectrum: they allow faster travel to more locations than any other transport mode.

Via an aircraft, Indians of certain means access leisure, education and business opportunities across the country and around the world. Destinations that were only diversions for the daydreaming mind a generation ago are now within ready reach of millions of urban Indians. The aircraft continues to moderate the financial, physical and emotional transaction costs of studying at a foreign university, or of spending several years employed overseas. Inbound tourism, reliant almost entirely on civil aviation, has brought a great fillip to the travel industry, served as an important source of foreign exchange, and provided much needed impetus for the preservation of country's natural and cultural heritage.

Domestically, the idea of the 'day trip' has entered the vernacular: managers and officials routinely access nearly every part of India in under three hours for a meeting. Closer ties between hinterland factories and mines, and urban head offices allow for greater business efficiencies. Aviation makes possible the shipment of fresh flowers from the Himachal and fresh fish from Kerala to wherever they will command the highest price. It allows firms to rationalise production and storage costs by sourcing intermediate components as required. Aviation has come to form the cornerstone element of time-sensitive logistics services.

Even so, air travel is not simply a means for going further, faster. The aircraft opens up the world at a more fundamental level. It allows wider first-hand exposure to and dissemination of new ideas. Where forbidding terrain or sparse populations cause certain regions to be un-served or underserved by road and rail, the aircraft can prove to be the most financially judicious and perhaps environmentally-friendly means of providing basic connectivity.

In short, by compressing the time between origin and destination, the aircraft is the basic engine of the modern globalised world. It has expanded the world by shrinking it. As India seeks to grow its economy

at the desired rates over the next 20 years, the careful nurturing and expansion of the aviation sector will be of the utmost consequence.

In 2012, more than 2.9 billion passengers travelled by air worldwide, a figure that was 5 per cent higher than the previous year¹. At one end, passengers took flights that hopped across islands in no more than five minutes. At the other, they stayed aloft in giant airliners for the better part of a day before arriving at destinations on the other side of the world. They flew on low-cost carriers that offer ever more innovative revenue generation and pricing mechanisms, allowing more people to make their very first flights. They also flew on legacy full-service carriers with the promise of the traditional courtesies and pleasures of a baggage allowance, a hot lunch, and a movie. Passengers were offered more choices of destinations on more airlines than ever before. Against this, they had to contend with crowded and inefficient airports, sub-optimal routings, increasingly stringent security arrangements, and airfares bloated with fuel surcharges and a laundry list of taxes.

Meanwhile, the 51 million tonnes of cargo transported by air in 2012 were a small decline on the volumes of previous years, a reflection of recent anaemic growth in the world economy. That said, facilities for processing airfreight have continued to be designed and implemented at rapid rates. Logistics firms and freight forwarders have built dedicated hubs at major world airports to process cargo. Governments have lent a hand by installing dedicated customs and

Air travel is not simply a means for going further, faster. Where forbidding terrain or sparse populations cause certain regions to be unserved or underserved by road or rail, air travel can be the most financially judicious means of providing connectivity

1. ICAO, Press release, 18 December 2012.

clearance facilities for both exports and imports, and by minimising the times required to remove cargo for onward transshipment. The net result of these movements of passengers and freight is an aviation business that directly supports over 8.4 million jobs and generates \$539 billion in worldwide GDP².

Over time, the aviation sector has continued to restructure and consolidate, with a number of mergers taking place. The aftershocks of the government's directive for Air India and Indian Airlines to merge are still being experienced

In 2011-12, the Indian civil aviation sector provided the means for transporting 122 million domestic and 40 million international passengers as well as 807 million metric tonnes of domestic cargo³ and 1,460 million metric tonnes of international cargo. Over the 11th Plan period, domestic passenger movements have grown at 11.5 per cent per annum, and international passenger movements at 9.5 per cent. International freight traffic has grown

at 7.5 per cent, somewhat slower than the domestic freight growth rates of 8.8 per cent. (All multi-year growth rates are compounded annual rates.) These strong growth rates have occurred during a period of relative weakness for the Indian economy, at least when compared with the previous Plan period. As the economy returns to growth rates of more than 7 per cent, as expected over the long term, the demand for passenger and freight aviation services will climb at rates in excess of those noted here. These growth rates mandate renewed emphasis on encouraging public and private investment in airport infrastructure, and in creating sensible policies that promote the growth of a competitive but stable aviation network.

INDIAN AVIATION: A SHORT HISTORY

Less than eight years after the Wright brothers' 12-second airborne adventure in 1903 on a wood-and-cloth contrivance at Kitty Hawk in the United States, the first aircraft was flying over Indian airspace⁴. Many of these early airplanes were recreational, the preserve of interested, wealthy and often ingenious amateurs. Mail services and ad hoc passenger air services quickly followed. By 1932, the serially enterprising firm of Tata Sons had set up an airline to deliver mail under a government contract. The government would eventually become an equity partner in the airline in 1946, with a rebranding to Air India the same year. Air India's first international service, from Mumbai to London, followed in 1948. At

the time, nine operational airlines provided a simple patchwork of scheduled and charter air services.

With the passing of the 1953 Air Corporation Act, the assets of each of these were subsumed into the creation of two new state-owned enterprises: Air India International and the Indian Airlines Corporation. The Act, which prohibited any party other than these two corporations from operating scheduled air transport services to, from or within India, effectively gave monopoly rights to Air India and Indian Airlines. Monopoly outcomes being what they are, air services remained undersupplied and overpriced for much of the post-Independence period. Apart from the United States, many countries followed the state-owned flag-carrier model for their airlines, for security and diplomatic reasons as much as any others. This eventually led to the complex system of bilateral landing rights negotiations that persists to this day.

For the next several decades, the history of Indian aviation is synonymous with that of Air India and Indian Airlines. Between the two, Air India fared substantially the better, cautiously expanding its route network to South-East Asia, the Middle East and Africa, Europe and the United States. An aggressive programme of fleet modernisation resulted in it being one of the first airlines to enter the jet age. New equipment combined with a distinctly Indian emphasis on warm hospitality delivered a stellar reputation for Air India.

Meanwhile, Indian Airlines, being the slightly uncomfortable melange of eight parent post-Independence airlines, never quite bedded operations down into an efficient and profitable domestic network. It was hindered in this task by a government mandate that required it to provide service to unprofitable destinations, poor airport infrastructure outside the major metropolitan centres, an unfortunate selection of aircraft in the fleet that were variously susceptible to malfunctions or unsuited to the demands of the network, and complications arising from various regional security skirmishes.

The Indian airlines did not prove immune to the oil shocks of the 1970s. Elsewhere, the massive losses sustained by the sector paved the way for deregulation and private competition from the late 1970s onwards. In India, the airlines were rescued through a series of capital injections and soft loans intended to stave off bankruptcy. Problems were compounded by several waves of labour unrest and strike action.

In 1986, the government began to allow private airlines to operate charter and non-scheduled services under the Air Taxi Scheme, according to which pri-

2. ATAG (Air Transport Action Group). 2012. Aviation: Benefits Beyond Borders, March. Geneva: ATAG. Available at <http://www.aviationbenefitsbeyondborders.org/>. The same study calculates the total impact of aviation, including indirect and catalytic effects, at \$1.4tn with the support of 22m jobs.
3. AAI Traffic News, March 2012.
4. The Ministry of Civil Aviation commemorated the centenary of aviation in India on 18 February 2011. A hundred years earlier, Henri Piquet had purportedly carried 6,500 pieces of mail 13 km from Ahmedabad to Naini on a Humber biplane.

vate carriers could transport passengers but were not permitted to publish time schedules or issue physical tickets to passengers. Nonetheless, the introduction of the Air Taxi Scheme was intended to enhance domestic air services, thereby providing a boost to (largely domestic) tourism and a small measure of competition within the existing monopoly market. The result was that a number of private players—many of which would ultimately become full private airlines—began operations as air taxi operators. Among these were Air Sahara, Jet Airways, Modiluft and East-West Airlines.

In March 1994, the Government of India repealed the Air Corporation Act and opened the air transport sector to private players, subject to the fulfilment of certain statutory requirements. And in 1997, additional measures were taken to further remove barriers to entry and exit in the domestic aviation sector, as the government relaxed requirements placed upon prospective entrants and began to leave more decision making authority (e.g., choice of aircrafts and fleet size) to individual operators. By 1997, four airlines that had begun taxi operations following the 1986 deregulation were in business as full-service scheduled carriers.

The entry of low-cost carriers into the market marked a watershed moment that dramatically altered India's aviation sector. In 2003, Air Deccan, India's first low-cost carrier, entered the domestic market, creating a new form of competition within what was, at the time, a highly concentrated industry comprised mainly of Indian Airlines, Air Sahara and Jet Airways.

Following that initial shake-up of the competitive landscape, other carriers appeared. In 2005, Kingfisher launched its business together with three low-cost carriers in Go Air, Paramount and SpiceJet. The following year, IndiGo entered the market, going on to become the largest domestic airline in India. In short, these changes have significantly altered the market structure and made air travel gradually more affordable. This phenomenon, coupled with India's growing middle class and economic successes in the decade to 2011, led to significant passenger traffic growth. Moreover, market changes have brought with them other customer-friendly developments, including the Advance Purchase Fare pricing strategy, which has resulted in discounted fares, promotional offers and the steady introduction of flights to new domestic and international destinations. The co-existence of full-service and low-cost carriers has provided greater choice and made air travel more affordable to a broader section of India's population.

Over time, the sector has continued to restructure and consolidate, with a number of mergers taking place. The aftershocks of the government's directive for Air India and Indian Airlines to merge are still

Under the Air Cargo Open Sky Policy, airlines, foreign and domestic, were allowed to operate cargo services to or from any Indian airport with customs facilities. The existing regulatory regime over cargo rates for major export commodities was abolished

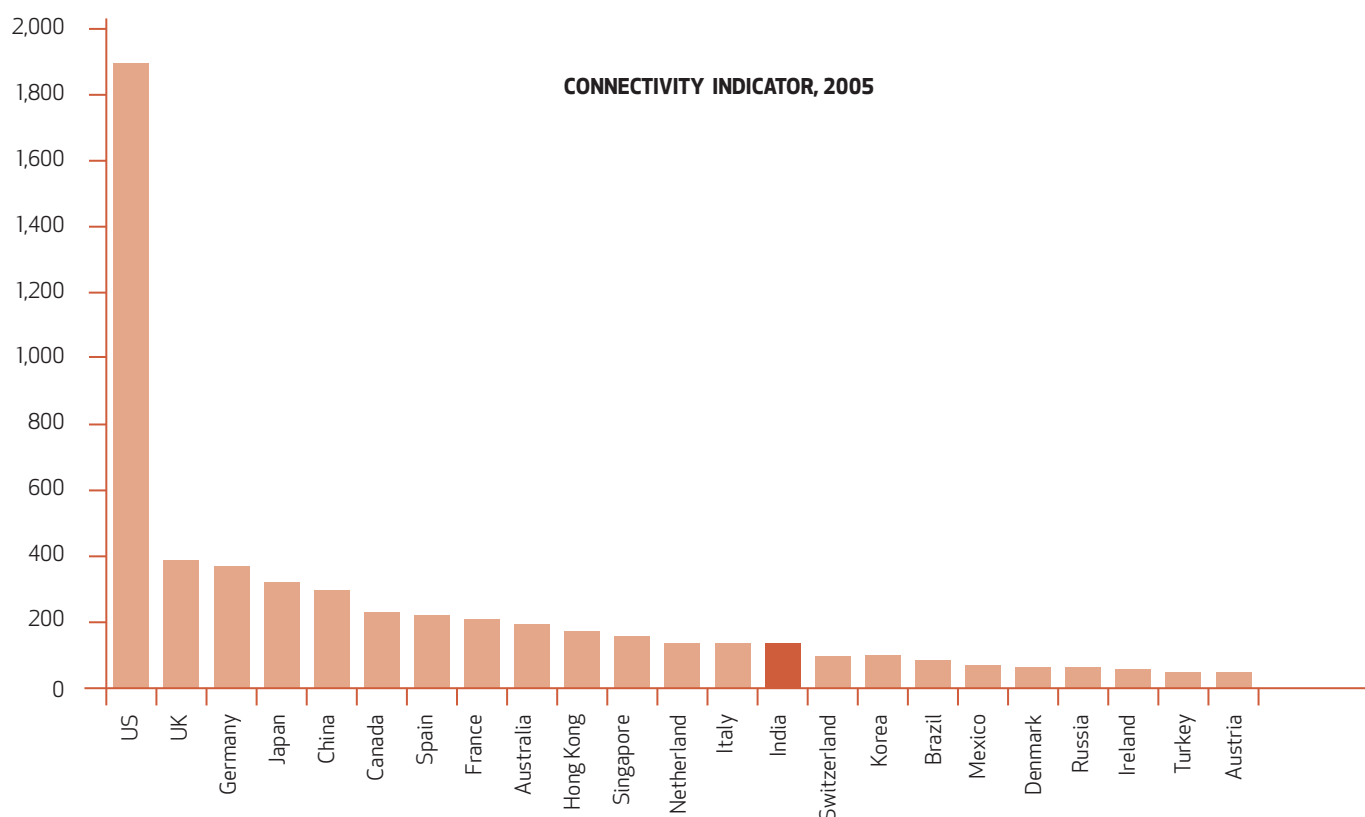
being experienced, with the combined entity lurching from one precarious debt position to another. Meanwhile, the full-service airline Kingfisher's ill-considered merger with the low-cost Air Deccan seems only to have resulted in an airline uncertain of its position and strategy, and for which it appears to have paid the ultimate price. For a while, the most successful of the mergers was that of Jet Airways with Air Sahara. By mid 2012, however, the new Jet Airways also found itself struggling to compete in a difficult market.

In the 1980s, the Indian economy grew at over 5 per cent annually but suffered from continual shortages of international air cargo capacity, which quickly became a key obstacle hindering the industry's ability to enhance export and foreign currency exchange earnings. Following the announcement of the government's industry-wise 'economic disengagement' policy in 1990, the Air Cargo Open Sky Policy was adopted initially for three years and thereafter permanently. Under this policy, any airline, foreign or domestic, that met certain operational and safety requirements, was allowed to operate scheduled and unscheduled cargo services to or from any Indian airport with customs facilities. Additionally, the Air Cargo Open Sky Policy abolished the existing regulatory regime over cargo rates for major export commodities, enabling carriers to begin setting their own rates. The government also relaxed restrictions on foreign airlines operating mixed passenger and freight aircraft, allowing additional passenger flights into India, and further liberalised domestic air taxi operations and the rules on international tourist charters. To make these changes, the government did not require reciprocity from bilateral partners for Indian carriers.

In the 1990s, when sector deregulation permitted private carriers to begin flying domestic routes—initially as air taxis and thereafter, as scheduled airlines—the government initially permitted up to 40 per cent foreign direct investment in scheduled air carriers, including by foreign airlines. For example, Gulf Air and Kuwait Airways held a 20 per cent stake each in Jet Airways, providing the young airline with much-needed access to both managerial and technical expertise as well as international passenger feed.

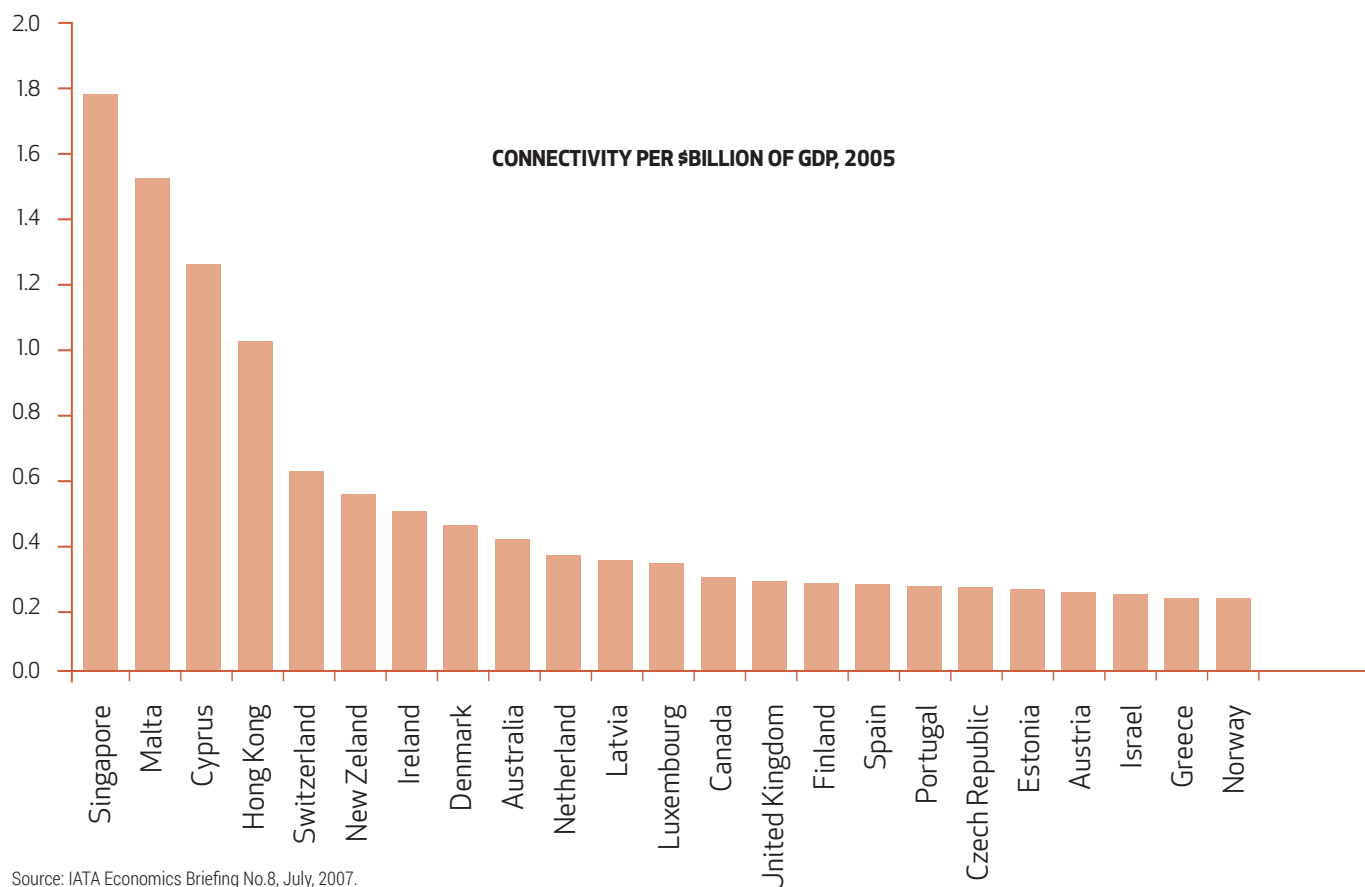
However, these benefits were short-lived: in 1996, the Government of India announced that foreign airline

Figure 3.1
IATA Index of Air Connectivity (2005)

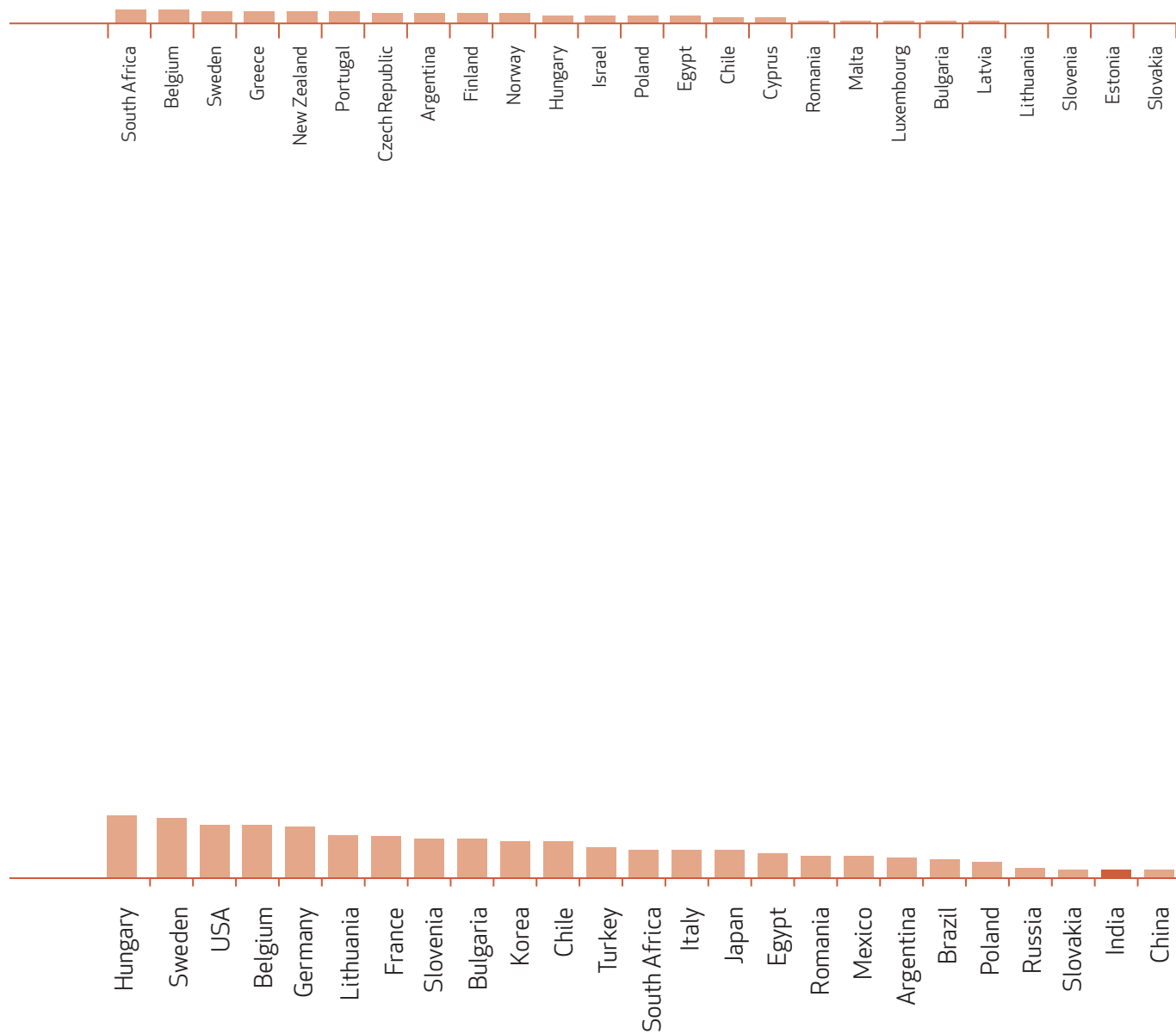


Source: IATA Economics Briefing No.8, July, 2007.

Figure 3.2
IATA Index of Air Connectivity, Adjusted for GDP (PPP), (2005)



Source: IATA Economics Briefing No.8, July, 2007.



It is fair to claim that the deregulation, liberalisation and eventual democratisation of civil aviation have made a seat on an aircraft accessible to more global citizens, and latterly to Indians, than ever before.

shareholdings were not in the best interest of Indian carriers and would thus no longer be permitted. At the time, the government's stated primary concern was that local private carriers were still very small and thus, there was a significant risk that foreign airlines would control these domestic carriers' development so as to feed their own offshore hubs, thereby relegating Indian airlines to the status of regional carriers and thwarting healthy development of the domestic civil aviation sector. Jet Airways thus had to buy back its shares from Gulf Air and Kuwait Airways, and the government reasoned that foreign airline investment restrictions would ultimately be lifted when domestic carriers were robust enough to negotiate as equals with potential investors. But over time, a combination of factors—poor economic conditions, looming security concerns and the ever-present question of how relaxed foreign airline investment restrictions would affect Air India—kept the restriction intact, until it was finally lifted in September 2012. A detailed analysis of this recent regulatory revision follows in a later section.

INDIA'S AIR CONNECTEDNESS

Around the world, air travel was the preserve of the wealthy and an elite few only a generation or two ago. Until the dawn of jet age, any necessary inter-continental journeys were made by ship or not at all. Ocean-going liners did not give up their domination of transatlantic passenger traffic to airlines until the early 1960s. And passengers who chose to board an aircraft, paid handsomely for the privilege of dramatically shorter transit times. Various estimates suggest that real airfares have declined by well over two-thirds since the first waves of deregulation of the airlines in the 1970s. For example, in 2012 dollars, the heavily trafficked and competitive New York-London route was around \$3,200 in 1970 and \$800 in 2012⁵. Leaving aside any hedonic adjustments for the changing quality of service over the ages (in either direction), the relative affordability of modern-day air travel is made starker by considering airfares as shares of income: the same New York-London airfare was 14 per cent of US per capita GDP in 1970. By 2012, this had declined to less than 2 per cent. A similar story can be told in the Indian context. Civil

aviation was very much considered a 'luxury for the few' (and taxed as such) with rail being the de facto choice for domestic long-distance passenger travel.

It is fair to claim that the deregulation, liberalisation and eventual democratisation of civil aviation have made a seat on an aircraft accessible to more global citizens, and latterly to Indians, than ever before. The impact of civil aviation on general economic activity is well-documented. An expansive and efficient aviation sector contributes significantly to a nation's economic development, generating both direct and indirect employment opportunities and simultaneously facilitating better productivity and efficiency in the manufacture and movement of goods and services. Since many of these benefits derive from the connectivity of an economy with its trading partners, it is useful to begin an examination of the economic impacts with an assessment of the present state of connectedness.

Aviation has improved India's internal and external connectivity by providing cheaper, more frequent, more reliable, and otherwise better transport service between many cities. According to the International Air Transport Association (IATA), the slightly nebulous concept of aviation connectivity is defined as a measure of both the number and the economic importance of the destinations served from a country's airports, the frequency of the service to each destination, and the number of onward connections available from each destination⁶. As such, this indicator is qualitative, measuring the relative importance of the destinations served rather than being purely monotonic with the number of destinations served, and the frequency of service⁷. Though the index is somewhat dated, the important point drawn from a comparison of Figure 3.1 with Figure 3.2 is that though India may be seemingly well-connected in terms of the number and importance of destinations served (a fact that will have only gained further credence in the ensuing years), connectivity is still relatively low when this is adjusted for the size of the Indian economy⁸.

Arvis and Shepherd (2011) deployed a technique derived from gravity models of trade to create an Air Connectivity Index for the World Bank. These models directly address the networked nature of the air transport industry. They defined a country's connectivity to be synonymous with its importance as a node within the global air network, thereby better capturing the hub-and-spoke nature of modern air networks. As they write, 'when a country is considered to be better connected, the stronger is the overall "pull" it exerts on the rest of the network. A country's connectivity score is higher if the cost

5. NTDPC calculation based on official CPI series and historical data from OAG.

6. IATA (2009, p16)

7. The relative importance of a destination is defined in terms of the economic influence it exerts on the rest of the world, i.e. in terms of its GDP.

8. A 2009 update of the index (with a UK-centric focus) shows that India's air connectivity relative to GDP on a PPP basis improved between 2005 and 2009, with a higher rank than Venezuela, Poland and Russia. Over the same period, China improved its ranking from the bottom-of-the-table to nearly mid-table, with a ranking superior to that Brazil, South Korea, France and Turkey.

Table 3.1
International Air Connectivity Index, Calculated for 201 Countries

RANK	COUNTRY	INDEX
1	United States	22.7
2	Canada	13.4
3	Germany	12.1
7	France	11.6
8	United Kingdom	11.6
44	Australia	5.9
46	China	5.7
88	India	3.8
125	Brazil	2.7

Source: Arvis and Shepherd (2011).

of moving to other countries in the network is relatively low. It is considered to be less well-connected if the dispersion of these costs is high⁹. In short, the greater the number of direct links that a country will have to other countries, and the higher the frequency of those links, the better the country's connectivity score. Their approach also uses realistic cost functions that accurately model the cost, technology and policy environments that airline managers face in planning route networks. The limitation is that the index only measures international connectivity. Arvis and Shepherd calculated the Air Connectivity Index for 201 countries in 2011; Table 3.1 presents results for a select sample.

The comparisons of the top two ranked countries offer an illustrative example in understanding air connectivity. The United States, with roughly 10 times the population of Canada, has proportionately more international traffic. However, the assessment of Canada's connectivity is boosted by the fact that most cities have extremely strong air links with several major US hub airports, from where these cities can access the world. In similar fashion, India's connectivity is boosted by the high frequency of its links with the largest international hub airports (such as Singapore, Hong Kong, London, and the Gulf airports of Dubai, Doha and Abu Dhabi), which then provide it with one-stop access to a substantial majority of the world's important cities.

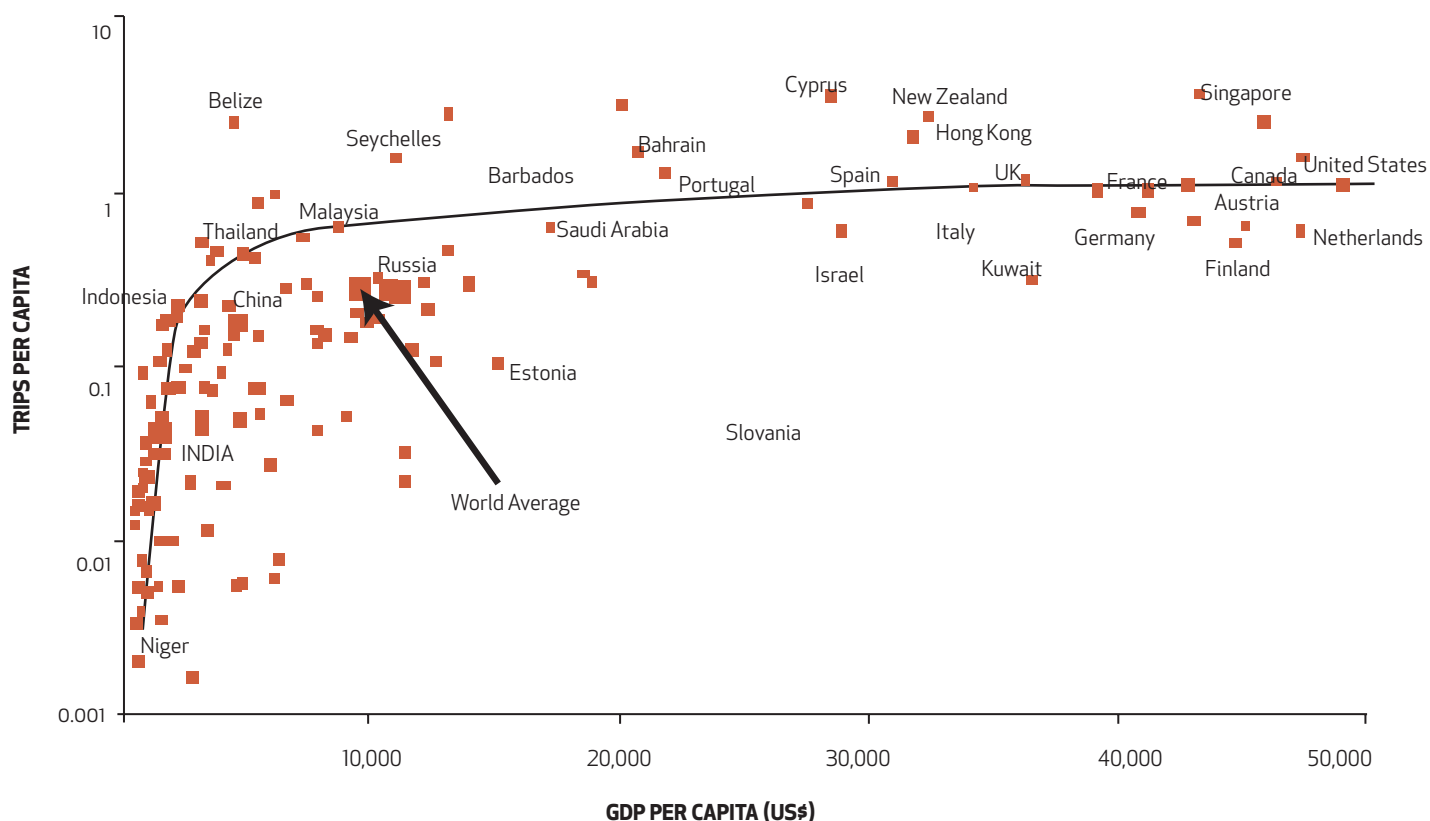
To sum up, India's connections with the world rely primarily on the strength of excellent links with regional hubs—and therefore, exhibit a marked dependence on overseas infrastructure and service providers. Connectivity is low by international standards, relative to the PPP-adjusted size of the economy. Finally, there has been little formal analysis on the changes in internal connectivity that have been achieved over the years.

THE ECONOMIC IMPACT OF AVIATION

The overall effects of this connectivity can be measured in terms of the easier access provided to more markets, efficiency improvements, and greater domestic and international competitiveness (see Figure 3.6). By connecting businesses with a wider range of global markets, and expanding the customer base, air transport allows for higher revenues and higher returns from capital deployed. These benefits are particularly relevant for sectors that manufacture products with high values-to-weight, and for those shipping time-sensitive goods. By expanding the customer base, air transport allows companies to exploit economies of scale and to reduce unit costs. By exposing domestic companies to increased foreign competition, it also helps to drive efficiency improvements among domestic firms in order to remain competitive.

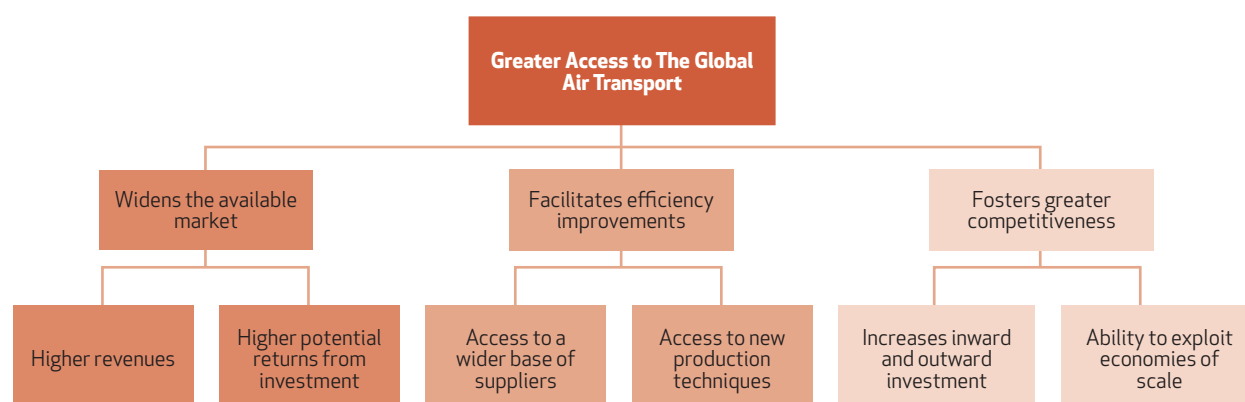
9. These results mean that a spoke country with a strong connection to another country cannot be considered to be well-connected. A regional hub with strong connections to a moderate number of destinations receives an intermediate connectivity score, since the costs are relatively dispersed across the remainder of a network. Finally, a global hub with strong connections to many countries in the network receives a relatively high score.

Figure 3.3
Travel Markets at Different Stages of Development



Source: IATA Vision 2050, Singapore, February, 2011.

Figure 3.4
The Wider Economic Impact of Connectivity



Source: IATA (2009).

Several industries rely on air transport to operate their just-in-time production operations, providing greater flexibility within their supply chains. Costs are controlled from a reduced need to hold stocks of supplies. Extensive air transport links facilitate effective networking and collaboration within and between firms located in India and abroad. Access to a greater number of markets also encourages greater spending on research and development by companies, given the increased size of the potential market for future sales.

‘Improved connectivity gives Indian businesses greater access to foreign markets, encouraging exports, and also increases competition and choice in the home market from foreign producers. It encourages firms to specialise in areas where they possess a comparative advantage. Where firms enjoy a comparative advantage, international trade provides the opportunity to better exploit economies of scale, driving down their costs and prices, benefiting domestic consumers in the process. Opening domestic markets to foreign competitors can also help reduce unit production costs, either by forcing domestic firms to adopt best international practices in production and management methods or by encouraging innovation. Competition can also benefit domestic customers by reducing the mark-up over cost that firms charge their customers, especially where domestic firms have hitherto enjoyed some shelter from competition’¹⁰.

PRODUCTIVITY IN THE AVIATION SECTOR AND GENERAL IMPACT

Relative to other spheres of economic activity, the sector exhibits relatively high levels of labour and multi-factor productivity. The productivity increases have come from the use of better technology in the form of more efficient airframes and engines, better regulatory policy that allows more airlines to use more innovative pricing regimes, better operating practice that results in faster turnaround times at airports, and so forth. In short, as in other industries, all productivity improvements can be traced to changes in technology, worker skills, institutional factors, capital utilisation and economies of scale.

Moreover, the international and relatively fungible nature of the business, personnel, and equipment—compare planes with trains and automobiles—means that productivity gains quickly filter across national boundaries. For example, better engine technologies developed offshore are quickly made available for export. (The same handful of manufacturing companies provide the aircraft deployed throughout the world.) Best practice standards or regulations set for one jurisdiction are necessarily or voluntarily adopted by the entire industry and by other jurisdictions. Safety protocols set by the Federal Aviation Administration of the United States or environmental restrictions placed by European authorities may

indeed only apply to aircraft and airlines flying into and out of these regions. However, their influence, which derives from the size of their markets, means that these protocols quickly become de facto global standards. Meanwhile, improvements in the competitiveness of foreign airlines force local carriers to improve their practices, at least in the markets that they compete directly with these foreign airlines. These improvements then naturally filter into domestic markets. In summary, the aviation sector is productive, and is also a sector where several types of productivity differentials cannot be expected to persist for long. (Of course, the efficient migration of productivity improvements across borders also depends on a prevailing regulatory environment that must be receptive to these improvements.)

The improvements in aviation productivity have also served to improve productivity in almost every other sector of the economy, from manufacturing to retail, from tourism to agriculture. This improvement in productivity in firms outside the aviation sector comes

through two main channels: through the effects on domestic firms of increased access to foreign markets, and increased foreign competition in the home market, and through the freer movement of investment capital and workers between countries.

This last point is an important, though less visible, avenue by which aviation and the industry’s productivity influences economic productivity more generally, through the marginal productivity of capital. Access to extensive air transport links allows domestic firms to identify and manage investments in foreign assets and encourages foreign firms to invest in the domestic economy. Firms can make better investment decisions in offshore locales by undertaking first-hand due diligence and by monitoring their investments in physical plant and equipment more easily. In essence, the liberalisation of aviation enables the full flowering of the benefits of financial liberalisation. Capital can be more easily directed to its best use. For India, this will prove ever more important in the decades to come as it seeks to attract increasing amounts of foreign capital and as more Indian companies attempt to expand their operations overseas.

OVERALL EFFECTS

Improved air transport has contributed to rapid growth in India’s international trade in recent decades by offering a faster and more reliable method by which to transport products and personnel across long distances. In particular, high-growth sectors are heavily dependent on aviation, and it is essential

Improvements in aviation productivity have raised productivity in almost every sector of the economy, from manufacturing to retail, tourism to agriculture

10. Oxford Economics (2011, p. 10).

that India's aviation industry continue to expand if the economy hopes to reap the full benefits of future foreign trade and investment expansion.

More than a whiff of precariousness prevails in the sector, with most airline balance sheets failing to register profits over multi-year periods

Air transport has contributed to rapid growth in international trade, offering rapid and reliable transportation to move products and individuals across long distances. Civil aviation has also played a vital role in tourism: in 2012, approximately 90 per cent of the 6.6 million foreign visitors to India arrived via air¹¹. According to Oxford Economics in a study for the IATA, in 2009 the aviation sector directly contributed approximately 0.5 per cent to India's GDP and 1.5 per cent if the indirect effects are included¹². The direct impact stems from the output of the aviation sector itself—airlines, airports, ground services and fees accruing to the government for the management of India's airspace. The indirect contributions to GDP arise from the aviation sector's supply chain and from the spending of those employed directly and indirectly by the industry¹³. The same study also reckons that in excess of 1.7 million high-productivity jobs are supported by the aviation sector, with 276,000 directly engaged in the provision of aviation services.

In the last 20 years, India's air cargo traffic has witnessed an average annual growth of 8.6 per cent. The entry of leading private air cargo companies into the Indian market has brought with it a wave of increased automation, mechanisation and process improvement initiatives at major air cargo terminals. That said, there is still a great deal of work to be done. The average weight load factor of air cargo over the previous five years was approximately 62 per cent, reflecting significant unused capacity. Generally speaking, air cargo has not been able to grow at the same pace as other cargo transport modes (notably marine cargo). The five-year CAGR for air cargo (approximately 11 per cent) is lower than the growth rate of India's overall exports and imports, which grew by approximately 15 per cent and 18 per cent respectively over the same period¹⁴.

Similarly, India's current proportion of air cargo (relative to cargo overall) is low versus other developing nations, and total air cargo volume for all Indian airports still pales in comparison to a number of individual airports, both within the region and globally (e.g., Hong Kong, Incheon, Shanghai, Paris and Anchorage). That these individual airports handle more cargo annually than all Indian airports in

aggregate reflects tremendous growth potential for India's air cargo sector, particularly in light of strong projected economic growth and rising exports.

THE MAJOR ISSUES

The past 20 years have brought dramatic changes to Indian aviation. More passengers are flying more often than ever before. New airlines are inaugurating new routes, both domestically and internationally. Prices have declined in both nominal and real terms generally, and a wide range of products is available at all service classes. Competition is rife, possibly even excessively so. Service frequency on the most popular metropolitan routes is in excess of 30 flights per day. Airports are being modernised and expanded with funding from both public and private sources. Safety standards at Indian airports and airlines are broadly at par with prevailing international practice.

Against this, the sector remains beset with problems and more than a whiff of precariousness prevails. Airline balance sheets and income statements are rickety, with most failing to register profits over multi-year periods. At various times, airfares have been considered to be unsustainably low or unjustifiably high, though the appropriate regulatory response is unclear. Passed under industry duress, new policies have reversed the long-standing injunction against foreign equity in domestic airlines. The cyclical wringing of hands over government subsidies to Air India, and the consequent effects on the industry, often results in little more than a fresh capital injection. Some issues have arisen regarding perceived high charges in some of the new private airports. Amidst all this, the industry is hamstrung by a tortuous system of taxes, cesses, rules and regulatory restrictions that are at odds with a sector that must necessarily be nimble and dynamic. This subsection provides summary snapshots of the most pressing issues confronting the aviation sector.

AVIATION AS PART OF A MULTI-MODAL TRANSPORT NETWORK

A fundamental recommendation of this report is that every decision on transport infrastructure should, ultimately, be able to be traced back to a sense of place and purpose within the wider transport network that is inclusive of all modes. Elsewhere, the report has argued for network-centric thinking in planning transport infrastructure. Relative to road, rail and other land-based transport modes, aviation is unique in that the network comprises only nodes—the airports. The arcs or paths between these nodes

11. India Tourism Statistics (2012). Ministry of Tourism, Government of India.

12. Oxford Economics (2011, p. 4).

13. The aviation sector's supply chain can be decomposed into the fuel, catering, repair and maintenance, ticketing and distribution, freight forwarding and aircraft financing activities sought by domestic airlines; into mineral products and composite hardware, and financial, technical and technological services sought by aerospace firms; and into the general requirements for finance and facilities management sought by firms that provide ground-based infrastructure.

14. NTDP Working Group Report on Civil Aviation, p. 53.

are typically just the shortest point-to-point distances subject to operational limitations.

Two major considerations apply towards ensuring aviation's place in the wider transport system. First, as with other modes, the efficiency of aviation and its contribution to social and economic welfare will be influenced by any policy that changes its cost or revenue structures. Second, at a more practical level, airports will function best as terminals if good land transport networks are available to quickly distribute passenger and cargo traffic to and from the region served by the airport. Depending on the size of the airport and the economic and demographic characteristics of the passenger traffic, these transport links may also include mass rapid transit options. The great advantages of air travel in terms of the savings in time that it offers will be muted if the air network does not cohere well with land-based transport. This is especially true for time-sensitive cargo.

CAPACITY ENHANCEMENT

As with other modes, the capacity of the air transport network depends on each of the component elements: the capacity of airport terminals to process arriving and departing passengers, and to provide gates for aircraft; the ability of airlines to deploy more or larger aircraft at higher frequencies; and the efficiency of support provided by other transport networks, importantly roads. In turn these are dependent on more fundamental factors, including the productivity of the capital invested and of human resources, and on new technologies such as radar or navigation systems that permit aircraft to fly with narrower separations or in difficult weather conditions.

At present, a major limiting factor is the capacity of airports. Several of India's existing airports are already running at levels near full utilisation. There is a shortage of landing gates and areas for processing passengers are crowded. The crowding extends to the immediate airspace at peak times as aircraft circle awaiting a landing spot. Even some of the airports that have been recently expanded are projected to run into capacity issues within the next five years, necessitating further enlargement of terminal buildings or new secondary airports.

INSTITUTIONAL ARRANGEMENTS

The Ministry of Civil Aviation is the central authority for the regulation of aviation in India. The oversight of Air India is also ultimately the ministry's responsibility. Under the ministry, the Directorate General of Civil Aviation manages the day-to-day tasks of ensuring that airline operators deliver safe and reliable service. It is responsible for making, implementing and monitoring compliance with the rules of civil aviation, and for the certification of pilots, engineers and other staff. The Airports Authority of India (AAI) constructs, maintains and

In spite of rapid growth, airport capacities remain constrained. The financial viability of the entire airline sector is in question. Adequate numbers of trained staff cannot be introduced to the sector. The economic regulation of airports has conspired to leave both airlines and airports dissatisfied with airport charges despite record traffic

operates the bulk of India's airports. More recently, it is a minority partner in six airports that have been modernised and are now operated as joint venture partnerships with private companies. A separate Airports Economic Regulatory Authority (AERA) is responsible for regulating airport charges.

With many of the decisions being made at the central level, and with the bulk of funding for new infrastructure arriving from the central fund, aviation should present fewer complications relating to the institutional arrangements that govern the sector. However, problems are present on several fronts. Airport capacities remain constrained, as noted above. The financial viability of the entire airline sector is in question. Adequate numbers of trained staff cannot be introduced to the sector. The economic regulation of airports has conspired to leave both airlines and airports dissatisfied with airport charges despite record traffic.

Reforms required for the future should emphasise the streamlining of decisions taken by these authorities aided by clarifications as to their agenda, remit and powers. The institutions will need to be strengthened with the addition of substantial numbers of staff skilled in network economics and regulation, certification, safety, setting and implementing standards, finance, and law. Greater cooperation between the authorities, civic agencies, and the administrators of other transport modes should also be mandated.

MANAGING COMPETITIVENESS

In recent years, there have been severe doubts about the viability of many of India's operating airlines. Kingfisher has ceased operations, Air India has required equity injections from the government, and many of the others have failed to establish stable long-term financial outlooks. A number of causes can be attributed to this: the ultra-competitive environment that has forced fares lower and delivered compressed operating margins, the pricing of aviation turbine fuel, the lack of availability of skilled staff which has driven up salary bills, inflexible cost structures with respect to maintenance, a high and growing overhang of debt that was used to fuel recent growth, rupee depreciation, and challenging global and domestic economic conditions.

The 'airport-as-hub' debate must carefully piece through the costs and benefits of developing global hubs versus focusing on developing the domestic market, or on developing regional and national hubs

In this environment, regulatory agencies must walk a fine line between continuing to encourage industrial competitiveness to maximise consumer surpluses and ensuring that the competitiveness is not achieved at the price of unsustainable or irresponsible actions on the part of the airlines. It is important to ensure that the barriers to entry are not insurmountable for firms that clearly qualify on account of their financial standing or industry experience and expertise. It is equally important to manage the exit of airlines from the market with grace and efficiency so as to not impose negative externalities of these exits on the remaining airlines.

DEVELOPMENT OF INDIAN AIRPORTS AS NATIONAL, REGIONAL AND GLOBAL HUBS

The hub-and-spoke model is an established result from efforts at optimising airline networks. (That said, it is certainly not optimal under all circumstances.) Discounting speed and any technological restrictions, the fundamental advantage that air travel holds over other modes of transport is the capacity to connect any two points on a map directly. However, traffic between these two points may not be sufficient to warrant scheduling a flight between them. If, however, passengers originating from several other airports can be assembled at a third point, then enough concentrated traffic may evolve to justify air service between this third point (the hub), and the first two. By collecting traffic, hubs afford viable air service to more locations than if every route was strictly between origin and destination.

It is obvious that metropolitan cities serve as natural hubs. Their large populations and concentrations of economic activity serve to attract people and cargo shipments. In India, Delhi and Mumbai serve as national hubs, accepting passengers and freight from abroad and other parts of India, and then forwarding these elsewhere within the country. Regional aviation—that is, travel between two non-metro cities—has yet to fully blossom in India on account of insufficient demand, though this may shortly change on some sectors. Consequently, there are few regional hubs, though Kolkata may be reasonably considered as the gateway to the North East region.

The astonishing growth of the airlines and airports of the Middle East in recent years has been predicated on their favourable geographic location, with hundreds of destinations within reach of their home airports by modern aircraft. A major plan mooted to provide further impetus to Indian aviation is the

promotion of an Indian airport as just such a global hub. The hub will serve to concentrate passengers from countries West of India, distributing them onto flights headed East and vice versa. This is considered especially enticing at a time that the balance of air traffic is expected to swing decidedly East, towards Asia.

However, there are fundamental differences between India and the entrepot airports of the Middle East and South East Asia that weaken the case for an Indian airport as a global hub. Chief amongst these is the massive latent home market for both domestic and international travel which stakes deserved claim to be the premier development priority. Hubs also require a dominant airline with an extensive international network; these airlines often require implicit or explicit state support. The debate must therefore carefully piece through the costs and benefits of developing global hubs versus focusing on developing the domestic market, or on developing regional and national hubs.

FUNDING

There are three issues on the funding of Indian airlines that immediately present themselves. With respect to Air India, it is necessary to frame a decisive policy of ownership on the government's part, and then setting a clear agenda for the airline. As with other State-owned enterprises, this agenda must not distort the market for privately owned competitors. Meanwhile, for these airlines, new rules on foreign ownership and operation of domestic airlines must be implemented. It must also develop careful regulations for assessing the stability of private equity and debt funding of domestic airlines, with a view towards promoting the overall financial health of the sector. Recent policy changes have made substantial headway in this regard (see section on foreign investment in Indian airlines).

Though most Indian airports remain under the government's direct funding and administrative purview through the AAI, a handful of the very largest airports—Mumbai, Delhi, Hyderabad, Bengaluru, Cochin and Nagpur—are now joint venture enterprises with private sector partners. For the AAI-controlled airports, the challenge remains to operate airports in the public economic and social interest, but with due regard for commercial principles in general, and at a minimum, to be self-sustaining. To this end, each airport should be endowed with a set of operations goals and a development plan, have measurable targets by which performance can be gauged, and be encouraged to adopt transparent reporting processes. For joint-venture airports, the task before regulators and administrators is to devise proposals that attract participants with both financial resources and technical and expertise such that stable long-term ventures can be successfully negotiated.

PRICING

The newly competitive landscape of Indian civil aviation has resulted in periodic bouts of cuthroat pricing of airfares. This competition is to be welcomed from a consumer's perspective. Regulators, however, have found cause to pause in the suggestion that the pricing is unsustainable, and the losses sustained will drive some participants out of the market, leading to higher airfares in the long run. At other times, there is considerable evidence of pricing that is unjustifiably high at times of increased passenger demand, such as during the festival season. As in many oligopolistic situations, the regulatory burden is in encouraging competition, permitting sensible and efficient market entry and exit, while building up a sector that is robust to short-term shocks. As discussed in a later section, the regulatory rules on the pricing of airfares require substantial overhaul.

Meanwhile, there is scope for authorities to ensure that airport pricing regimes for landing charges, passenger services, cargo, parking and hangar space, and other items like security and noise-related charges, are fairly determined and transparently applied. At all airports, possibilities exist to raise revenues from non-aeronautical activities, including from restaurants and food service, car parking, and rentals for concessions, retail, banking and other services. For the joint-venture airports, the regulatory challenge remains to decide on a tariff schedule that begins with recognition of the monopolistic nature of airports, accurately reflects the cost base of the airport, and places an equitable cost incidence on all users of the airport.

The bills for aviation turbine fuel (ATF) represent around 40 to 50 per cent of a domestic airline's operating cost. With several state and central surcharges ranging from customs duties to central excise to service tax and VAT levied on ATF, prices for this fuel are some of the highest in the world. Prices for ATF retailed to airlines at Indian airports are between 50 to 70 per cent higher than in other regional hubs. Indian airlines have regularly cited this as the biggest cost disadvantage they face. The rationale for pricing fuel in the manner that it is needs to be revisited.

MANAGING THE ENVIRONMENTAL IMPACT

Compared with other modes of transport, the impact of aviation on the environment is relatively moderate in aggregate terms. However, this observation must be tempered by the fact that, proportional to the passenger- or tonne-kilometres (for freight) travelled, an aircraft is potentially the most environmentally-unfriendly mode of transport. The impact is compounded by the fact that the bulk of the greenhouse gas emissions from jet engines take place in the upper reaches of the atmosphere where they may have the greatest potential to cause the most environmental damage. It is important to note that

the science establishing the net or relative marginal environmental impact is far from unequivocal: 'Air travel has the highest specific impact on short-term (global) warming, while on long-term warming, car travel has an equal or higher impact per passenger-kilometre'¹⁵.

The aviation industry has set itself challenging goals to dampen this impact, even in the face of global growth that is forecast to exceed 4 per cent per annum over the next few decades. These goals include the Air Transport Action Group's targets of reaching carbon-neutral growth by 2020 and that of reducing aviation's overall carbon dioxide emissions by half between 2005 and 2050.

The main greenhouse gas emissions generated by air transport are carbon dioxide (CO₂), nitrogen oxides (NO_x), water vapour (H₂O) and particulate matter (PM). The bulk of these emissions are at source—that is, from the aircraft engines themselves—with the remainder made up of on-the-ground contributions from aviation support services. The environmental and human costs of these emissions have been discussed elsewhere in this report, and it is urgently incumbent on all participants to devise solutions to mitigate emissions and their environmental impact.

All airports can raise revenues from non-aeronautical activities—restaurants, car parking, rentals for retail, banking and so on

The other major source of environmental pollution from aircraft is noise. The principle sources of aircraft noise are the aircraft's engines and, particularly during approach, the aircraft's flaps and landing gear. Aircraft noise levels are today typically around 20 decibels lower than they were 40 years ago. This represents a significant reduction in the acoustic energy at source and consequently, for an individual event, the noise level perceived by the listener. However, over this period, the number of air traffic movements has significantly increased, and will continue to grow. As a result, aircraft noise continues to have a very significant environmental impact around airports and is a source of disturbance to the public. Many airports in other countries have implemented noise-related charging schemes, quotas on night flights or even night curfews. As cities and airports both expand, increasing shares of India's urban populations will lie under a flight path, and will expect reasonable efforts on the part of authorities to shield them from the worst excesses of engine noise.

HUMAN RESOURCES

The desired growth in Indian aviation will require the country's technical colleges and flying schools to churn out engineers, pilots, air traffic controllers and other key staff in substantially greater numbers

15. Borken-Kleefeld, Bernsten, Fuglestedt (2010).

than at present. No less important is the requirement for an improved, larger cadre of airline administrators and managers, regulatory economists and planning professionals. The internationally fungible nature of aviation service professionals means that India faces stiff competition for skilled employees. Students trained in India are lured to the rapidly expanding regional hubs by better salaries. Meanwhile, there is a shortage of pilots with sufficient experience in India. This will need to be addressed by short-term contracts with foreign pilots. These skill shortages are especially limiting to the incipient ambitions of India as a global hub for civil aviation and mechanical, repair and overhaul (MRO) work.

AIR CONNECTIVITY TO REMOTE AREAS

Remoteness is a function of both geography and topography. The North East region of India is far from India's largest centres of economic activity, but the problem is compounded by relatively poor road and rail access. In turn, the poor road and rail networks in the region are at least partially a function of the difficult terrain and climatic conditions that prevail, and the expense of surmounting these. Remoteness is at least partially self-fulfilling as well. Land transport links tend to be difficult within these regions, thereby making them 'remote'. The somewhat obvious point here is that when robust transport links are extended to regions previously considered remote, they are no longer so.

Some of the insidious effects of remoteness are well-known: a lack of accessibility to education and employment opportunities, a lack of engagement with the nation's zeitgeist, and disaffection and disinterest on the part of both the remote peoples and the rest of the country. Air travel can be the quickest, cheapest, and most environmentally-friendly class of transport links that can be extended to these regions. The challenging topography places less of a barrier to the construction of an airport than to the laying of a railway line. Arguably, the airport presents less of an environmental threat than the cutting of a new road that requires the acquisition of vastly more land and its subsequent clearance. The scattered nature of the communities can be easily accommodated within a standard hub-and-spoke framework. Connectivity within the region improves from low-cost hopping flights. The environmental costs and safety implications of a five-minute flight can be more favourable than those of an equivalent five-hour car ride over a treacherous mountain pass or riverboat journey.

The remote regions of India—the North East, Jammu and Kashmir, the Andaman and Nicobar Islands, Lakshadweep, and parts of central India—are amongst the most impoverished of the land. They stand to gain enormous economic and social

benefits from being better connected with the rest of the country, and civil aviation makes a promising case for being the preferred mode to accomplish this needed connectivity.

At present, mandated Route Dispersal Guidelines (RDG) require airlines to provide service to certain remote locations as a condition of licenses to operate the more heavily-trafficked routes. The guidelines aim at 'ensuring that all players in the liberalised era deploy capacity to destinations in remote areas and participate equitably in providing air transportation to remote areas'¹⁶. By dividing the air routes into three different categories depending on their economic profitability and viability, the guidelines essentially mandate a system of internal cross-subsidisation from the profitable routes (generally, those connecting metropolitan cities), to less profitable ones. The present sentiment is that the RDGs cast a burden on the commercial health of airlines in India¹⁷. Further, there are concerns that RDGs do not achieve the intended outcomes with air connectivity largely concentrated on routes connecting state capitals, and more generally, to a very limited number of airports in remote areas. Island airports, too, remain underserved. Consequently, there is a need to devise an alternative mechanism that better serves the goals of remote-area connectivity.

INDIAN AVIATION TODAY

The reforms of the 1980s and 1990s have resulted in a civil aviation landscape that is vastly different from the anaemic State-controlled system of the post-Independence period. However, the reforms are incomplete, growing pains pervade every element of the sector, and for all of the strong fundamentals that will drive growth, substantial and uncertain headwinds remain.

Table 3.2 sets the industry in context. Scheduled airlines contribute over half the gross product of the civil aviation sector. This is only representative of the domestic and international operations of domestically incorporated airlines. The revenues earned by international airlines from their Indian operations are estimated to be around Rs 200 billion for 2010-11 but are not included in this table.

SERVICE DELIVERY: PERFORMANCE AND RECENT TRENDS

PASSENGER SERVICES

Since India's economic liberalisation began in 1991, domestic air traffic has grown at an annual average rate of 10.4 per cent, and in 2011-12, Indian carriers transported 60.8 million domestic and 14.3 million international passengers¹⁸. Over the last two decades, India's overall air traffic has grown 10.5 per

16. NTDP Working Group on Civil Aviation, p. 115.

17. *ibid* [p. 92], citing Nandan Committee on Remote Area Air Connectivity, MoCA 2011.

18. DGCA and AAI.

Table 3.2
Estimated Gross Revenue Earned by Various Participating Sub-Sectors
 (Rs billion)

SUB-SECTORS	GROSS INCOME 2012-13
Airlines	547
Scheduled	532
Non-Scheduled	15
Airports	111
AAI	69
Private	42
Maintenance, Repair and Overhaul (MRO)*	40
Air Cargo Express Industry*	190
Ground Handling*	20
Aviation Academies*	3
Total	911

Source: Respective Annual Reports, Industry Sources, Analysis: Ministry of Civil Aviation.

Note: * The income of FY 2009-10 is presented. Data for non-scheduled airlines is for 2010-11; For Air India and Alliance Air, data pertains to 2011-12.

cent domestically, 4.0 per cent internationally and 8.4 per cent overall. Not surprisingly, the most rapid period of growth has been post-sector liberalisation: from 2005-06 to 2011-12 passenger traffic grew 15.5 per cent overall, with domestic passenger CAGR of 15.8 per cent and international passenger CAGR of 14 per cent¹⁹ (see Table 3.3).

Over the last two decades, domestic passenger traffic has generally grown more rapidly than international passenger traffic. This can perhaps be partially attributed to stagnating foreign tourist arrivals into India: only 6.6 million visitors in 2012 (less than 10 per cent the figure for China in that year)²⁰. Urbanisation, pent-up demand from previously underserved cities, the entry of low-cost carriers, the expansion of the middle class, internal migration are only some of the factors that are good candidates for explaining why domestic traffic has grown faster than international traffic.

Moreover, Indian carriers have been unable to make substantial inroads into the international market for air traffic in spite of rapid economic growth (and rising foreign tourism and investment) since market liberalisation began. Indeed, in 2009-10, Indian

scheduled carriers transported 34.6 per cent of international passengers to and from India, versus 31.7 per cent two decades ago²¹. A number of factors are often cited to explain why Indian carriers transport only a third of international traffic to or from India. These include: their low utilisation of international traffic rights, entry restrictions, inherent cost disadvantages, and the foreign airlines'²² expansive hub airports that provide onward connections to a wider array of international destinations.

A final reason lies in the ability of foreign airlines to add or remove capacity on Indian routes more easily than domestic carriers can. The former's extensive networks allow them to rebalance capacity across the network with comparative nimbleness. Meanwhile, Indian airlines are hamstrung, because the equipment used for domestic or short-haul international travel (narrow-body jets), cannot be easily repurposed for service to destinations further afield.

This observed lack of dominance of Indian airlines in the market for international travel often prompts concern that foreign exchange is frittered away on international travel, and that carefully negotiated bilateral rights and expensive landing slots lie

19. NTDP Civil Aviation Working Group Report, [p.15] citing Directorate General of Civil Aviation, Airport Authority of India and Ministry of Civil Aviation.

20. World Bank and Ministry of Civil Aviation.

21. Directorate General of Civil Aviation; Ministry of Civil Aviation.

22. As examples from the past two years: American Airlines has withdrawn its service between Delhi and Chicago; Qantas no longer flies between Mumbai and Sydney.

Table 3.3
Passengers Carried by Scheduled Carriers

YEAR	DOMESTIC	INTERNATIONAL	TOTAL
Passengers Carried (millions)			
1990-91	7.5	6.3	13.8
2005-06	25.2	6.5	31.7
2011-12	60.8	14.3	75.2
CAGR (per cent)			
1990-91 TO 2011-12	10.5	4.0	8.4
2005-06 TO 2011-12	15.8	14.0	15.5

Source: DGCA, AAI; Analysis: Ministry of Civil Aviation.

redundant. There are further concerns that Indian air travel could be held hostage to fickle route decisions by the foreign airlines, as well as national security implications. However, primary importance should certainly be placed in noting that all who want to travel to or from India can do so. Though not unimportant, the home of the carrier airline is a second-order concern.

There is reason to believe that Indian airlines will gain market share in coming years. Unused rights under the bilateral negotiations will be used up as the new domestic airlines of the past decade expand and become eligible under current rules for scheduling international flights. With no overnight domestic flights in India, it makes sense for the airlines to use idle planes to fly offshore even if their primary focus is the domestic market. New equipment such as the more fuel-efficient wide body aircraft, the Airbus A350 and the Boeing B787, are ideally suited to long-haul travel direct from origin to destination. With substantial domestically sourced traffic for a large variety of destinations, and in the absence of international hubs, these new aircraft could be just the ticket to boost domestic airlines' international market share. Air India has already announced plans to expand its international network to Australian airports, and to Birmingham and Moscow using the B787²³.

Further liberalisation and market access reform will also help to balance market share. For example, Indian low-cost carriers' enhanced ability to fly between

India and the Middle East or South and South East Asia could provide a valuable boost to international air traffic. More convenient and less expensive travel within the region, at a time when disposable incomes in India are rising quickly, will enhance international passenger flows.

THE DOMESTIC MARKET

The domestic market is served by two full-service carriers: Air India (19.1 per cent share as of April 2013), and Jet Airways (17.1 per cent) which also has a low-cost subsidiary Jet Lite (5.4 per cent). Three low-cost carriers comprise the lion's share of the market: IndiGo (29.5 per cent), Go Air (9.0 per cent) and SpiceJet (19.8 per cent). In addition, there are some regional carriers.

Aviation capacity and its utilisation (See Figure 3.8) is a function of both the number and size of aircraft deployed as well as the distance travelled, which is representative of their availability for use in commercial service. So, Available Seat Kilometres (ASK) refers to the available capacity deployed by scheduled carriers across their network, and is a measure of the supply of aviation services²⁴. On the demand side, Revenue Passenger Kilometres (RPK) refers to the number of seat-kilometres for which the carrier has earned revenue²⁵.

Figure 3.5 indicates that capacity in the domestic market has grown steadily. Both ASK and RPK moved in tandem for most of the post-liberalisation period from 1993-94, indicating that latent demand

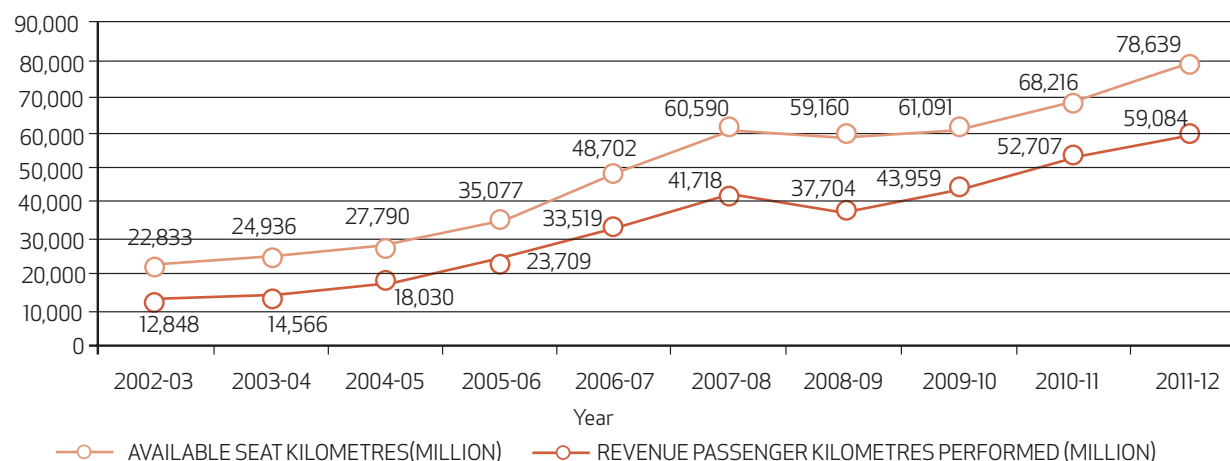
23. Hitherto, nearly all traffic between India and Australia was carried on the airlines of Eastern Asia via hub airports in their home countries.

24. Available Seat Kilometer (ASK) stands for the sum of the product obtained by multiplying the total number of seats that are available in each flight by the flight stage distance.

25. RPK is calculated as the sum of the product obtained by multiplying the number of revenue passengers carried on each flight stage by the stage distance, which gives the number of kilometers travelled by all passengers.

Figure 3.5
Revenue Passenger Kms (RPK) and Available Seat Kms (ASK) for Scheduled Domestic Carriers

LONG-TERM GROWTH IN ASKM AND RPKM PERFORMED ON SCHEDULED DOMESTIC SERVICES BY ALL SCHEDULED INDIAN CARRIERS FOR THE LAST 10 YEARS



Source: DGCA.

justifiably motivated capacity increases and that the new capacity was priced sensibly so that the latent demand could be actualised.

The ratio of RPK to ASK yields the passenger load factor, the most widely used measure of capacity utilisation (See Table 3.4). Load factors had increased even as new private carriers added substantial capacity from 2005-06 onwards. However, in the aftermath of the global financial crises of 2008, demand declined precipitously and load factors dropped. This illustrates the difficulties that airlines face in cutting capacity in the short term, and also the importance of creating an industry that is resilient enough to weather these storms. More recently, with Kingfisher's withdrawal from the market, resurgent demand, and more cautious expansions to the network, load factors have increased. They stand at as high as 90 per cent for IndiGo, down to 75 per cent for Jet Airways.

THE INTERNATIONAL MARKET

The market for international air travel again features Air India and Jet Airways as full-service carriers over long-haul distances. More recently, as the new private carriers IndiGo and SpiceJet have acquired experience, equipment and credibility, they have begun international service to short-haul destinations in South Asia, South East Asia and China, and to the Middle East. The international market is fragmented, with no one carrier boasting a dominant market share. The largest airline serving the international market is Jet Airways, followed by Emirates and then Air India. The top 13 carriers account for only 70 per cent of passenger traffic, as seen in Table 3.5, with around 60 carriers account-

ing for the remaining 30 per cent. Though it is not uncommon for as many carriers to operate to large countries with many airports, it is unusual in the international context to not have a domestic airline that dominates international traffic at any one airport or at all airports within a country.

The rights to operate international service to and from India by domestic or foreign airlines are set out in bilateral air services agreements (BASA). In the absence of open-skies agreements, where any airline from a defined region or group of countries is free to establish the characteristics of air services offered of its own accord, a BASA identifies maximal allowances between any two countries. India has negotiated bilateral agreements with over 120 countries (Figure 3.7), with many having been signed or renewed in the last wave of liberalisation of 2005-06. These agreements are negotiated on the basis of reciprocity, and specify some permutation of the number of flights, number of airports, frequency of service, and type of aircraft that can be allocated to international air service by airlines domiciled in either of the entreating parties.

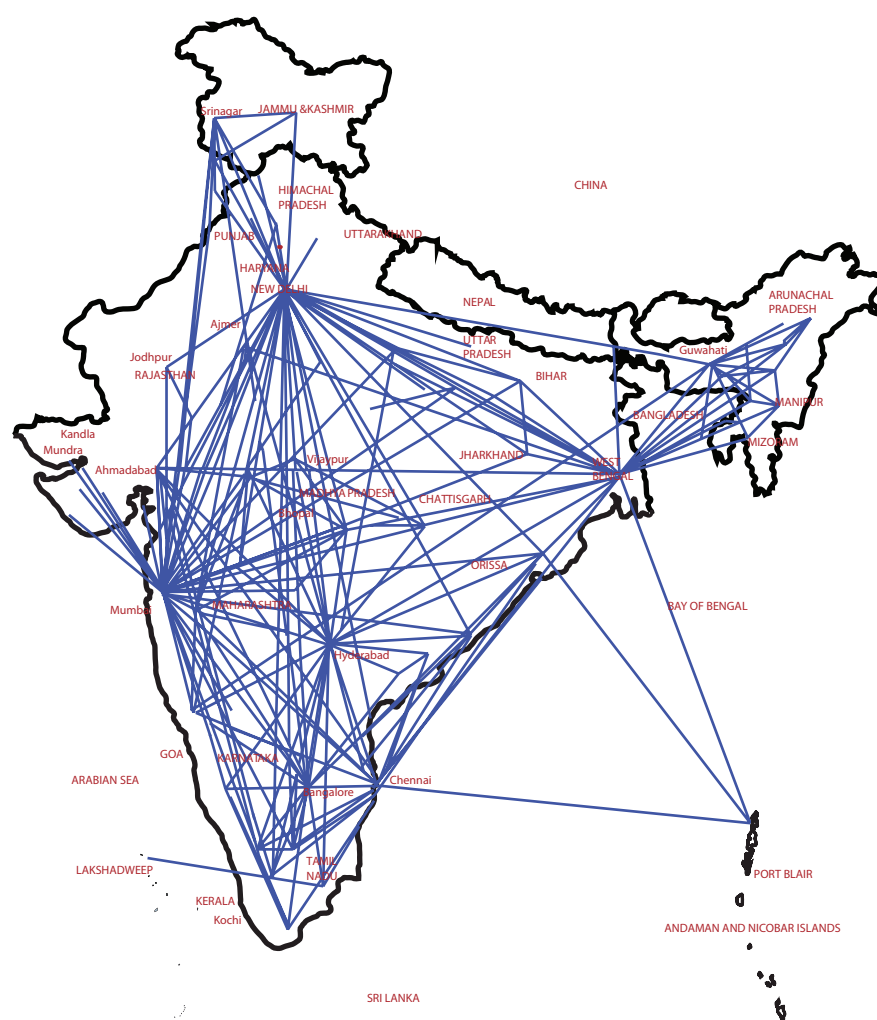
Many of the bilateral agreements lie dormant, with the rights remaining unexercised by airlines from other countries. Of these, there is little prospect of any uptake of rights on the vast majority of dormant agreements. The major critique levelled on the others is that they are overly generous in granting access to foreign airlines at a time that the domestic ones are uninterested or incapable of exercising their rights, face Indian regulatory barriers, or find it uneconomical to do so. Indeed, it is estimated that around 65 per cent of the rights allocated to foreign

Table 3.4
RPK and ASK of Scheduled Domestic Carriers

YEAR	RPK (MILLION)	ASK (MILLION)	LOAD FACTOR
1993-94	6,779	10,821	62.6
1999-00	11,420	19,089	59.8
2004-05	18,030	27,790	64.8
2005-06	23,709	35,077	67.6
2006-07	33,519	48,702	68.8
2007-08	41,718	60,590	68.8
2008-09	37,704	59,160	63.7
2009-10	43,959	61,091	71.9
2010-11	52,707	68,216	77.2
2011-12	59,084	78,639	75.1

Source: DGCA.

Figure 3.6
India's Domestic Air Network



Source: NTDP.

Table 3.5
Indian Operations of International Airlines, 2011-12

AIRLINE	PASSENGERS (M)	SHARE(PER CENT)	NUMBER OF INDIAN AIRPORTS WITH INTERNATIONAL SERVICE	NUMBER OF FOREIGN DESTINATIONS ^b	NUMBER OF ONWARD FOREIGN DESTINATIONS ^c
Jet Airways	5.45	15.7	10	20	0
Emirates	4.65	13.4	10	1	120
Air India	4.23	12.2	13	27	0
Qatar Airways	1.53	4.41	12	1	
Air Arabia	1.49	4.31	13	1	>40
Lufthansa	1.18	3.42	4	2	
Oman Air	0.95	2.75	10	1	
British Airways	0.93	2.70	5	1	
SriLankan	0.85	2.45	7	1	45
Cathay Pacific	0.74	2.14	4	1	
Etihad	0.67	1.95	9	1	
Kingfisher ^a	1.18	3.42		8	0
Indigo	0.41	1.19	7	4	0
SpiceJet	0.29	0.86		7	0
Others	10.09	29.1			
Total	34.8	100			

Source: NTDP.

Note: (a) Kingfisher ceased operations in the second half of 2012. (b) The number of foreign destinations served refers to non-stop or direct flights from Indian airports to a foreign airport. A direct flight can be a halt within or outside India en route to the final destination, but there is no change of aircraft. (c) The number of onward foreign destinations refers excludes all destinations within India.

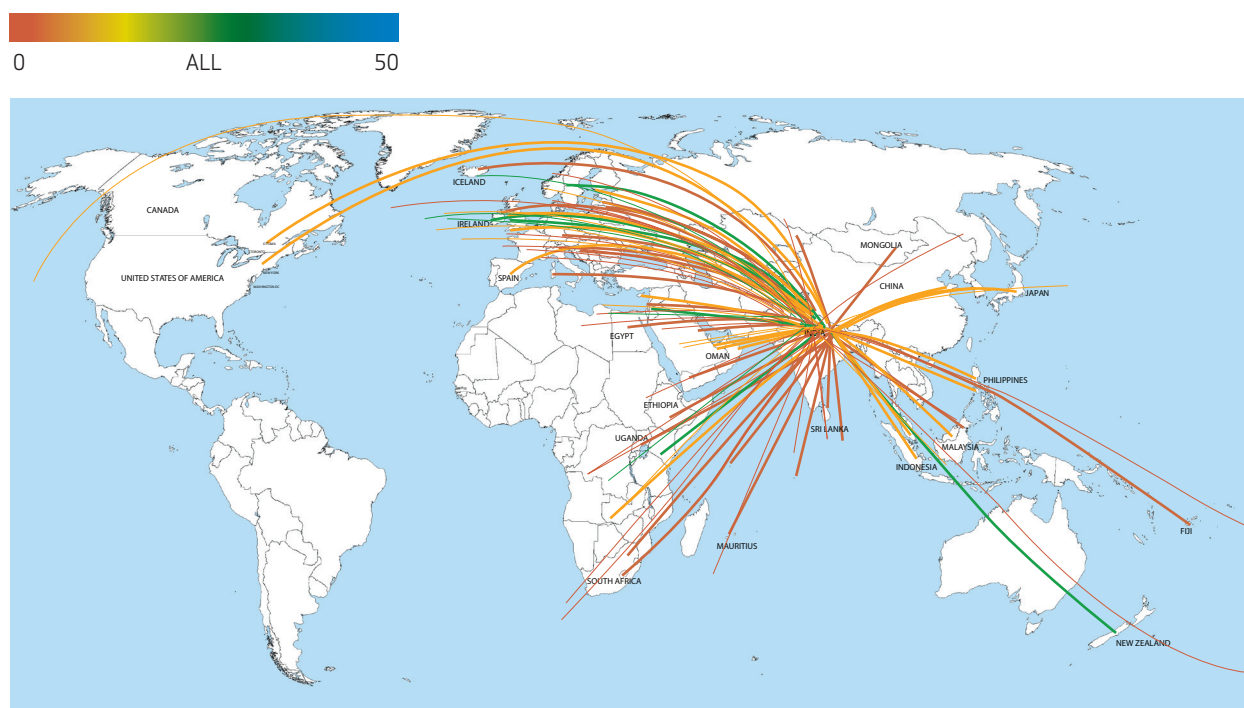
airlines are exercised, and only around 30 per cent of rights allocated to Indian airlines are used²⁶.

In a review of these bilateral agreements, the Comptroller and Attorney General of India (CAG) found that though the liberalised policy towards bilateral entitlements benefited the Indian traveller considerably in terms of choice and lower tariffs, the timing of the liberalisation left much to be desired. The merger of Air India and Indian Airlines was relatively new, and many aircraft purchased by these

airlines that would allow them to make full use of the bilateral rights would only be delivered several years hence. Further, the major airports of India that would serve as natural gateways to expanded international traffic were in the process of being modernised. The CAG also took issue with the spirit of the agreements being violated by international regulators and carriers. The agreements are intended to serve demand for bilateral point-to-point travel. But the CAG concluded that much of the rights were being used to soak up demand for onward travel from

26. See Performance Audit Report of Civil Aviation in India by the Comptroller and Auditor General (2011), p 51.

Figure 3.7
India's Bilateral Air Services Agreements



Source: WTO, Air Services Agreement Projector.

offshore hubs, the so-called 6th freedom of the air. (Box 3.1).

A BASA can have a substantial effect on the patterns of air traffic. For example, the expansion of capacities between India and certain hub airports, together with the easing of foreign ownership rules, could result in realignment of direct traffic from Indian cities to such hubs, making use of the foreign airlines' extensive onward network. As a result, traffic that may have been aggregated at Indian hubs like Delhi and Mumbai from the regional cities for onward service on international routes could then shift to the foreign hub.

Indian airlines that seek to expand overseas must also contend with the so-called '20-5 rule'. Under this rule, scheduled domestic carriers must amass a minimum fleet of 20 aircraft and have completed five years of domestic flight services, before being eligible for licenses to provide international service. Foreign airlines servicing Indian cities are generally not subject to similar requirements. As explained above, these airlines must idle aircraft when they cannot be deployed on domestic routes, cannot take advantage of market opportunities, and must give up any possible first-mover advantages to foreign airlines²⁷. There does not appear to be a strong justification for the persistence of this rule.

GENERAL AVIATION

General aviation refers to the non-scheduled domestic and international flights of approved operators, charter operations, business and private jet travel, helicopter services and the non-scheduled travel of scheduled operators. According to the Directorate General of Civil Aviation (DGCA), the general aviation fleet in India comprises around 800 small aircraft and 300 helicopters. Around 20 per cent of this fleet is likely to be more than 25 years old and may not be operational. The number of approved non-scheduled operators is now in excess of 220, a substantial increase over the 36 registered in the year 2000.

The drivers of the demand for general aviation are diverse. Helicopters perform a multitude of services where airborne versatility is required. This includes the provision of emergency medical treatment and evacuation, city-to-airport transfers, airborne law enforcement, aerial photography, relief and rescue operations, news reporting, and agricultural activities like spraying. As the economy grows and as technologies and incomes advance, demand for each of these value-added services provided by the helicopter industry is likely to increase.

Charter services play an increasingly central role in ferrying tourists to India. As appreciation of India's

27. The rule may also prompt perverse outcomes in other ways. The two-year old Kingfisher's purchase of a 26 per cent stake in Air Deccan in 2007 at what now seems to be an excessively high price was prompted in large part by the former's desire to take advantage of the latter's more extensive operational experience to circumvent the 20-5 rule.

Box 3.1

Freedoms of The Air

Bilateral and multilateral agreements on commercial aviation between countries are negotiated on the basis of freedoms of the air. Similar to concepts in marine shipping, these freedoms refer to rights to transport passengers and goods under a variety of circumstances. The first two freedoms concern the right of an airline to use airspace and air facilities in countries other than where the airline is registered without actually providing any service. Specifically, the first freedom allows an airline to overfly a country, and also permits the country to charge for this right. Airlines use rights under the second freedom to make technical halts, such as for refuelling or maintenance, at airports outside their home country without providing any services for passenger or goods to or from these airports.

Freedoms 3 and 4 allow an airline to transport goods and passengers from its home country to others and vice versa. The fifth freedom allows an airline to provide service between two foreign countries as part of the normal course of service to and from its home country. For example, Jet Airways exercises the rights available under this freedom to service the Brussels-New York market, as these flights arise in the normal course of its international services from Indian cities. The first five freedoms are enshrined in the Convention on International Civil Aviation of 1944.

The remaining four freedoms are 'unofficial' insofar as they are not subjects of the Convention. They have gained prominence in recent times as newer route and scheduling patterns have emerged. The sixth freedom is behind the rise of the entrepot hub airports of Asia such as Singapore, Dubai and Abu Dhabi. Under the rights conferred by this freedom, airlines may provide service between two foreign countries by directing traffic through their home countries. The seventh freedom is similar, except that it waives the requirement of a home-country halt while permitting an airline to offer service between two foreign countries. This freedom is rarely exercised except by airlines in countries that are signatory to open-skies agreements. For example, low-cost carriers link many international city pairs in Europe without heed for halts in home country hubs.

'Cabotage' is a shipping term that refers to service provided between two ports in a country by a vessel flag-registered in another country. The eighth and ninth freedoms extend this concept to air travel. The eighth freedom permits an airline to offer service between two airports in a foreign country as part of continuing service to its home country. The ninth freedom waives the continuing service requirement.

offerings increases, and as the tourism industry itself becomes regularised, the country is more likely to attract the package tourist, the one who is more content to leave the organisation of a vacation up to the professionals. A steady stream of charter flights from Eastern Europe already plies routes to the beaches of Goa and Kerala every winter. It is anticipated that international charter flights will increase, and the itineraries will become more complex with time by the inclusion of multiple domestic stops. Finally, with corporate growth and in the ranks of the very rich, it is easy to foreshadow increased demand for travel by private aircraft.

FREIGHT AND CARGO SERVICES

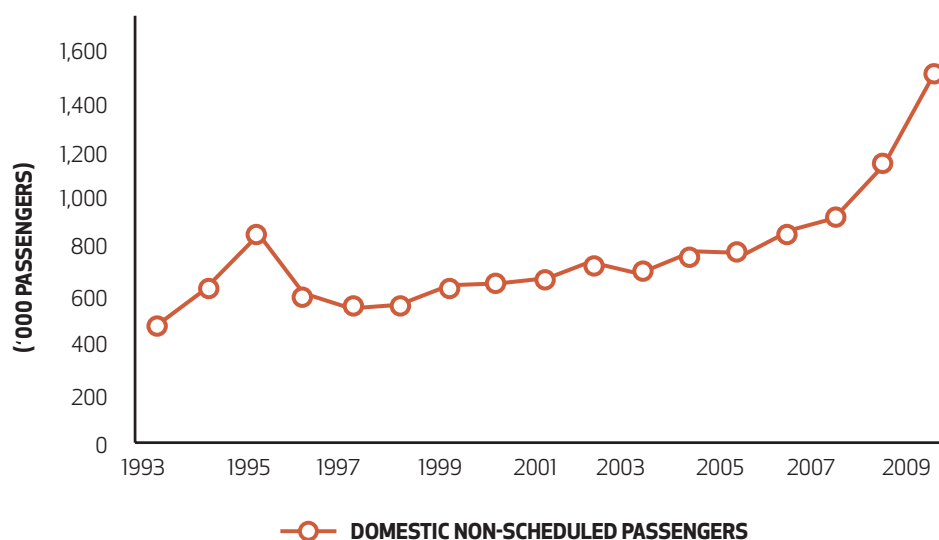
The demand for air cargo transportation has increased significantly in recent years, growing at approximately 8.6 per cent CAGR since 1990-91. Today, air cargo represents approximately 10 per cent of the Indian airline industry's revenues and

35 per cent of the value of goods traded internationally. Scheduled Indian carriers have lost significant international freight market share in the last 20 years. When the liberalisation of the markets began in 1990-91, Indian carriers held 36.9 per cent market share in total cargo carried. Unfortunately, in 2009-2010, domestic carriers transported only 16.1 per cent total cargo while foreign carriers were responsible for 83.9 per cent total cargo carried to and from India that same year²⁸.

Indian cargo carriers' paltry market share is largely due to foreign carriers' rapid entry into the sector after the launch of India's Air Cargo Open Sky policy in 1990, at which time Air India was the only major domestic airline equipped to handle cargo. Sensing a longer-term growth opportunity and capitalising upon their own economies of scale and scope, international carriers were aggressive at filling India's domestic market gap. Consequently, international

28. Directorate General of Civil Aviation; Ministry of Civil Aviation.

Figure 3.8
Domestic Passenger Traffic Carried by Non-Scheduled Operators²⁹



carriers now enjoy a stronghold over India's cargo sector.

Long-term growth rates for international and domestic cargo are largely similar. That said—and in a trend that parallels recent passenger growth rates—recent trends suggest that domestic air cargo is growing at a faster rate than international cargo to and from India. Not surprisingly, air cargo growth rates are generally susceptible to fluctuations in India's GDP growth rate (and in fact sometimes seem to foreshadow an economic slowdown).

Since 2003-04, the share of international air cargo that passes through Delhi and Mumbai has declined from 66 per cent to 57 per cent, while a greater proportion of cargo now passes through Chennai (20 per cent, up from 17 per cent in 2003-04) and Bengaluru (9 per cent, up from 7 per cent previously). The total volumes of cargo shipped stood at around 1.2 million metric tonnes for 2010-11, with imports accounting for about 60 per cent of this. Imports and exports forwarded via air have exhibited remarkably similar annual growth rates over the past 20 years, being around 7.5 per cent for imports and 11 per cent for exports. Thus, if trends persist, we may expect the volume disparity between inbound and outbound freight to disappear with time, providing greater efficiencies.

With respect to domestic movements of freight, the interesting trend is the slow but steady decline in the use of passenger aircraft to transport cargo, and the rise of the dedicated freight service³⁰. This can be attributed to the time-sensitive demands of the logistics industry which requires extreme efficiency in processing air freight.

AIRPORT PERFORMANCE

At present, there are a total of 125 airports in India, of which 84 are currently operational. Six of these airports—Delhi, Mumbai, Bengaluru, Nagpur, Hyderabad and Cochin—are run via a PPP model and currently handle approximately 60 per cent of India's total air traffic. AAI is responsible for the remaining airports, 84 of which are operational. Additionally, there are eight airports that are either completely privately owned or owned by their respective state governments³¹. Fifteen airports are designated as *major*; the AERA-determined criterion for this designation is an airport with an annual throughput in excess of 1.5 million passengers³². Of these 15, the six largest airports associated with India's six largest cities—Delhi, Mumbai, Kolkata, Chennai, Hyderabad, Bengaluru—are called metro airports.

29. More recently, there has been a substantial decline in passengers carried by non-scheduled operators. In 2010, only 660,000 domestic passengers were carried by non-scheduled operators, rising to 890,000 in 2011.

30. Over the past 10 years, the share of cargo transported in the belly of passenger service aircraft has declined from 89 to 83 per cent.

31. Jamshedpur, Latur, Lengpui, Mundra, Nanded, Baramati, Puttaparthi and Vidyanagar.

32. Currently, these airports are declared major: Delhi, Mumbai, Chennai, Bengaluru, Kolkata, Hyderabad, Cochin, Ahmedabad, Goa, Thiruvananthapuram, Guwahati, Jaipur, Kozhikode, Lucknow and Pune.

Table 3.6
Cargo Carried on Scheduled Flights

YEAR	CARGO CARRIED (IN '000 MT)		
	INTERNATIONAL	DOMESTIC	TOTAL
1990-91	231	97	328
1995-96	348	113	461
2003-04	617	227	844
2010-11	1244	476	1720
	CAGR (per cent)		
(1995-96 TO 2003-04)	7.4	9.1	7.8
(2004-05 TO 2010-11)	9.1	8.9	9.0
(1995-96 TO 2010-11)	8.9	10	9.2
(1990-91 TO 2010-11)	8.8	8.3	8.6

Source: DGCA, Analysis: Ministry of Civil Aviation.

Together, the six metro airports have the capacity to process 171 million passengers annually. This is equivalent to 78 per cent of the total capacity of all Indian airports, which is 214 million passengers. And as a final decomposition, note that the two airports of Delhi and Mumbai together account for 41 per cent of the total passenger throughput of Indian airports. This highlights both the importance of the two airports in the current network schema, but also the potential for rebalancing away from these airports as growth becomes more widespread³³.

Currently, only seven out of AAI's 89 operational airports are profitable, in spite of the government's aggressive Rs 124 billion capital investment program under the 11th Five Year Plan (2007-12), which was intended to upgrade and modernise India's non-metro airports by improving the technology and manpower at these airports, so as to enhance efficiency and reduce costs over time.

PASSENGER MOVEMENT AT AIRPORTS

In 2011-12, including arrivals and departures, approximately 163 million passengers were carried by air, either domestically or internationally. Greater numbers of passengers were processed by airports on domestic routes, and this has been growing more rapidly than international passenger traffic: the percentage of domestic passengers as a proportion of total passengers processed has increased from 68 per cent in 2004-05 to 74 per cent in 2010-11. Similarly,

domestic CAGR has grown at approximately 18 per cent over the last six years versus approximately 12 per cent international CAGR during that same period³⁴. Table 3.7 provides additional information regarding passenger traffic growth over the last 15 years³⁵.

CARGO MOVEMENT AT AIRPORTS

Cargo handled at Indian airports reached 2.28 million metric tonnes (MMT) in 2011-12 after growing at approximately 11 per cent CAGR over the previous years, though this comprised a small decline over the previous fiscal year. Of this, nearly 90 per cent was processed at one of the six metro airports. On the back of an expansion in domestic trade, domestic cargo has grown at a relatively more rapid pace versus international cargo during that period³⁶. International cargo, accounting for two-thirds of total cargo handled, passes primarily through India's the major metropolitan airports. The airports in Delhi and Mumbai alone handle approximately 50 per cent of India's total cargo. Some airports, such as Pune, have become more important as regional hubs for cargo than for the passengers processed there.

Table 3.9 provides additional information regarding cargo traffic growth over the last 15 years³⁷.

The average weight load factor of air cargo over the last five years was approximately 62 per cent, reflecting significant unused capacity. Air cargo has not

33. This will not necessarily apply if either or both of the Delhi and Mumbai airports become true international hubs.

34. NTDP Civil Aviation Working Group Report p. 49.

35. (Source: Airport Authority of India and Ministry of Civil Aviation).

36. NTDP Civil Aviation Working Group Report p. 51.

37. (Source: Airport Authority of India and Ministry of Civil Aviation).

Table 3.7
Passengers Throughput
 (Millions)

YEAR	DOMESTIC	INTERNATIONAL	TOTAL
1995-96	26	11	37
2004-05	40	19	59
2010-11	106	38	144
2011-12	122	41	163
	CAGR (per cent)		
1995-96 TO 2004-05	4.9	6.3	5.3
2004-05 TO 2011-12	17.2	11.5	15.6
1995-96 TO 2010-11	10.1	8.5	9.7

Table 3.8
Annual Terminal Capacity and Passenger Movement at Major Airports, 2010-11

MAJOR AIRPORTS	ANNUAL CAPACITY (MILLION)	PASSENGER TRAFFIC HANDLED (MILLION)	CAPACITY UTILISATION (PER CENT)
Mumbai	40	29.07	73
Delhi	60	29.94	50
Chennai	23	12.05	52
Bengaluru	11.5	11.59	101
Kolkata	24.1	9.63	40
Hyderabad	12	7.60	63
Cochin	5	4.34	87
Ahmedabad	4.02	4.04	101
Goa	3.23	3.08	95
Thiruvananthapuram	1.79	2.53	141
Guwahati	1.15	1.93	168
Jaipur	1.16	1.66	143
Calicut	1.85	2.06	111
Lucknow	1.21	1.58	130
Pune	1.12	2.81	251

Table 3.9
Cargo Handled at Indian Airports
('000 metric tonnes)

YEAR	INTERNATIONAL	DOMESTIC	TOTAL
Cargo Handled ('000 MMT)			
1995-96	222	458	680
2004-05	490	831	1,321
2010-11	888	1,504	2,391
2011-12	812	1,468	2,280
CAGR (per cent)			
1995-96 TO 2004-05	9.2	6.8	7.7
2004-05 TO 2010-11	7.3	8.8	6.1
1995-96 TO 2010-11	8.3	7.3	7.0

grown at the same rapid clip as certain other transport modes (e.g., marine cargo), with five-year air cargo CAGR standing at approximately 11 per cent, substantially lower than India's overall export and import growth rates (approximately 15.1 per cent and 17.3 per cent over the same time horizon). Additionally, as mentioned earlier, the amount of air cargo volume that all Indian airports handle is less than that handled by a number of individual airports around the world, including Hong Kong, Memphis, Shanghai, Incheon, Anchorage and Paris. These facts, coupled with forecasted trade and economic expansion, suggest that significant growth opportunities exist for India's cargo sector. The need for attention to improving infrastructure and policies around the sector is thus critical.

CIVIL AVIATION IN INDIA OVER THE NEXT 20 YEARS

What should India's civil aviation sector look like by 2032, the end of the 15th Five Year Plan period? What outcomes does the country require such that aviation supports its growth agenda, and which policies will deliver these outcomes? As with chapters detailing the discussion on infrastructure investment in other transport modes, it is helpful to begin with a vision for the ideal civil aviation milieu of 2032. A shared vision together with derived qualitative and quantitative goals is more likely to result in a coherent, comprehensive network that best addresses India's socio-economic needs and wants. It can serve as a valuable communication device in selling infrastructure policy and decisions to the populace. Equally, it

can serve to hold to account the public and private institutions that are responsible for designing, planning, commissioning, building, operating, managing and maintaining India's civil aviation network.

GROWTH DRIVERS FOR INDIAN AVIATION

This subsection only considers the fundamental drivers, the long-term secular trends that will underpin demand for aviation services, and will be responsible for catapulting the Indian civil aviation sector from the ninth- to the third-largest market worldwide over the next decade. The size of the market will obviously depend on the supply response as well. Conditional on the needed infrastructure and on accommodative policy, it is assumed that the private sector will respond to market forces and supply the requisite additional capacities for passenger and freight transport.

Growing economic activity will result in more business and leisure travel. The GDP-elasticity of demand for passenger aviation services has been usually estimated at between 1.3 and 1.8 in several international studies³⁸. At a 7 per cent growth rate (implying a doubling of GDP in 10 years), the demand for passenger aviation could increase nearly three-fold. Further, with the bulk of GDP growth being fueled by growth in industry and services, the flow-on demand for aviation will be direct. In the longer term, as India becomes a middle-income country, the growth decompositions will undoubtedly be different from today. Even so, as gross trade increases, the demand for aviation services can be expected to remain strong.

38. NTDP Civil Aviation Working Group Report, p. 37, Table 12.

By 2020-21, the average Indian will undertake 0.12 domestic air trips per year. This is less than what the annual trip rate today for the average Chinese (0.15), the average Brazilian (0.25), and the average Malaysian (0.54)

India's middle class—160 million strong as of 2010—is expected to rise to 547 million, or 37 per cent India's total population, by 2025³⁹. This middle class, with higher disposable incomes, can be expected to express the same preferences for domestic and international travel for leisure, education and business that today's middle classes do. Further, as incomes rise, airfares will constitute a smaller share of disposable income, increasing demand. The new middle classes are likely to substitute away from road and rail in favour of air travel, whenever the latter presents a viable advantage in terms of cost and time. Meanwhile, as India's young population continues to mature and reaches working age, increasing numbers of youth will seek to take advantage of employment and education opportunities elsewhere, expanding the domestic passenger base.

The McKinsey Global Institute projects that India's urban population will reach 590 million by 2030. By this time, it is estimated that India will have 68 cities with population of greater than one million, and six cities of more than 10 million⁴⁰. Even if the economic and demographic factors noted above apply in reduced strength than envisaged, the greater concentration of the nation's population in cities will make air travel naturally more attractive. As populations become concentrated, demand for point-to-point travel increases, thereby boosting demand for air travel relative to that for road and rail transport that are better suited to distributed populations.

Tourism is another important growth factor. The sector continues to grow on the back of recent economic growth, and better air transport will continue to increase both domestic and international tourism in India. Domestic tourist visits within India grew to over 1 billion for the first time in 2012, and the number of foreign tourist arrivals to India has grown to 6.6 million from 2.3 million in 2002⁴¹.

The Indian government's stated goal of enhancing connectivity in remote, inaccessible regions of the country has created the potential for growing demand from these new regions. Finally, there is significant untapped market potential generally. Air traffic density in India remains very low versus developed nations as well as for India's emerging-market peers (e.g., Brazil and China, where densities

are three and four times higher respectively), signalling a key opportunity for sector development.

Finally, some other factors that will support growing future demand for aviation include:

- **Global Integration of Business.** Greater economic activity and the subsequent greater integration of businesses globally will lead to increasing cross-border business travel over time and in turn, growth in civil aviation.
- **Shifting Traffic Patterns.** In line with global economic forecasts, air traffic will continue to shift away from North America and Europe and toward Asia-Pacific over time. By 2030-2031, Airbus forecasts that 25.2 per cent of global RPK will be from Asia-Pacific (versus 19.0 per cent today)⁴².
- **International Market Access.** While Open Sky Agreements have increased competition in international air travel, so too have they increased the size and scope of the market itself. Similarly, further deregulation and market opening should help to enhance international passenger and cargo growth for Indian carriers.

On the supply side, growth in India's low-cost sector since 2004 has made air travel accessible to a broader swathe of the population, stimulating new demand. Low-cost carriers (including the LCC brands of full-cost operators) constituted over 65 per cent of the total market share in 2012, as domestic traffic continues to rapidly shift toward LCCs. As certain low-cost operators (such as IndiGo) achieve financial success, we believe that this trend should continue over time. Indeed, the only airline to have evinced interest and made formal forays to enter the Indian market at this time is Air Asia, a subsidiary of an established low-cost Malaysian carrier⁴³. Low-cost carriers are especially attracted to serving non-metropolitan cities, the so-called Tier-II or Tier-III towns. While there may be already some connectivity between these towns and the metros, there is a lack of competition relative to traffic between a metro city-pair. This, and the government's new commitment to expand airport capacity or develop new airports in these towns, will only serve to make them more attractive to LCCs.

Further on the supply side, private-sector participation in India's airports—Rs 300 billion invested in the last five years alone—has expanded airport capacity and allowed airlines to schedule more flights to these airports. The government has cited India's rapidly expanding air transport network,

39. NCAER (2010).

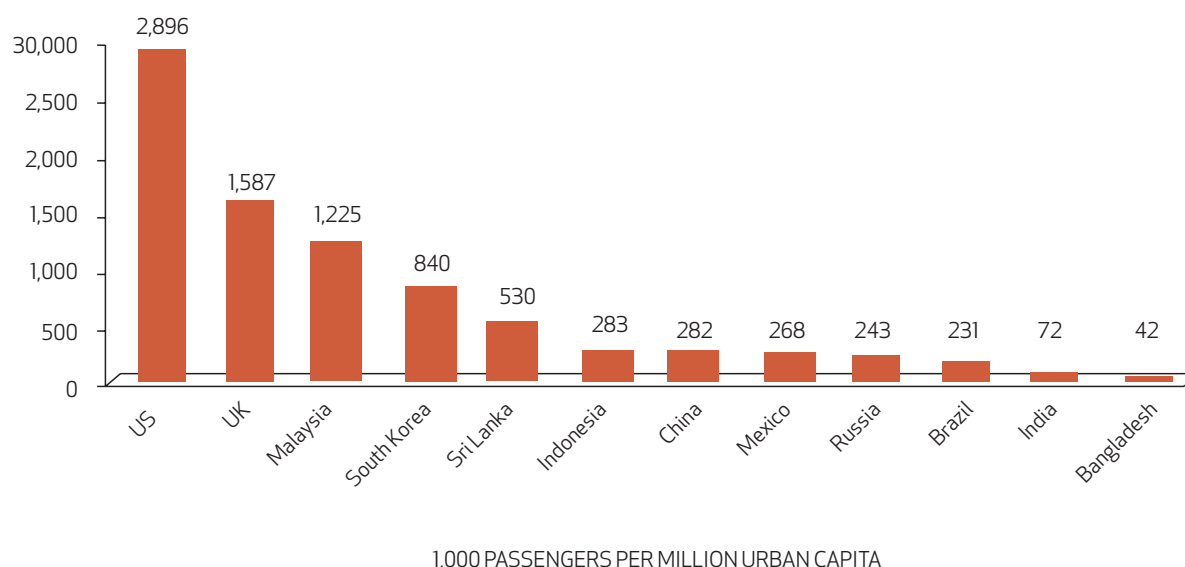
40. NTDP Working Group Report on Civil Aviation p. 29.

41. India Tourism Statistics, At a Glance, Ministry of Tourism, 2013.

42. Airbus Global Market Forecast 2011-2030.

43. Air Asia is a joint venture between a Malaysian LCC of the same name, Tata Sons, and a Delhi-based conglomerate, Telstra Tradeplace, which owns Hindustan Aerosystems, a manufacturer of aviation-related hardware and other products.

Figure 3.9
Air Passengers Per Million Urban Population ('000)



Source: NTDP Civil Aviation Working Group Report, based on McKinsey & Co., and World Bank data. Data for India is from 2010; for other markets from 2008-09.

together with massive investments in airport infrastructure, as key reasons for the surge in air passenger traffic in India.

TRAFFIC FORECAST FOR INDIAN AVIATION

The first task of an infrastructure planning exercise is to forecast the likely passenger demand that the aviation infrastructure of the future must service⁴⁴. The airline industry will rely on the forecast to prepare a fleet acquisition plan. Efforts at training the appropriate numbers of skilled staff are contingent on the forecast, as is the planning for the provision of ancillary services like MRO, ground handling services, and others. The Working Group's forecast is based on an econometric model that relates GDP to the demand for the carriage of passenger and freight traffic. These exercises yield GDP-growth elasticities for passenger and freight traffic, thus providing a simple linear relationship between expected future GDP and the expected future demand for domestic and international travel⁴⁵. These elasticities were measured at 1.7 and 3.1 for domestic and international passenger travel, and at 1.4 and 1.3 for domestic and international cargo movement respectively. The results were shown to be robust to several choices of the measure of demand, and also in broad agreement with eight other planning exercises conducted by various airports or countries.

To forecast traffic, assumptions are made on the growth path of future GDP. The Working Group

chose to assume growth rates for domestic GDP that ranged between 8.5 per cent in the near term, to 6.0 per cent in the long term. This yields the results summarised in Table 3.10.

The domestic air traffic carried by scheduled airlines is projected to be about 164 m passengers in 2020-21, about three times more than the 54 m carried in 2010-11. This is less than the growth in traffic achieved in the 10 years to 2010-11. Similarly, international passenger traffic is anticipated to be around 92 m passengers in 2020-21, which is smaller multiple of 2010-11 traffic levels than the latter were of 2000-01 levels. With aviation yet to become truly accessible to the Indian masses, these comparisons would suggest that the forecasts are suitably conservative. They also agree comfortably with forecasts produced by other agencies as seen in Figure 3.11. (However, traffic levels forecast by MoCA for 2030-31 are around one-third higher than those estimated by other agencies.) A final reality check on the forecast is from the observation that by 2020-21, the average Indian will undertake 0.12 domestic air trips per year. This is less than what the annual trip rate today for the average Chinese (0.15), the average Brazilian (0.25), and the average Malaysian (0.54).

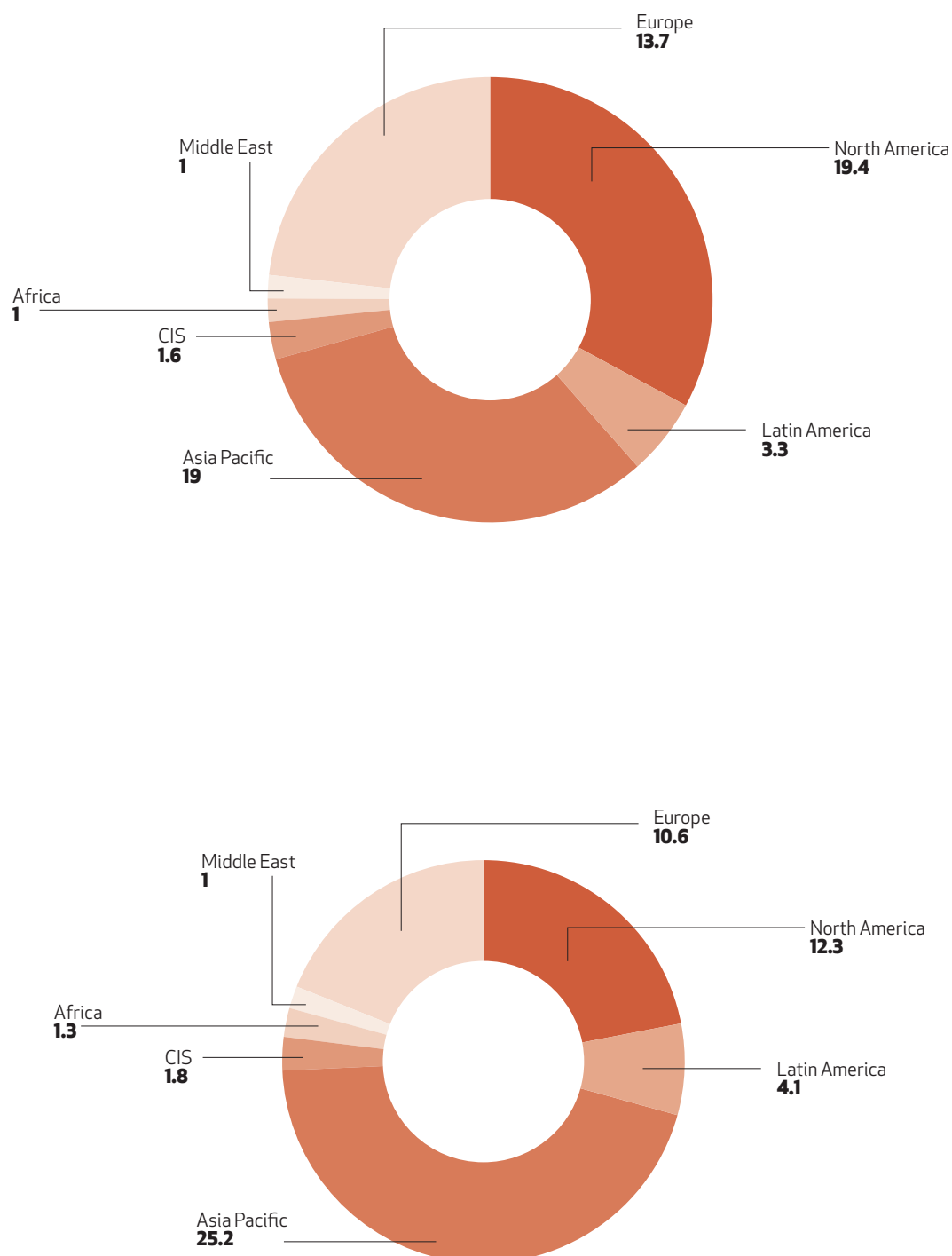
Table 3.12 highlights forecasts for cargo traffic, with both domestic and international volumes growing by around 11 per cent per annum. Again, these are

44. This subsection summarises the results of a forecasting exercise conducted by the Working Group of the NTDP on Civil Aviation. Full details are available in Chapter 4 of the report of the Working Group.

45. The defining relationship for domestic passenger travel, and domestic and international cargo movement was with domestic GDP. The defining relationship for international passenger travel, was with international GDP.

Figure 3.10
Expected Changes in Demand for Passenger Travel, by Region
 [Per cent]

Figures are per cent share of global RPK and are for 2010-11 (top panel), and 2030-31 (bottom panel).



Source: Airbus (2011).

Box 3.2

Secondary Airports

Most Indian cities have one operational airport or airfield that can accommodate scheduled, commercial air services. This is in stark contrast to the situation in other countries, where cities often have two or more airports. For example, London boasts of five airports and New York four. Paris, Chicago, Frankfurt, Shanghai, Beijing, Tokyo, Rome, Stockholm, Melbourne, and many other global cities of note have two or more airports. Several substantially smaller cities and cities in developing economies are home to two or more airports: Phoenix, Dallas, Sao Paulo, Johannesburg, Rio de Janeiro, Istanbul and others.

In some instances, the need for multiple airports to serve the same urban agglomerations has arisen from capacity constraints. (Civil aviation has grown so rapidly in China over the past decade that both Beijing and Shanghai have commissioned new airports only a few years after completing major airport projects in the same cities.) In others, the urban agglomeration has steadily grown to encompass several airfields that lay outside historical city boundaries.

The major advantage of multiple airports is choice. Where airports ownership is privatised and de-regulated, the airports compete amongst each other to attract airlines. For example, each of the five airports of London has developed distinct characters and offers a distinct service profile. Heathrow serves as the major regional and long-distance hub for international travel, with Gatwick rapidly rising in prominence as Heathrow reaches capacity limits. London City airport, located only a few miles away from the centres of financial and political activity, serves as a convenient short-haul option for business passengers. Meanwhile, Stansted and Luton are at considerable distances from the city centre, and have less stringent noise abatement restrictions allowing greater operational freedom. These airports have aggressively pursued business from low-cost carriers.

In fact, the rapid rise of low cost aviation owes much to the presence of secondary airports in cities. When Ryanair, one of the pioneer European low-cost carriers, flies from London to Stockholm, it does so from Stansted (50 km from London city centre) to Västerås (100 km from Stockholm city centre).

As urban agglomerations grow, it is not just airlines that benefit from choice. A four-hour door-to-door trip via air from a Delhi address to a Mumbai address can easily double in duration if the origin is somewhere in the expanses of Greater Noida and the destination in Thane or Vasai. The presence of a secondary airport affords passengers much in the way of time saving choices.

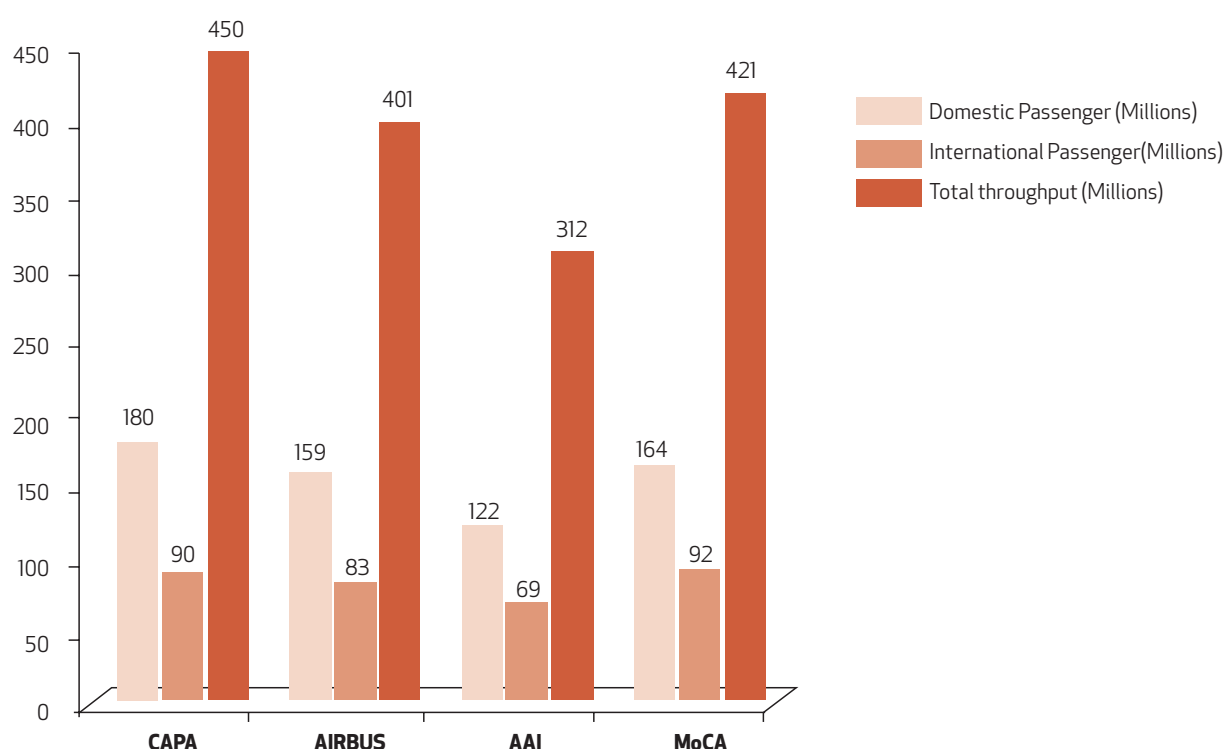
Table 3.10

Forecast of Passenger Traffic

YEAR	DOMESTIC (MILLIONS)	RESULTANT CAGR (PER CENT)	INTERNATIONAL (MILLIONS)	RESULTANT CAGR (PER CENT)	TOTAL (MILLIONS)	CAGR (PER CENT)
2010-11 (Actual)	53.9	-	37.9	-	91.8	-
2015-16	94.1	11.8	59.4	9.4	153.5	10.8
2020-21	164.4	11.8	91.9	9.3	256.3	10.8
2030-31	437.9	11.0	217	9.1	654.9	10.3

Source: DGCA and MoCA estimates.

Figure 3.11
A Comparison of Passenger Traffic Forecasts for 2020-21



Source: NTDP Civil Aviation Working Group, from CAPA, Airbus, AAI and MoCA estimates, p. 43.

broadly in line with estimates produced by other agencies⁴⁶.

TRAFFIC IMPLICATIONS FOR AIRPORT CAPACITY

Every passenger travelling by air must journey through two airports, with the possibility of more if several sectors are on the itinerary. The traffic increases forecast above must essentially be doubled to arrive at estimates of passenger throughput at domestic Indian airport terminals. For international travel, only one terminal will be located in India, but a five per cent adjustment is made to traffic figures to account for passengers transiting to other airports. If a strategy to develop Indian airports as global hubs is desired and successful, the throughput estimates for these airports must obviously be adjusted to account for a substantial bulk of transit passengers. The same considerations noted here also apply to the movement of cargo traffic. Consequently, the airport throughput noted in Tables 3.13 and 3.14 should be considered a conservative estimate conditional on the traffic forecast.

Total passenger movement at Indian airports is expected to be three times present levels by 2020-21, and seven times larger by 2030-31. Growth is expected to be driven marginally more by domestic passenger traffic, on account of the untapped market potential

noted above. Similar growth multiples are expected for cargo throughput over the next 10 and 20 years.

REQUIRED INVESTMENT IN AVIATION INFRASTRUCTURE

The previous section noted a set of traffic forecasts for domestic and international air transport of passengers and cargo. This section describes the preferred supply response in the form of infrastructure spending required to expand capacity. The investment for aviation infrastructure consists of the development and expansion works at new and existing airports, and of the acquisition of aircraft to make use of the extra capacity at airport terminals. The assumption in this report is that, given a policy environment conducive to investment, the private sector will increase aircraft numbers and service delivery capacity as required to meet demand. Thus planning for the future consists of identifying the likely airport development required, and the creation of a sensible, market-friendly, policy environment.

AIRPORTS

Airports in India are largely under the administrative purview of the Airports Authority of India. The AAI implements long-term government policy and

46. The Report of the Working Group on Civil Aviation also presents these forecasts.

Table 3.11

Forecast of Non-Scheduled Domestic Passenger Traffic

YEAR	DOMESTIC (MILLION)	CAGR (PER CENT)
2009-10 (Actual)	1.49	-
2015-16	1.98	4.8
2020-21	2.52	4.9
2030-31	3.89	4.7

Table 3.12

Forecast of Cargo Traffic

YEAR	DOMESTIC (‘000 MT)	CAGR (PER CENT)	INTERNATIONAL (‘000 MT)	RESULTANT CAGR (PER CENT)	TOTAL (‘000 MT)	CAGR (PER CENT)
2010-11 (Actual)	475.5	-	1,243.9	-	1,719.4	-
2015-16	835.3	11.9	2,113	11.2	2,948.3	11.4
2020-21	1,436	11.7	3,500	10.9	4,936.0	11.1
2030-31	3,622.8	10.7	8,238.4	9.9	11,861.2	10.1

Table 3.13

Expected Passenger Throughput at Indian Airports

YEAR	DOMESTIC (MILLION)	RESULTANT CAGR (PER CENT)	INTERNATIONAL (MILLION)	RESULTANT CAGR (PER CENT)	TOTAL (MILLION)	CAGR (PER CENT)
2010-11 (Actual)	106		38		144	
2015-16	188	12.1	62	10.3	250	11.7
2020-21	329	12	97	9.8	426	11.5
2025-26	546	11.5	147	9.4	693	11
2030-31	876	11.1	228	9.4	1,104	10.7

Source: Ministry of Civil Aviation Estimates.

Table 3.14
Expected Cargo Throughput at Indian Airports

YEAR	DOMESTIC (‘000 MT)	CAGR (PER CENT)	INTERNATIONAL (‘000 MT)	RESULTANT CAGR (PER CENT)	TOTAL (‘000 MT)	CAGR (PER CENT)
2010-11 (Actual)	888	-	1,504	-	2,392	-
2015-16	1,671	13.5	2,133	7	3,784	11.4
2020-21	2,872	12.5	3,500	9	6,372	11.1
2025-26	4,652	11.7	5,472	9	10,124	10.6
2030-31	7,246	11.1	8,239	8.9	15,485	10.1

Source: Airports Authority of India/Ministry of Civil Aviation Estimates.

direction on the development of airports. In recent years, six of the largest and systemically important airports in urgent need of expansion or re-development have had their ownership transferred into public-private joint-venture enterprises, under Operation, Maintenance and Development agreements. The private partners in these enterprises have supplied much-needed financing in exchange for a majority equity holding. The AAI has retained a minority stake in the joint venture companies and shares in the revenue generated. It also continues to supply air navigation at these, and all other airports. The tariff structure of these airports is regulated by AERA. A plan for developing airport infrastructure must therefore identify the location of any new development or expansion, the size of this exercise, and must also identify clear criteria for how the development works are to be funded and administered, whether through the AAI, or through a PPP joint venture.

The Ministry of Civil Aviation has established that the unit cost of creating additional new terminal capacity that is capable of processing 1 million passengers per annum is in the range of Rs 2.75 to 3 billion at 2011 prices. Where this capacity is to be created by enlarging existing infrastructure, i.e. as brownfield development, the unit costs are somewhat larger at Rs 4 billion. Though the land acquisition costs for greenfield developments should indicate a higher unit cost, the received wisdom is that capacity expansions at existing busy airports are made difficult by the need to plan around everyday operations.

According to Table 3.7, Indian airports processed 106 million domestic passengers and 38 million international passengers in 2010-11. This is expected to grow to 329 million and 97 million by 2020-21, and to 876

and 228 million by 2030-31 respectively. As standard international practice, a 30 per cent increment on these forecasts is applied for infrastructure planning to future-proof investments by ensuring sufficient slack in the added capacity: mid-course correction of design and development on account of changes in traffic forecasts will only result in higher outlays.

These facts lead to a straightforward assessment of the required capacity and investment in airport infrastructure as summarised in Table 3.15. For each Plan period through to 15th Five Year Plan concluding in 2032, the analytical framework apportions traffic between greenfield and other airports. This is then translated into a capacity requirement as described above, together with the 30 per cent margin, and by applying the unit costs, a total anticipated outlay for each plan is acquired.

A total investment of Rs 5,900 billion is estimated to be required for airport infrastructure development by 2030-31. This investment will result in creation of additional capacity of around 1,700 million passengers per annum (mmpa), out of which 383 mmpa capacity will come up in greenfield airports alone. This additional capacity will help in catering to the forecasted passenger traffic of 1177 mmpa by 2030-31 in a seamless and safe manner.

Unlike with roads or rail networks where investment output can be measured in so many kilometres of roads cut or rails laid of a certain type, investment in aviation is lumpier. Some airports will be larger than others by several orders of magnitude, and the unit costs of construction will be idiosyncratic. We may be able to differentiate between the unit cost of an expressway with that of a village road; however, it is an altogether different matter to compare unit costs of capacity expansion at airports in Delhi

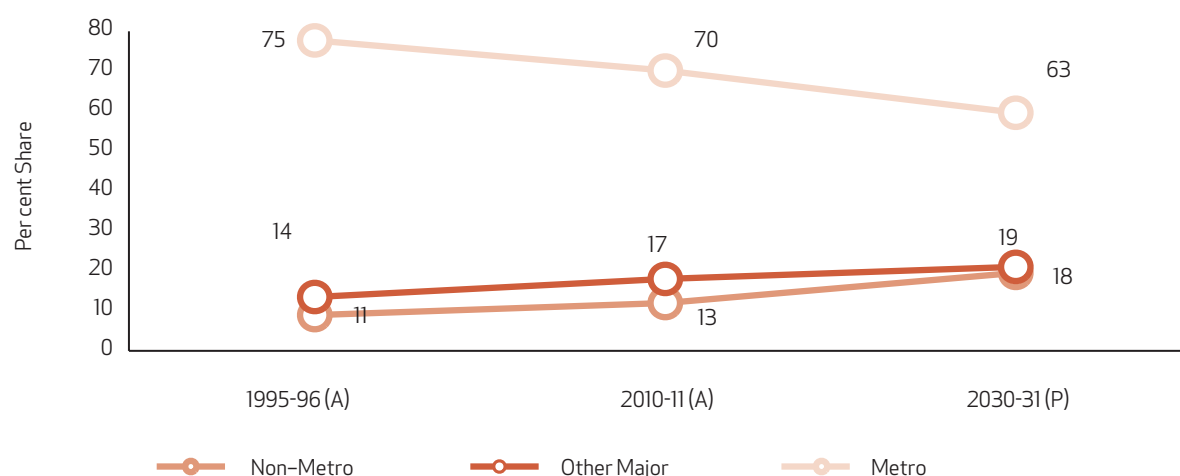
Table 3.15

Investment Requirement in India for Airport-Related Infrastructure by 2031-32 (Passenger Services)

PLAN PERIOD	PLAN PERIOD ENDING AT FINANCIAL YEAR	TOTAL PAX THROUGH-PUT FORECASTED (MILLIONS)	TRAFFIC APPORTIONED AMONG AIRPORTS			ESTIMATED CAPACITY REQUIREMENT AT AIRPORTS			ADDITIONAL CAPACITY REQUIRED AT AIRPORTS			INVESTMENT REQUIRED RS BILLION		
			GREEN-FIELD	OTHER THAN GREEN-FIELD	TOTAL	GREEN-FIELD	OTHER THAN GREEN-FIELD	TOTAL	GREEN-FIELD	OTHER THAN GREEN-FIELD	TOTAL	GREEN-FIELD	OTHER THAN GREEN-FIELD	TOTAL
1 st FIVE YEAR PLAN	2011-12	162	23	139	162	29	181	211	6	(16)	18	18		18
12 th FIVE YEAR PLAN	2016-17	281	39	242	281	51	314	365	22	101	123	60	369	429
13 th FIVE YEAR PLAN	2021-22	473	95	378	473	123	492	615	78	194	272	215	707	923
14 th FIVE YEAR PLAN	2026-27	764	153	611	764	199	795	993	97	404	501	268	1,474	1,741
15 th FIVE YEAR PLAN	2031-32	1,177	235	942	1,177	306	1,224	1,530	186	623	809	511	2,275	2,786
TOTAL									383	1,322	1,705	1,071	4,825	5,896

Source: NTDPC.

Figure 3.12
Throughput at Major, Non-Major and Metro Airports



Source: NTDP Civil Aviation Working Group, from MoCA analysis of AAI data.

Note: (A) refers to Actual and (P) refers to Projected.

versus Patna, or Mumbai versus Aizawl. Nonetheless, the preceding analysis has lumped together all the different types of capacity expansion to arrive at a net figure for infrastructure investment. However, it is crucially important to determine which cities and airports should benefit in which manner from the global pool of spending. Further, there is endogeneity in the process: decisions made on airports today will influence the airline route maps of the future; equally, the expected airline route maps should, by rights, determine the distribution of today's investment.

With 130 airports in the country and many more envisaged, it is specious to map out an investment plan for each. As a mirror to the point made above, these airport-specific plans should be dynamic in their response to changing traffic patterns and demand, and yet proactive, by building airport capacity in advance of the period when constraints start to bite. It is a difficult but essential balance, and one that will require substantial skill and strength of expert judgment.

That said, a rebalancing of traffic shares away from the metro airports is anticipated. At present, these airports process around 70 per cent of passenger traffic. With the rise of low-cost airlines, a preference for point-to-point travel whenever possible, a strategy that emphasises regional aviation, congestion at major airports and the general economic rise of the hinterland towns, the metro airports can be expected to yield traffic share to other major and non-major airports. These metro airports will remain systemically important, however, both as international gate-

ways to the country, as national hubs for both full-service and low-cost carriers.

There is an urgent need to build airport capacity to process cargo. Congestion and delays in air cargo terminals in some of the major metro airports have become chronic. The limitations spring from several sources: limited apron space for freighter aircraft, mixing of passenger luggage and cargo, delays in customs processing and clearances, poor connectivity with the road network delaying removal of cargo from airport facilities, and so forth.

At the larger airports, capacity can be done through dedicated cargo terminals with land-side facilities let out to freight forwarders and logistics providers. Consideration should also be given to building airports that are entirely dedicated to freight. These may be public airports sited at locations that have other excellent transport facilities or are proximate to metropolitan cities and other final destinations for cargo. These may also be private airports that are operated by a provider of logistics services. For example, two of the biggest package delivery services in the world, FedEx and UPS, each maintain dedicated hubs for their US operations at Memphis and Louisville respectively. Located centrally, the firms have built massive cargo processing facilities at these airports, to allow goods to be trans-shipped to their final locations. In India, locations like Nagpur or Pune could prove to be good choices on account of their geographic centrality, thereby minimising travel times to most metro cities in India.

Cargo that is air-freighted tends to be time-sensitive, relatively low in volume, and relatively high in val-

Table 3.16
Forecast of Passenger Throughput, Decomposition by Type of Airport

AIRPORTS (MPPA)				
PHASE	METRO	OTHER MAJOR	NON-METRO	TOTAL
2015-16	165	43	42	250
2020-21	276	77	7	425
2025-26	444	125	124	693
2030-31	695	210	199	1,104

Source: Ministry of Civil Aviation.

ue. Effort should be devoted to studying the decomposition of air freight in greater detail, and a database built of origins, destinations, and the nature and value of shipments. This will provide valuable information on the candidate sites for dedicated cargo facilities.

Table 3.17 presents estimates of the required investment in airport infrastructure to process cargo. Required capacities are calculated on the basis of a 30 per cent premium on the estimated cargo throughput over the next 20 years. Further, it is assumed that the unit cost of installing capacity to process an additional 1 million metric tonnes (mmt) of cargo is Rs 4.17 billion.

Combining the estimates presented in Table 3.15 and Table 3.17 yields a net required investment for passenger and cargo processing at airports of about Rs 6 trillion.

AIR NAVIGATION SERVICES

The Air Navigation Services (ANS) unit of the AAI operates communication, navigation, surveillance and traffic management systems for aircraft operating in Indian airspace. The ANS controls all air movements over India's sovereign airspace, and develops and maintains critical infrastructure and flight path systems throughout India. At airports, it manages air traffic control towers and radar centres.

In keeping with its land area, India has one of the largest sovereign airspaces in the world, and one that is projected to become even busier as domestic and international traffic in India expands. Being at the

geographical crossroads of Europe and the Middle East on the one hand, and East Asia and Australasia on the other, the ANS also assume responsibility for the through traffic over India's airspace. This traffic, too, will grow substantially in the years to come.

Substantial investment will be required to ensure that the ANS can continue to deliver on an exceptional record of aviation safety. Already busy airspace over metropolitan cities will become even more crowded, and new technologies will have to evolve to allow faster processing to and from the terminal gate. This will mean a closer separation between landings and departures, and more sophisticated methods for managing traffic in the airspace proximate to airports.

The Indian air navigation system master plan includes significant investment in modernisation communication, navigation, and surveillance (CNS) equipment, and air traffic management and meteorological equipment. It also foreshadows required upgrades in the number and expertise of air traffic controllers and other skilled staff. A series of new technologies will be required to provide centralised control over air traffic, as well as allowing some dynamic variation in flight path. (These measures may also result in reduced time and fuel burn on many routes, as the commander of an aircraft can restrictively amend the flight path to best suit circumstances.) A new navigation system, the GPS-aided GEO-augmented Navigation system (GAGAN) has been developed by the AAI with the support of the Indian Space Research Organisation (ISRO). The AAI estimates the project will require a total investment of Rs 7 bil-

Table 3.17

Investment Requirement in India for Airport-Related Infrastructure by 2031-32 (Cargo Processing Services) Investment

PLAN PERIOD	PLAN PERIOD END- ING AT FINANCIAL YEAR	TOTAL CARGO THROUGHPUT FORECASTED (MILLION TONNES)	ESTIMATED CAPAC- ITY REQUIREMENT AT AIRPORTS (MILLION TONNES)	ADDITIONAL CA- PACITY REQUIRED AT AIRPORTS (MILLION TONNES)	INVESTMENT REQUIRED (RS BILLION)
11 th Five Year Plan	2011-12	2.4	3.1	0.7	3
12 th Five Year Plan	2016-17	4.3	5.6	2.5	10
13 th Five Year Plan	2021-22	7.4	9.6	4.8	20
14 th Five Year Plan	2026-27	12.0	15.6	8.5	35
15 th Five Year Plan	2031-32	18.0	23.4	12.6	52
Total				28.9	121

lion during the 12th Plan period. More generally, industry sources suggest that the investment required for ANS alone would be around Rs 37 billion for the next five years.

AIRLINES

The investment in aircraft will largely be undertaken by the private sector, though from a public regulatory perspective, the methods of finance chosen to fund these purchases will remain important. These are discussed in later in the chapter. Airbus, the aircraft manufacturing conglomerate, has prepared an estimate of the number of aircraft that will be required over the next 20 years (see Table 3.18). This includes those purchased to add capacity, and those purchased to replace existing aircraft. India can expect to add in excess of 1,000 commercial and 1,000 general aviation aircraft to its national fleet over the next 20 years.

GENERAL AVIATION

The General Aviation (GA) market in India is expected to grow at 10 per cent per annum to cross Rs 16 billion by 2016-17. Industry sources indicate that around 300 business jets, 300 small aircrafts and 250 helicopters will be added to the current fleet by this time. A total investment of more than Rs 200 billion in GA facilities is required during the next five years alone.

The development of heliports is important to support the growth of general aviation in India, especially in areas that cannot have runways for financial or terrain-related challenges. A PPP policy for the development of heliports needs to be formulated, and one that especially applies to remote area service. There is also a need to develop standardised route operating procedures for helicopters.

The supporting infrastructure for GA at airports in Tier-II and Tier-III cities requires development. This includes night-landing facilities, enhancement of passenger amenities and State support in statutory services (e.g., security) to boost the GA industry. GA facilities at metro airports may be better served by developing separate terminals with premium facilities, and others that are fit-for-purpose.

Non-operational airstrips should be upgraded in places of economic significance such as ports, mining areas, tourist places and industrial clusters. These should be done at the lowest possible cost without compromising on safety. The airstrip may attract a small number of GA flights initially and if it has a strong business case, it may ultimately lead to full-scale operations in future, with significant benefits to the local economy.

With the current traffic load of scheduled flights at metro airports, GA aircraft, at times, are allocated lower priority as compared to scheduled opera-

Table 3.18
Investment in Aircraft to 2031-32

TYPE OF AIRCRAFT	FORECASTED NUMBERS OF AIRCRAFT	VALUE US \$ (BILLIONS)	VALUE IN RS (BILLIONS)
Passenger (> = 100 seats)	1,019	141	7,070
Freighter (Payload > 10 Tonnes)	218	110	5,500
Sub-total	1,237	251	12,570
General Aviation (Only up to 2020)	1,400	8	410
Total	2,637	259	12,980

Source: Airbus, CAPA.

tors. Delays in take-off and landing clearances may defeat the purpose of investments in GA aircraft. A joint review committee should be formed by MoCA and DGCA with representation from GA operators to review the existing regulatory and operational framework.

MAINTENANCE, REPAIR AND OVERHAUL

The Indian MRO industry is expected to triple in size from Rs 22 billion in 2010 to Rs 70 billion by 2020. However, this future size is small when compared with the present MRO industry size of countries such as the UAE (Rs 80 billion per annum) and China (Rs 100 billion per annum). With India likely to become the third largest aviation market, there is substantial reason to promote an MRO industry that is even larger than the Rs 70 billion envisaged. It is possible that, even at this size, the industry will not be large enough to accommodate MRO operations for India's expected fleet, forcing operators to despatch aircraft offshore for this purpose, much as they do today. India has strong comparative advantages to become a world-leading centre for MRO. These include a growing domestic fleet, location advantages, and the availability of a large skilled workforce. The challenges against this are in ensuring that the industry is regulated properly, and that the required skills are developed to service increasingly sophisticated aircraft.

To pave the road for India as a preferred global hub for MRO, it bears thinking carefully as to why it is not already so in light of the comparative advantages just noted. First, under the present set of taxation policies, Indian MRO service providers pay nearly 40 per cent more in taxes than their foreign competitors⁴⁷. These are in terms of countervailing import duties, value-added and service taxes. This has led to Indian carriers taking their aircraft to other locations like Dubai, Singapore, and Malaysia for the cheaper MRO service available there, even after the transaction costs are factored in. The resultant tax revenues in India from MRO are a fraction of what they could have been. There is a need for urgent review of this taxation policy to make it consistent with international practices. The current policies place Indian airlines at a cost disadvantage, as foreign airlines are able to make use of cheaper MRO services at their home bases.

The high countervailing duties on spare parts also need to be reviewed to bring them in line with the practice at other MRO hubs. These duties prevent local MRO providers from maintaining an inventory of key spare parts, leading to wasteful delays as aircraft are grounded for long periods. The 2013-14 budget of the central government went some way in this regard. First, the time period for the consumption or installation of parts and testing equipments imported for MRO purposes was extended from three months to one year. Second, a broader class of parts

47. NTDP Working Group Report on Civil Aviation, p. 77.

Airlines should be encouraged to set up MRO hubs through three-way joint ventures with MRO service providers and airports. This assures a symbiotic relationship between the three most important entities in the industry.

and testing equipment was made exempt from basic customs duty. The rationale for continued imposition of countervailing duties appears weak when considering that their sustained application over the years has hardly resulted in a vibrant domestic aeronautics industry. Meanwhile, with aircraft often deployed on both domestic as well as on international routes, and the policy goal noted above of attracting foreign-registered aircraft to Indian MRO service centres, a re-consideration of service taxes and duties on imported parts is necessary to properly account for MRO service exports.

Airlines should be offered incentives to set up dedicated MRO hubs in India through three-way joint ventures with MRO service providers and airport companies. This assures sustained business for the venture, a cost advantage for the airlines, and a symbiotic relationship between the three most important entities in the aviation industry. Many global airlines have set up their own engineering services to which other airlines outsource maintenance. Air India's engineering arm is well-regarded, and with investment in training and equipment and a sound supporting policy, it can become a regionally important MRO provider in short time. These incentives may take the form of government designating a few airports as MRO hubs while also stipulating that all planned development at these locations properly allocates suitable on-site land and hangar facilities for MRO activities, with charges regulated by AERA. Further, AERA's remit may be expanded to regulate tri-partite arrangements between airport, airline and MRO provider and the tariffs charged for services rendered.

According to industry participants, receiving approvals for the establishment of MRO service provision is extremely challenging. Currently, the licensed activity is 'ground-handling' rather than MRO which suggests that no distinction is made between these very different services. Urgent repairs of grounded aircraft may require foreign specialists at short notice, but the issuance of the necessary security clearances is cumbersome and time-consuming. This renders them ineffective since the opportunity cost of a grounded aircraft is extremely high. There is a need to streamline clearance procedures so that there is a rational balance between business exigencies and security considerations.

In summary, the anticipated growth in Indian civil aviation, the country's geographic advantages and

the potential of a skilled labour force combine to offer a persuasive case for the setting up of regionally dominant MRO facilities. The enabling policies required are (i) reconsideration with a view towards reduction or elimination of customs duties and other taxes; (ii) mandated provision of suitable facilities as airports are re-developed together with a regulated tariff regime for real estate and for provision of services at airports; and (iii) policy support to equip a skilled labour force.

GROUND HANDLING

A huge variety of activities are clubbed under the generic term 'ground handling'. Airlines can choose to undertake some or all of these themselves, contracting out the remainder to dedicated providers of ground handling services. Airlines will often undertake their own handling services at their hub airports; the economies of scale being such that the provision of services at other airports will be contracted to specialist providers or other airlines. These services can include arranging for passenger check-in and baggage handling, aircraft servicing at turnaround, refuelling, and in-flight catering amongst others.

The market for these services is expected to double from the present Rs 20 billion to Rs 39 billion within the next five years. A number of global ground-handling service providers have aggressive expansion plans in India. Future infrastructure development in this space will be largely driven by technology. Among the technologies expected to have a significant impact on the Indian aviation sector are passenger self-service solutions (such as for check-in), radio frequency identification for faster and more reliable processing of baggage, common use terminal equipment, unit load device scanners for cargo handling, and internet and mobile technologies. The introduction of these technologies will depend significantly on supportive fiscal policies and requisite traffic at the airports to warrant their use. Again, with handling equipment deployed for service provision on both domestic and international routes, a strong case for removing or reducing customs duties may be made.

The Ministry of Civil Aviation has brought in a ground handling policy for the six metro airports, limiting the number of ground handling agencies therein in order to facilitate consolidation and promote efficiency⁴⁸. Mechanisation and modern ground handling processes are also key to ensuring efficiency. There should be proper monitoring mechanisms to oversee and enforce service level agreements between airlines and ground handling agencies, and between custodians, airport operators and ground handling agencies. To this end, airport regulators should specify service standards on the speeds with which passenger check-ins are processed, and the

48. This has been contested by airlines. The matter is currently subjudice in the Supreme Court.

numbers of mishandled baggage, and then require service providers to file regular compliance updates and be subject to period procedural audits.

DEVELOPMENT AND MANAGEMENT OF AIRPORTS: SELECT ISSUES

INSTITUTIONAL CHANGE

In India, the AERA was inaugurated during a round of reforms in 2007, with the express purpose of regulating tariffs set by the new joint-venture airports and those under the direct control of the AAI. AERA regulates a wide range of tariffs relating to the operation of aviation services including landing charges, passenger service charges or user development fees, cargo charges, parking and hangar charges. Airports can also collect revenue from non-aeronautical activities such as aviation fuel and oil concessions, restaurants and catering services, car parking, and other commercial activities such as leases to express cargo and freight forwarding companies. Revenues from non-aeronautical activities sometimes subsidise those that are directly related to aviation.

The JV airports can be considered a success on several levels. There has been rapid expansion in capacity and improvements in quality of service delivery. On the whole, these airports are not just fit-for-purpose but are comparable with the very highest international benchmarks on several fronts. However, these improvements have been achieved at a price that may be considered untenable. Landing and usage fees at Delhi and Mumbai airport are amongst the highest in the world, though these have been approved by AERA⁴⁹. Airlines have periodically complained of these fees, and have cited them as major barriers to increased service provision and lower airfares. The outcry has been vociferous enough that some airlines have claimed that it is uneconomical for them to operate service to these airports entirely⁵⁰. The increases in fees sought by airport operators have been large, ranging between 100 and 400 per cent, again provoking concern from users. An important contributing factor to the large increases which have created adjustment costs for end users has been that tariffs were held steady from 2001 onwards, necessitating larger revisions. Several other airports are currently following or will shortly follow a PPP-JV investment model for constructing new facilities or upgrading existing ones. It is hoped that future adjustments will be more timely, and transparently presented with a more detailed assessment of airport costs.

The JV airports will need to be careful to levy reasonable tariffs that are competitive with other airports in the region. Any attempt to levy high tariffs

by the JV airports, which, it will be recalled, are the systemically important airports in the Indian aviation network, are not conducive to the desired expansion of the industry or to lower airfares. It is fair that the development of these airports be paid for with substantial user charges. However, the current system of large increases in end-user charges on the basis of higher-than-anticipated development or other costs which the regulator has little power to reject lest this force the venture into bankruptcy is untenable. To prevent this, future PPP-JV agreements must be subject to more careful scrutiny on development costs, with reduced tolerances for budget overruns. India's preferred model of maximal regulation of airport tariffs through AERA on the basis of cost-plus pricing is sound only if the authority has real powers to impose penalties on contracting parties to the JV for failures to hold costs in check. To this end, the permissible structure for charges should be made known at the time of the tender, so that the consortium bids accordingly and the appropriate level of investment is expended on the airport development project. This can only be achieved if there is the framework of a National Master Plan for the development of airports which identifies clear economic reasons for building new airports in generally specified locations.

Nonetheless, private funding and management of airport operations is increasingly the international norm, and it is desirable that the Centre should progressively withdraw from airport operations where feasible and commercially sustainable. If anything, state governments should play a much more active role in the airport sector since aviation is a key enabler of local economic development and they would be the appropriate partners for investors. Therefore, MoCA should engage with and encourage the states regarding the potential benefits of establishing a more conducive environment for the aviation sector based upon their understanding of the significant economic benefits of airports on their local economies.

With respect to other airports run by the AAI, the government should clarify the future role of the agency. As a first step, the AAI should be separated into two distinct functions: Airport Operations and Air Navigation Services. Each function should initially be corporatised, preparing its own financial statements, continuing under State ownership but managed independently along commercial lines. The

Airport regulators should specify service standards like speed of check-in, and then require service providers to file regular compliance updates

49. See IATA Economics Briefing May 2012 and IATA Submission to AERA on Consultation Paper 32/2011-12, dated March 2012 for a detailed review of the airline industry's position on these charges.

50. See <http://goo.gl/PH9I04> and <http://goo.gl/IW903M>.

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Airport⁵¹ Operations Division currently has no clear commercial goals and is involved in a large number of projects, of which many are economically unviable. There would be advantages to breaking these activities into smaller units, separating airport construction from airport management, in turn further breaking these down by region. Further, budget accountability is essential, considering that as the AAI enhances its prime assets and progressively privatises them, it will be left with the task of continuing to invest in airports that are initially not viable. It is also possible for the public sector authority or corporatised entity to act as a landlord while terminal operations are run by private entities.

The newly reorganised Airports Authority should then turn its attention to developing new airports together with state governments so as to stimulate their participation in the sector. However, new airport projects should be subject to review by an independent Airports Approval Committee. Such new projects should also be developed within the context of a 30- to 50-year Master Plan for Indian Airports as mentioned above, integrated with the National Transport Plan and metropolitan road and mass transit projects.

At present, the AAI's business model is highly complex as it manages the largest portfolio of airports in the world under a single operator and, in addition to the management and construction of airports, it also has the onerous task of providing air navigation services. It is for this reason that our recommendation is for a clear structural and commercial reorientation of the authority with a rolling programme of privatisation of the new assets that it creates.

SLOT MANAGEMENT

For the purposes of providing fair access to a capacity-constrained airport, 'slots' permitting planned operations are allocated to the airlines seeking to use the airport. For the purpose of slot allocation, airports are categorised according to the following levels of congestion⁵²:

- Level 1: where the capacity of the airport infrastructure is generally adequate to meet the demands of the airport users at all times.
- Level 2: where there is potential for some peri-

ods of the day, week or season which can be resolved by voluntary cooperation between airlines.

- Level 3: where capacity is constrained due to lack of sufficient infrastructure.

Major revisions to India's slot allocation policy were introduced in 2007, and again in May 2013. The 2007 revisions were prompted by a need to accommodate the differential requirements of the joint-venture airports. The managers of these airports received proposed schedules either directly (from domestic airlines), or via Air India (for foreign airlines, highlighting an immediate conflict of interest). The airport managers would then liaise with the AAI in its role as the provider of air-traffic control and navigation services to determine runway capacities and usage, before communicating outcomes to the airlines. Slot allocation at all other airports remained under the purview of the AAI.

The newly issued 2013 guidelines aim at correcting some of the shortcomings of the system which include⁵³: (i) the absence of a system for objectively assessing the available slots at an airport; (ii) the absence of information on available slots in the public domain; (iii) no mechanism to cancel slots; (iv) the blocking of slots by airlines without using them; and (v) the absence of robust appellate mechanisms. The revised policy introduced in May 2013 is intended to be transparent, fair, equitable, and amenable to course correction. To this end, it identifies streamlined procedures for assessing demand and managing capacity at airports, simplifying the process of categorisation of airports as Level 1, 2 and 3 facilities. It also sets up a coordination mechanism wherein the airport operator liaises with airlines and sets up a coordinator to allocate slots in a 'neutral, transparent, and non-discriminatory manner'. The major prioritisation principle for slot allocation is historicity in that an airline seeking slots for a forthcoming period must have used more than 80 per cent of the slots allocated to it in the previous period.

The 2013 guidelines also go some way towards ensuring that allocation considerations account for the entry of new airlines into the market, the promotion of domestic and international hubs, the promotion of season-long and year-round operations, the promotion of market competition, and ameliorating the impact of curfews at one airport on the civil aviation network. The guidelines also give the coordinating authorities more precise criteria for gauging slot misuse and powers to cancel allocated slots. As such, these guidelines are a welcome reform.

However, problems remain. Today, as per IATA principles, an incumbent airline in India is entitled to retain a group of slots based on historical precedent provided the slots in question have been allocated to

51. In this context, 'operations' refers to the collective of all activities required to arrive at and depart an airport.

52. See 'Guidelines for Slot Allocation', May 2013 revision, MoCA.

53. Ibid (p. 7).

a passenger air carrier and utilised at least 80 per cent of the time in the preceding season⁵⁴. The guidelines additionally state that slots may not be withdrawn from existing carriers in order to accommodate new market entrants; rather, from a given pool of available slots, new entrants have access to only 50 per cent of these. At present, while the United Kingdom and European Union recognise and apply IATA slot allocation guidelines, the United States does not, in part due to concerns regarding anti-trust law.

Not surprisingly, these slot allocation rules create artificial barriers to entry for new market participants by sharply limiting the number of free slots available to them at domestic Indian airports. IATA's grandfathering provision, to which the AAI adheres, allows existing carriers to withhold prime-time slots at airports on lucrative, popular routes, thus enabling incumbent airlines to cling to substantial market share and effectively crowd potential entry out of the market. Carriers also automatically control all slots utilised at least 80 per cent in a particular assignment season during the next season, and underutilised slots are only brought to market every six months, creating a time lag that compounds new market entrants' competitive disadvantage. Moreover, it is often the case that underutilised slots are intrinsically less desirable in the first place—at unfavourable times and otherwise unable to generate high revenues—which compounds new carriers' ability to compete on lucrative high-margin routes.

Another power imbalance resulting from India's slot allocation system occurs when domestic airlines merge. When two incumbent carriers merge, all pre-merger slots of both airlines will be allocated to the surviving entity. Since the number of slots that a carrier controls is positively correlated with the market power it enjoys, merged entities consequently end up in a disproportionately favourable position from which to capture greater market share from competitors. Not only does this process create an artificial scarcity of (already-scarce, in many cases) slots, so too does it raise the concern that sector consolidation will by default severely reduce competition in the domestic market, particularly if two larger industry players were to merge and thus effectively crowd out other incumbent carriers and potential new entrants alike. Here again, only if the merged entity fails to utilise individual slots are those slots returned to the 'unallocated' pool—a pool comprised primarily of non-peak, oddly-timed slots.

Unfortunately, the overall effect of the 2013 guidelines is unlikely to be conducive to a well-functioning and competitive sector. A case in point is the trading of slots among airlines, a process that is permitted as per IATA guidelines but banned within the Indian regulatory framework. It has been demonstrated globally that allowing airlines to trade slots can

promote operational efficiency among carriers and maximise the utilisation of available slots. Indeed, slot trading (with financial incentives) is permitted in the United Kingdom, the European Union and the United States and allows airlines in these jurisdictions to enhance overall sector efficiency by effectively creating a market in which slots can be allocated to airlines based on willingness to pay.

Having said this, the slot trading system is by no means perfect: for example, it can lead to hoarding, since there is generally a positive correlation between controlled slots at a carrier's influence within a particular market. However, on balance, allowing Indian carriers to trade a limited supply of slots would lead to more efficient outcomes versus the existing semi-annual government slot review and assignment, particularly in light of the other regulatory challenges to effective competition that have been highlighted above. Greater adherence to due process, transparent decision making by airport operators and regulators will lead to continued improvements in the slot management process. Reviewing and gradually revising India's current slot allocation system will help to reduce a key market barrier to competition and in turn create a framework of more predictable and efficient slot allocation outcomes, as it has in other markets globally.

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LAND ACQUISITION AND LAND USE FOR AIRPORT DEVELOPMENT

Unlike for other transport modes, the provision of aviation services does not depend on transport corridors. Instead, what is required are reasonably sizable pieces of land in close proximity to centres of population that also conform with international standards for safety in civil aviation. Wherever possible, it should be preferable to develop brownfield airports: these will offer the greatest locational advantages. Where it is desirable to develop greenfield airports, the area required for airport development should be decided based on current and future demand and traffic patterns.

The long-term traffic forecasts indicate that the growth of our new metro cities will require second and in some cases third airports in the 20- to 30-year timeframe. Land scarcity implies that this will not only become a significant political issue but requires search for the land for second and third airports to

54. NTDP Civil Aviation Working Group Report, p. 106 (citing IATA regulations). Note that in a year, there are two seasons (six months each) for slot utilisation; slots used less than 80 per cent of the time in a given season are categorised as 'underutilised'. See Procedure Manual Directorate of Regulations & Information, Government of India Office of the Director General of Civil Aviation, p. 10.

commence now with appropriate zoning for such land and reservation of such land for connecting transport corridors.

A strong regulatory framework is essential to determine the practices under which land can be acquired, the compensations paid, and the zoning of both the actual land used for airport development and that in its immediate vicinity. In many countries, land that is proximate to airports has been put to extremely productive use in the form of off-site cargo processing and shipping facilities, as warehousing space for time-sensitive cargo, and as real estate for the several industries that both rely on and support civil aviation. With many global cities boasting multiple airports, urban development master plans and plans for development of civil aviation should both give formal consideration to

a handful of smaller airports in the largest metropolitan cities.

An 'Airport Approval Commission' may be established within MoCA to review the business plans of proposed airports prior to granting clearance⁵⁵. The Commission would take account

Urban master plans should give formal consideration to a handful of smaller airports in the largest metropolitan cities

of airport development within the multi-modal context of transport development policy: it would consider airport development with regard to sustainable viability: it would refer to goals and objectives defined for airport in that location and, in order to attract private and PPP models, the transparent and equitable economic regulatory framework needs to be articulated in advance.

HUB AIRPORTS

In recent times, the government has declared the intention of revitalising Delhi's, and possibly Mumbai's airport, as international hubs. These ambitions are commensurate with India's expanding aviation market, and a desire to direct a greater share of aviation business originating both domestically as well as internationally to Indian economic and tax jurisdiction. However, as noted previously, these ambitions for global hubs that rival Dubai to the West and Singapore to the East, should be subservient to the pressing requirement for the development of national hubs within India, which help to transfer passengers from one part of the country to another more cost effectively than through point-to-point services. These West Asian and South East Asian hubs have, to some extent, developed because of the absence of similar-sized and efficient hubs in India.

While it seems a strategic national imperative that India should have an international hub to inter-

change the travellers overflying India in the global east to west and west to east air corridors, *it must be appreciated that a hub in India can only operate competitively against the West Asian and South East Asian hubs, if it has a strong national airline (or airlines) to patronise this hub in preference to hubs promoted elsewhere by national governments for the airlines of their respective countries.* Had Air India grown into an airline of scale, with significant international reach both eastwards and westwards to all five continents and, were it to be a viable airline, Delhi may evolved naturally to be a major airport hub for long-distance international travel to and through India. Unfortunately, Air India's current network and market share do not accommodate this vision and its future viability is in doubt.

It has been estimated that there are at least 30 destinations from India to Europe, North America and South East Asia that could justify daily non-stop flights departing India, in some cases multiple flights per destination. Therefore, as it is in the national interest for Indian-owned airlines to gain the revenue of long-distance travel of India-originating traffic, it would be necessary to actively support the development of such a full-service international airline or airlines, by providing the appropriate facilities at Delhi airport, support on bilateral rights, and other required government approvals, each according to a transparent regulatory framework. In summary, discussions on the development of international hubs in India must first recognise the more urgent requirements for promoting domestic hubs, and also ensure that a viable airline with sufficient reach exists to symbiotically develop the international hub.

Air India continues to possess the slots and air traffic rights that could, potentially, enable it to emerge as a dominant Indian airline that can be counted among the best in the world. That such an outcome is beyond any current expectation is obvious. It is therefore imperative that the government takes a considered view in this matter and reinvent Air India with the ambition of making it into a competitive airline comparable with peers such as Emirates, Singapore Airlines, Qatar Airways, Etihad, Lufthansa and the like. All of these airlines are under public ownership but are run completely on commercial lines. An imaginative solution will have to be found that takes a complete break from the past. Within India, very competitive commercially aggressive entities have appeared from former public ownership, such as ICICI Bank, and others. The solution may be to develop a completely new airline that takes over key Air India assets, while the liabilities are hived off, to be dealt with separately, analogous to a good bank/ bad bank strategy. The new airline could be in the public sector (if so desired), joint sector, or private. But the

55. CAPA's submission on the New Civil Aviation Policy.

important ingredient would be complete commercial and operational autonomy.

ISSUES RELATING TO REGULATION OF AIRLINES

THE AIRLINE MARKET

The government seeks to take a number of measures to prevent airlines from engaging in anti-competitive practices. One such practice common among incumbent players is to charge fares on routes at levels that are in aggregate insufficient to cover marginal costs. Airlines sometimes do this to undercut relatively inefficient competitors, or to deter the potential entry of new market players by deciding to take short-term losses, something that new market entrants may not have the balance sheet strength to do. Another such strategy is for airlines to add excessive capacity or frequent service, the deployment of which can force competitors to drop fares in order to ensure greater utilisation of their own aircraft. Here again, an incumbent airline can pressure new players effectively out of the market, by lowering fares in the short term.

Needless to say, the behaviours and institutions outlined here contribute to the power imbalance among India's new and emerging airlines that is discussed throughout this report.

PRICING STRATEGY

A number of market developments surrounding scheduled carriers' pricing mechanisms suggest the need for some form of pricing regulation. Most recently, in 2010, there were allegations that domestic carriers were setting prices artificially high, particularly during festival and holiday seasons and during periods in which airline employees were on strike. According to the Civil Aviation Working Group Report, evidence suggests that day-of-departure spot prices on certain routes were sometimes seven to eight times higher than the prices airlines had been charging only weeks previously.

Although it is common in other jurisdictions—around Thanksgiving or Christmas in the United States or Chinese New Year throughout East Asia, for example—to charge higher prices during holiday seasons, the differential by which Indian domestic carriers are alleged to have done so is notable. Moreover, a number of passengers filed complaints related to excessive pricing during peak festival seasons (e.g., Diwali) during which some airlines' pilots were striking, which thus naturally gave undue advantage to carriers whose pilots were not striking, allowing them to drive up prices even as they captured excess market demand. Preying on customers whose options are limited, particularly during periods in which domestic demand is high, is problematic.

Following these episodes, the Directorate General of Civil Aviation required that carriers become more trans-

A new airline could take over key Air India assets, while the liabilities are hived off, to be dealt with separately, analogous to a good bank/bad bank strategy. The airline could be in the public, joint, or private sector. But it must have commercial and operational autonomy

parent in disclosing airfares in advance to the public. Going forward, regulators should work with airlines to regulate pricing, but only loosely. The desired regulatory framework should protect consumers against episodes of predatory and discriminatory pricing as described above while simultaneously ensuring that prices are fair, reasonable and largely market-driven.

One of the key factors in determining airlines' financial outlay lies in effective utilisation of aircraft, which can have a dramatic impact upon carriers' ability to efficiently manage costs. Higher aircraft utilisation rates allow airlines to reduce overall operating costs and to rationalise capacity induction in the most financially viable manner.

Not surprisingly, within the domestic market, low-cost carriers (e.g. IndiGo and SpiceJet) are more effective than full-service carriers in aircraft capacity utilisation, in part because they tend to lease rather than own their aircraft and are thus able to respond more quickly to changing demand. According to the Civil Aviation Working Group Report, in 2010-11 SpiceJet (10.6) and IndiGo (10.2) posted aircraft utilisation rates (in block hours/day) closer to those of global industry leaders such as Singapore Airlines (11.7) than to domestic full-service peers (e.g., Jet Airways 9.7; and Air India 6.9)⁵⁶.

PROFITABILITY AND VIABILITY

CAPA estimates that India's airlines would posted a combined loss of approximately \$1.65 billion for the 12 months ending March 31, 2013⁵⁷. These losses stem from two carriers—Air India (\$950 million loss) and Kingfisher (\$500-520 million loss). Other airlines, except IndiGo, which fared well, made modest profits⁵⁸.

Generally speaking, Air India has struggled throughout the Indian aviation market's transition from a monopoly market into one that is increasingly competitive. Although the flagship carrier was able to break even or limit operating losses until 2005-2006, the entry of four additional airlines in that year has contributed to rising losses at Air India in the period since then. Simply, Air India continues to struggle to improve efficiency and keep pace with its more innovative and agile private competitors.

Air India's performance somewhat improved in 2012-13. The net losses came down, due to increase in load factor from 67.9 in 2011-12 to 72.4. The yield (Revenue/Passenger Km) improved by 16 per cent. The financial restructuring plan approved by the government should have also contributed towards improvement in the balance sheet. Air

56. NTDP Civil Aviation Working Group Report p. 93 (citing Directorate General of Civil Aviation and airline annual reports).

57. CAPA India Aviation Outlook 2012/13.

58. Though Kingfisher has ceased operations, its exit from the market is messy, and daily losses accrue to creditors.

Based on air traffic forecasts, India's commercial fleet size is expected to more than double over the next decade. Airlines in India are expected to add approximately 370 aircraft (worth Rs 1.5 trillion) to their respective fleets in the next five years

India should continue to improve yield and load factor and effect reduction of cost base. Finally, strong consideration must be given over the medium-term to the rationale for retaining a national airline. If the arguments are not tenable, then plans should be made to divest investment therein.

Simultaneously, Jet Airways continues to struggle financially: the airline's recent revenue growth has been surprisingly modest in spite of the fact that market conditions presented Jet with a prime opportunity to exploit the financial woes its two key full-service competitors (Air India and Kingfisher) have been facing. Although Jet Airways achieved growth in revenue and yield, the traffic in terms of passenger kilometres decreased in 2012-13 compared to the year before. The load factor also dipped marginally. Industry analysts believe that Jet Airways' inability to leverage the issues its main competitors have faced over the last year could signal structural weaknesses within the business. Specifically, CAPA India has stated that Jet's cost base may be too high and that without efforts to restructure controllable non-fuel costs—particularly in light of high ATF prices and a weak rupee—the airline will struggle to maintain viable operations⁵⁹.

IndiGo continues to lead the domestic market in performance, though India's recent higher-cost environment and the airline's entry into international services have even pressured the financials of this rising star; by all accounts the domestic aviation industry's greatest success story in recent years. In spite of these factors, CAPA India still believes IndiGo is likely on track to record its highest annual profits to date this year, provided international operations prove successful and the airline is able to successfully navigate the current challenging cost environment. Moreover, as IndiGo continues to expand rapidly, it must place heavy emphasis upon ensuring consistently strong service levels (e.g., efficiency of service, on-time arrivals and other factors that have to date differentiated IndiGo's business strategy vis-à-vis domestic peers) across all the markets it serves. While customer satisfaction remains high, these issues will become ever more challenging as the airline continues to ramp up.

Go Air, India's smallest carrier by fleet size, continues to perform better than the majority of its much larger competitors. The carrier maintains stable operations and high customer satisfaction rates, and has managed to achieve the market's highest gross fares among low-cost carriers. A targeted and strategic network, the decision to operate routes on which the airline faces little competition and higher yields have served Go Air well. As the airline matures, continued reduction of debt levels will help to ensure future financial viability.

Finally, SpiceJet's financial performance continues to suffer, in part due the airline recently beginning to operate Q400 aircraft (a move that has yet to turn profitable) and its launch of international flights. Although these decisions may have been better-timed in light of broader financial pressures on the domestic market, over time they may help the airline to build a more competitive cost base and improve efficiencies, if managed appropriately.

Overall, although the combined performance of these carriers is the best it has been over the last 18 months—yields continue to improve and the airlines are demonstrating capacity discipline as they continue to focus on profitability above market share—current market conditions place a great deal of pressure on domestic airlines. Moreover, a number of key factors (most notably fuel prices and recent, sharp depreciation of the rupee) remain beyond the control of the airlines' management teams, who continue to struggle to find ways to tackle these issues. Cost pressures have further intensified this year, as airlines expect the announcement of still-higher airport charges and passenger fees in Mumbai, Chennai and Kolkata. In short, the combination of these factors continue to pressure domestic carriers and render their potential to deliver sustained profitability somewhat unlikely over the near term.

ENHANCING PHYSICAL CAPACITY

Physical capacity in the domestic market continues to grow steadily, with both Available Seat Kilometres (ASK) and Revenue Passenger Kilometers (RPK) moving largely in tandem since the mid-1990s: in fact, the gap between the two has increased significantly since 2005-06, indicating excess supply of capacity in relation to demand growth over the last five years. This has in part been the result of the global economic downturn—given the high degree of sensitivity of passenger air travel to broader economic conditions—and consequently it is critical that capacity continue to be enhanced over time in order to keep pace with India's economic growth over the medium-to-long term.

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59. CAPA India has stated that Jet Airways must focus on three key elements to create viable operations, namely: 1) introduce strategic clarity and greater definition with respect to its low-cost subsidiaries and strategy; 2) control and rationalise non-fuel costs; and 3) focus on generating ancillary revenues, in which CAPA India believes the airline has recent begun to take positive measures.

next decade. Airlines in India are expected to add approximately 370 aircraft (worth Rs 1.5 trillion) to their respective fleets in the next five years⁶⁰. Similarly, India's general aviation fleet is expected to expand by roughly 2,000 (aircraft and helicopters) in the next decade⁶¹.

There are various methods by which airlines can successfully induct new aircraft (e.g., direct purchases, finance and operating leases), each of which holds various degrees of benefits and liability. In India, while Air India chooses to follow the direct purchase model, low-cost carriers such as IndiGo and SpiceJet tend to lease their aircraft.

Although Air India owns its aircraft, industry analysts are concerned that the flagship carrier may not have the capacity to fully leverage domestic demand and engineer a turnaround of its recent financial and operational woes. Air India currently owns 55 domestic aircraft (only 45 of which are available purely for domestic routes)—an insufficient number with which to successfully meet domestic market demand. Similarly, Air India only has between 20 and 25 aircraft for international routes, and CAPA India further believes that its core aircraft (the Boeing 777) has not been optimally deployed with respect to route selection, further pressuring the airline's already-insufficient international fleet.

FUEL PRICING

Fuel is perhaps the largest input in aviation, accounting for around 50 per cent of operating costs. Prices for ATF in India are nearly 60 per cent higher than in neighbouring hubs like Dubai, Singapore and Kuala Lumpur. The high prices result from its administrative treatment, a complex system of taxes and the lack of competition in a market where other fuels are subsidised. Representations delivered to the Working Group on Civil Aviation suggest that the market for ATF is not sufficiently competitive to ensure that prices have a direct basis in costs⁶². Prices of ATF are based on International Import Parity Prices and so are unrelated to the actual cost of refining ATF in India which is a middle-distilled crude derivative. Instead, the purchase price of ATF includes a notional customs duty of 5 per cent, a customs excise duty of 8.25 per cent, service taxes on refuelling activities at 10.3 per cent, value-added taxes at around 25 per cent that are levied by most states and an Octroi or entry tax.

Despite being an input fuel (similar to coal and gas), ATF is subject to VAT, ranging in most states between 20 per cent and 30 per cent. Generally, the central excise duty paid on any input in manufacture is set off against service tax paid on output as per the ser-

vice tax principles laid down by the Central Board of Excise and Customs. However, this facility of set-off is not applicable in the case of ATF although air travel itself is also subjected to service tax.

Other recommended policy changes are (i) the inclusion of ATF in the unified GST regime, as introduced in the future; (ii) the existence of a more transparent ATF regime where oil marketing companies are required to declare costs and methods used to price the end product; and (iii) a switch to a specific rate of duty rather than an ad valorem structure. The last recommendation is motivated by the fact that higher base prices result in both higher duties as well as higher VAT under the present taxation regime.

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AIR INDIA

The government should clarify the future role of Air India. In the present environment, reasons for government to operate an airline in a highly competitive, volatile, and capital-intensive environment must be clearly defined. The Committee has not found persuasive arguments for continued government ownership and operation of the airline. In the event that these reasons are not defined, a plan for the progressive disinvestment of the government's stake in Air India over a period of three to five years, based on a phased scheme with defined milestones should be identified. The airline will need to be recapitalised, restructured organisationally, its working capital debt burden written off and some divisions made independent and corporatised, with government retaining perhaps a 26 per cent stake. It would essentially be a new airline. As recommended earlier, this entity should start completely anew while Air India's current liabilities are separated out and dealt with.

It is apparent that with its excessive and unproductive manpower, its failure to invest in the technology required to keep it competitive and with its sub-scale operations, Air India's future prospects remain precarious. Air India must therefore be provided the opportunity to reinvent itself with new professional management, managerial and operational autonomy, while taking over all existing productive assets. If such a makeover cannot be done in a public sector or joint sector framework, it will need to be privatised. Failure to implement such a plan will continue to drain over \$ 1 billion per annum of tax payers' money each year over the next 10 years,

60. Report of Working Group on Civil Aviation for Formulation of 12th Five-Year Plan (2012-2017).

61. According to the Working Group Report, studies of mature aviation markets (e.g., the United States) suggest that general aviation plays a significant role in the expansion and growth of a nation's scheduled commercial market. Consequently, it is important to take note of India's future general aviation growth, as it will in part influence commercial and overall sector growth.

62. NTDP Working Group Report on Civil Aviation (p. 76).

The aviation market still presents barriers to entry relating to political risk. Nor does it facilitate orderly exit with airlines having been allowed to continue operations when they fail to meet their payment obligations

which is surely unacceptable in the light of our national priorities. Meanwhile, Indian civil aviation will suffer and India will not be able to develop major hubs.

GENERAL AVIATION

General Aviation has the potential to emerge as the key driver of regional connectivity and with it, accelerated economic development. It is therefore surprising that this sector, which has such a massive growth potential and in many other countries has hundreds if not thousands of aircrafts being operated on a non-scheduled basis does not have a dedicated policy or regulatory framework or infrastructure or services in this country to support it.

The current neglect of the sector is a serious economic opportunity loss for the Indian economy. Plans for the development of national airports should incorporate steps to increase capacity of support to, and flexibility for, general aviation. This would include ensuring adequate parking and hangar space, allowing MRO activities on the airport, and developing ATC procedures capable of accommodating increased movements of small aircraft.

Along with this, serious consideration should be given to the development of disused or low-traffic secondary airports, where state governments could support their revival to stimulate air taxi operations for business and tourism.

The current regulations affecting general aviation impose restrictions on import of aircraft and in some cases do not recognise the difference between helicopters and fixed wing aircraft. The DGCA suffers from shortage of personnel to monitor this area whether there is a multiplicity of aircraft type and fragmentation of operations. The DGCA should establish a dedicated division to deal with general aviation through, for example, the appointment of a Director for General Aviation.

COMPETITIVENESS

The present aviation market, though liberalised, still presents barriers to entry relating to political uncertainty and risk, as a result of absence of an aviation policy. Nor does it facilitate orderly exit with airlines having been allowed to continue operations when they fail to meet their payment obligations. The

regulatory authority must take into account (and have the expertise to do so) the financial strength and stability of airlines while permitting entry and also continuing operations. A similar approach for financial viability assessment should be put in place and applied to airlines in view of the very large numbers of passengers who can be stranded away from their homes, in India or abroad, by a cessation of an airline's operations. These important factors relating to airline stability must be gauged by more systematic and consistent criteria that agree with basic accounting and economic principles, rather than by arbitrary rules of thumb such as the 20-5 rule described here. The criteria and the resulting regulatory action can also include the very basic: for example, airlines should not be permitted to expand if they are encumbered with heavy debt obligations which remain unpaid; or if they have negative net worth; or if they have inadequate liquidity to meet their current operational obligations.

It is further recommended that new entrant airlines should be scrutinised for the strength of their business plans, for adequate capitalisation and that the airline at any point of time has the liquidity to meet liabilities for a defined period (such as one or two quarters) without any revenue inflow for that period. The aviation policy should also strictly prohibit the grant of no-objection certificates for the relaunch of any airline whose previous debts to banks or creditors remain unpaid. Elsewhere in the world, if an airline does not have cash to pay fuel bills, or airport charges, or navigation and landing fees, it is obliged to cease operations. If the same discipline is made to apply in India, inefficient airlines will quickly either recapitalise or exit, thus permitting entry of better capitalised entities.

SUSTAINABILITY AND OTHER ISSUES

EMISSIONS

Four kinds of gases make up the main emissions from aviation⁶³. These are carbon dioxide (around 70 per cent of total emissions), water vapour (30 per cent), and miniscule proportions of nitrogen oxide and sulphur oxide. About two per cent of global carbon dioxide emissions can be attributed to aviation. Though the absolute quantities may be small relative to other transport modes, these are very large relative to passenger kilometres performed. The effects of the emissions are especially pernicious as the largest quantities of these take place at high altitudes where their warming potential is greatest.

The industry's collective efforts at reducing emissions are spearheaded by ICAO and IATA, though the European Union has perhaps made the largest efforts of any individual jurisdiction. The Group on International Aviation and Climate Change (operat-

63. World Bank (2012).

ing under an ICAO mandate) was tasked with developing measures consistent with the UN Framework Convention on Climate Change for the aviation industry. The declarations emanating from meetings held to debate the findings of the Group argue for annual average fuel efficiency improvements of two per cent until 2020, with similar long-term goals from 2021 through 2050. The declarations also ‘announced plans to create a market-based mechanism to lower emissions and a comprehensive reporting system to track emissions’⁶⁴. Further, the development of alternative fuel technologies and engine efficiencies is encouraged.

Meanwhile, the European Commission’s 2008 directive on extending an emissions trading scheme to aviation requires all flights operating to or from the EU to be subject to market-based measures to either reduce greenhouse gas emissions, or to compensate for them. Carriers are given allowances based on their past emissions levels, and are then set targets to reduce these by defined proportions each year. ‘Carriers that exceed their allotted allowances must either purchase allowances from other ETS participants, purchase approved emissions-reduction credits, or pay a fine’⁶⁵. Finally, IATA has proposed that the industry respond to these goals and regulatory requirements with a four-pronged approach. First, new technologies must be deployed to yield more efficient engines and aircraft, and better fuels. Second, operational practices like weight-reduction measures and more efficient flight procedures and air-traffic control should be researched and adopted widely. Third, better airport infrastructure (for example in terms of its siting, layout, and design) could result in reduced low-altitude emissions. Finally, market measures like carbon offset programmes, cap and trade programmes, and others should be developed and adopted.

Indian regulatory authorities have not agreed or subscribed to these goals for the most part. However, Indian carriers will not be immune to these measures even if they are not adopted domestically. Fungible technologies and the absence of a domestic manufacturing industry mean that over time, globally standard equipment will be the norm in domestic fleets. More importantly, Indian carriers will have to conform to rules imposed by regulatory authorities in foreign destinations. For example, the EU directive noted above applies to international airlines from all domiciles from 2012 onwards. Indian regulatory authorities and airlines are active and valued participants in institutions like the ICAO and IATA. By treating this as a matter of importance as they shape the growth of the sector, and by allocating greater priorities towards these concerns, they can both shape the global agenda as well as better prepare the domestic industry for changes in international standards. To that end, if domestic authorities

deem objections to proposed international norms justifiable, then rigorous alternatives must be investigated and raised for discussion at the international forums. To do nothing would ignore a pressing problem and signal a substantial missed opportunity to shape the international agenda.

NOISE POLLUTION

Since the rise of the jet aircraft in the 1960s, concerns have been raised about the impact of generated noise on human health. Though the science assessing this impact is not universally accepted at the margin, several less controversial links have been proven to hold true. Sustained exposure to defined ‘high’ noise of around 85 decibels (dB) can cause hearing impairment in the medium to long term. Shorter exposures to even higher peak sounds (in excess of 120dB) can cause immediate pain, tinnitus, and immediate and permanent hearing loss. The physiological effects of noise pollution are not limited to the ears. Noise exposure has also been pinged as a causal factor in adverse cardiovascular, immunological, and pre-natal effects. Perhaps most importantly, there is general annoyance, stress and hypertension, sleep deprivation, and irritability that stems from excess noise, each of which has consequences for workplace productivity and the general enjoyment of life.

Concerted global effort has made sure that modern jet engines are almost a quarter as noisy as those in the 1960s

In recognition of these effects, there has been concerted global effort over the years to ameliorate aircraft noise and its effects. The lion’s share of the noise abatement has come from the aircraft themselves: modern jet engines are between a quarter and a third as noisy as their ancestors from the 1960s. Regulatory authorities have modified ATC and other practices to allow for quieter take-offs and landings. For example, the practice of Continuous Descent Arrival wherein an aircraft descends continuously from cruise altitude (typically around 35,000 feet) to a final approach altitude of 3,600 feet reduces the noise associated with step changes in altitude⁶⁶. Similarly, prohibitions on the use of reverse thrusts substantially reduce noise in the immediate vicinity of the airport.

The ICAO recommends a balanced approach to limit noise from civil aircraft. The first element is a progressive tightening of noise certification standards on jet engines and airframes. These standards are published by the ICAO periodically, and referred to by ‘Chapter’ numbers. The latest noise standard, Chapter 4, was agreed to by the ICAO in 2001, and fea-

64. *ibid*, p. 34.

65. *Ibid*, p. 35.

66. The AAI has recently permitted this practice for landings at Delhi International Airport, with a view to extending this to other airports.

tures a ceiling that is 10dB lower than the previous Chapter 3 standard. It is estimated that each new generation of jet aircraft are 15 per cent quieter than the previous generation. The second approach focuses on ensuring that the population affected by aircraft noise is minimised around the airport through better land-use planning. Third, new regulations governing operational procedures can mitigate noise. These can range from outright bans and curfews to procedures governing flight paths and technical restrictions on take-off and landing practices. Finally, as with the emissions reduction methods proposed above, the fourth pillar at containing aircraft noise seeks to implement measures that directly charge airlines on the basis of noise emitted by their fleets. For example, the United Kingdom sets noise emissions quotas and also determines the contribution that an aircraft movement of a particular type makes towards using up the quota. A gross quota is allocated to airlines which helps them better manage their fleet and operations to ensure that their cumulative noise emis-

sions remain contained within the quota.

The challenge lies in ensuring necessary levels of supply of skilled staff, while maintaining unimpeachable safety standards

It is recommended that all future airport developments be made with a view towards mitigating the impact of aviation noise on surrounding

populations. This may be done by designating and allocating land far in advance of intended usage, and by permitting populations in the vicinity both the incentive and the opportunity to relocate. Further, the neighbouring land should be zoned for uses that are compatible with the aviation industry, thereby minimising the likelihood of objections to aviation-related noise. Such advance planning will also avoid the requirement of post hoc measures such as curfews which may prove detrimental to the growth of the industry. Should issues of noise become especially pertinent at a particular airport, consideration may be given to innovative schemes such as quotas that allow airlines to self-regulate total noise emissions in any manner consistent with market realities. Meanwhile, for the present, detailed observations should be made of the impact of noise at all airports on the surrounding community. Where the data suggest obvious health hazards, consideration should be given to stricter amelioration measures like insulated homes and windows and abatement measures like curfews. As the Indian aviation market expands and matures and remains profitable for the operating airlines, the curfews should not prove inimical to the health of the industry.

67. NTDP Working Group Report on Civil Aviation (p. 151).

68. CAPA.

HUMAN RESOURCES

THE PRESENT SITUATION

India's civil aviation sector is at present facing acute shortages in manpower, e.g., for pilots, cabin crew, engineers, air traffic controllers, ground staff and handlers, administration and management. According to the Report of Working Group on Civil Aviation for formulation of 12th Five Year Plan (2012-17), the total manpower requirement of Indian carriers is estimated to rise from 62,000 in 2010-11 to 117,000 by 2016-17. This shortage is due primarily to a significant lack of adequate training infrastructure, including training academies, instructors and equipment. The staffing requirements at Indian airports can also be projected. The metropolitan airports, on average, employ one staff for every 65 passengers, while this ratio is around 200 in the smaller airports. Consequently, the Working Group estimates the total manpower requirement at airports to increase from 20,000 to as much as 30,000 by 2016-17. Even after accounting for improved efficiencies, this figure could grow fivefold over the period under consideration by this Committee.

The challenge lies in ensuring supply of skilled staff at a pace consistent with the expected and desired growth rates in civil aviation, while maintaining unimpeachable safety standards. India faces competition from regional aviation hubs, as well as from those further afield for these skilled staff. For example, between 30 and 40 per cent of the staff at several carriers and aviation service providers based in the Arab Gulf, are drawn from India⁶⁷. Meanwhile, the ICAO forecasts that all regions except North America are expected to face a shortage of pilots, with the problem most severe in the Asia-Pacific region. Another independent forecast suggests that airport employees, air traffic controllers, ground handlers, catering staff, retail and security staff are estimated to triple from 90,000 at present to 270,000 within 10 years⁶⁸.

Almost no educational, research or governmental institution in the country undertakes research in civil aviation. There is also an absence of qualitative and recognised formal educational programmes in civil aviation (as opposed to engineering and aeronautics). Many public and private organisations in the field must therefore recruit generalist staff and invest considerable resources in on-the-job training. The quality of flying schools in India is not gauged to be satisfactory. Airlines and type-training organisations report serious concerns with the quality of graduating students. In the absence of sufficient high-quality domestic pilots, India continues to rely extensively on foreign pilots. Of the 42 licensed pilot-training institutes, only 17 are operational. There is no institute for training civil helicopter pilots in the country. India has approximately 1,900 Air Traffic Controllers compared to a sanctioned strength

of 2,200. There is a need to increase the capacity of current training facilities to keep pace with growth as well as to provide recurrent training to existing controllers. It is estimated that an additional 2,500 to 3,000 ATCs will be required over the next five years. Further, the existing ATCs would also require upgraded training to keep pace with the significant investments in modernising equipment and operations under the Indian Navigation System Master Plan.

Finally, in Air India's case, the resolution of personnel issues remains the national carrier's most significant structural challenge. The imminent retirement of 13 executive directors will deplete the airline's management strength at a pivotal time in the airline's life, and it is of paramount importance that Air India use the current opportunity to induct experienced industry professionals so as to create a strong management team capable of carrying the airline through this critical phase. Simultaneously, the periodic pilots' strikes have proved extremely costly to the airline's global reputation and, according to CAPA, 'virtually sealed the decision by Star Alliance not to proceed with its membership'.

IMPROVEMENT MEASURES

At present, the Indira Gandhi Rashtriya Uran Akademi (IGRUA), the National Institute of Aviation Management & Research (NIAMAR, recently renamed the Indian Aviation Academy), and the Civil Aviation Training Colleges at Allahabad and Hyderabad airports provide education and training services in civil aviation. However, these institutions collectively offer only a small subset of the required skills for the modern industry. For example, IGRUA trains pilots to be eligible for commercial licenses, and this is the only regularly scheduled course it offers. Other courses such as on instrument rating and engine endorsement are only offered on an as-needed basis. Meanwhile, NIAMAR/IAA specialises in short courses such as on IATA guidelines on dangerous goods or on environmental and safety issues that meet the needs of the employees of DGCA, the AAI and BCAS.

These course offerings are not sufficient to meet the needs of a vibrant industry. The initiative taken by MoCA to set up the Rajiv Gandhi National Aviation University in Uttar Pradesh should be supported with full administrative and financial support. A separate division in the Ministry with a full contingent of staff and officers devoted exclusively for aviation education and training with appropriate budgetary support is also required. Second, the standards of curriculum and examination systems for various categories of personnel in the aviation sector should be completely overhauled with modernised systems of examination and evaluation. Third, the systems of accreditation of various training institutes of

In the absence of sufficient high-quality domestic pilots, India continues to rely extensively on foreign pilots. Of the 42 licensed pilot-training institutes, only 17 are operational. There is no institute for training civil helicopter pilots in the country

the aviation sector in the country by the regulator need to be reviewed and restructured to ensure that the most modern systems are available with the training institutes along with adequate infrastructure for imparting training to all categories of personnel. The University should offer degree and diploma programmes in the various fields of civil aviation leading to increased professional recognition, better job-market signalling, and better-defined career paths in the industry.

The training and capacity building of ATCOs should be an immediate priority. Partnership options with international ATC training institutes should be explored. The enhanced capacity can also help ATC earn additional revenue in the long run by training foreign ATCOs and providing consultancy services to global ATC service providers. It is appropriate to consider the option of allowing private players to set up ATCO training facilities, subject to adequate supervision by AAI. This may be started in a PPP mode first and thereafter be made fully open to private sector in the long run.

Midcareer training to personnel who are already employed in the industry should be the next area of priority. The training of trainers should be the priority in all organisations in the sector and adequate funds should be made available for this purpose.

There are 77 DGCA-approved Aircraft Maintenance Engineer (AME) institutes producing around 5,000 engineers every year. AMEs and technicians need a minimum of a year's experience on heavy aircrafts and pass the DGCA examination to get type-rated license. Although India enjoys a significant cost advantage, it has a shortage of qualified MRO personnel who can carry out complicated repairs on the latest aircrafts and components. There is a strong case for establishing MRO training institutes to help develop capability of certified MRO engineers.

Cabin crew strength has increased from around 4,000 in 2001-02 to around 10,000 in 2008-09. The requirement would increase significantly as the fleet sizes of Indian and global carriers expand in the near future. On this front, the focus should be on setting standards expected of graduating students, and on setting benchmarks for testable skills. On several occasions, training establishments have proven to be sub-standard or, at their worst, fraudulent enter-

The FAA has periodically placed the DGCA on notice after 'safety audits showed a lack of coordination in air worthiness and flight operations in the country'

prises. Greater vigilance is required to register and certify these institutions, and towards ongoing monitoring.

SAFETY AND SECURITY

Safety is of paramount importance in air transportation. The safety levels that global air transport enjoys today represent an enormous improvement on the outcomes of earlier decades and an achievement built on the determination and efforts of all stakeholders. India has maintained an excellent safety record with only four accidents in scheduled commercial air operations over the decade to 2000. (Non-scheduled air operations account for 22 accidents in the same period.) The outcomes of these efforts must be preserved and new standards established to keep pace with the demands of increased traffic. It is forecast that the 1.3 million aircraft movements of 2010-11 will grow by about 13 per cent each year to reach a total of nearly 5 million by 2020-21 and 14 million by 2030-31⁶⁹.

The major regulatory issues are as follows. First, staff shortages at the DGCA render safety oversight, regular audits, and monitoring of operations difficult. The shortages make it impossible to carry out meaningful audits, surveillance of a large number of scheduled and non-scheduled operators, training institutes for pilots and engineers, maintenance organisations, and airport service providers⁷⁰. The DGCA has further responsibilities in terms of compliance with ICAO standards, the licensing of personnel, the registration and certification of aircrafts and communication systems, and the investigation of accidents that it is not able to execute satisfactorily given the staff and skill shortages. These shortages have been severe enough that the international credibility of safety standards of Indian aviation have occasionally been under threat. For example, the FAA has periodically placed the DGCA on notice after 'safety audits showed a lack of coordination in air worthiness and flight operations in the country, which pose a risk to passenger life.' Should such downgrades in the perceived reliability of the DGCA's work eventuate, it would have a massive impact on the credibility of the entire sector and impose large costs on the airlines as they seek the offshore certification that will allow them to continue operating overseas. Recruitment processes at the DGCA are constrained by standard government practices. To these ends, the Committee is able to endorse the ICAO's recommendation that the DGCA

be transformed into a Civil Aviation Authority with the necessary autonomy.

Second, infrastructural limitations cause ground- and air-space congestion with attendant implications for safety. As traffic increases, the reduced separation between aircraft movements and in holding patterns will create increased levels of stress for ATC staff, and increase the odds of accidents. Specifically, safer air travel can be achieved with less congestion or with practices and technologies that can better manage congestion. New ATC policies, hardware, and software will help in this regard, as will the expansion of airport facilities to include parallel runways. Instrument landing systems (ILS) that enable aircraft movements during times of reduced visibility will require pilots to be trained in the necessary procedures. Third, training of aviation personnel must be subject to accreditation and recognition of institutions and to in-depth and on-going certification of the standards achieved by graduating student, as described in the previous sub-section.

Fourth, regulatory powers must be clearly identified and delegated to allow effective enforcement of unambiguous rules. At present, the system requires the regulator to initiate legal proceedings under all circumstances. The enforcement mechanism should differentiate between the severity of an offence and delegate powers to the authority to investigate, prosecute and adjudicate over a limited range of procedural matters. Such a system is common in many countries, and indeed in India for the roads and railways. An appellate mechanism outside DGCA, preferably in the Ministry of Civil Aviation, should be available to operators to ensure fair enforcement of regulations. Beyond these considerations, the improvement of facilities for maintenance and MRO operations, and wider training in new technologies will both ensure continued safe outcomes in the sector.

In 2006, the ICAO carried out a comprehensive audit of the DGCA and identified technical manpower, training of personnel, legislation, and oversight capacity as the major areas of concern and redress. The DGCA has already made some progress in addressing these, such as by establishing a training institute for its staff in conjunction with the AAI (see above). Modernisation of the DGCA's operating practices is essential to keep pace with technical innovations in the operation of aircraft and management of airlines. For example, urgent implementation of a proposed comprehensive computerisation plan to maintain databases of pilot qualifications, tests, medical records, engineers' qualifications and air traffic control is required. That said, the institution and the desired goals may be better served by a fundamental reconsideration of its charter and powers with views formed as to whether this could be better executed if the body were to be re-incorporated as an

69. NTDP Working Group Report on Civil Aviation, p. 137.

70. *ibid*, p. 148.

independent third-party regulator, or as a civil aviation authority.

Aviation security is in the responsibility of BCAS which ensures that air passengers, airport and airline staff, and air cargo are all fit to undertake journeys or perform functions. As with the DGCA, the BCAS is under-staffed and must rely on a mix of state police and the CISF to actually undertake the security screenings at airports. This results in wide variation in the stringency with which the clearance protocols are applied at the various airports. The enlargement of airports, new airports, and the general rise in traffic when coupled with new and emerging threats to the security of civil aviation will place increased demands for more efficient screening from the security apparatus. A revitalised BCAS should be staffed with experts in airport design, planning, information technology, human resource management and civil intelligence.

AIR SERVICES IN THE NORTH-EAST

As noted in the introduction to this chapter, air travel can be an expedient, financially sound, and environmentally-friendly means of providing connectivity to remote areas, and to regions of the country that present challenging terrain for expansions of the road and rail networks. This is especially important in the eight states that comprise India's North-East: Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim. At present, air services are available to or from 11 airports in the region, with most of these being the primary airports of the state capitals. Over the past five years, flights connecting the region with other parts of India have grown consistently, but at rates slower than the general pace of aviation growth. The Summer Schedule of 2007 indicated 290 flights per week to the region; the same period in 2011 saw 370 flights; and 420 flights in 2013. In addition to scheduled air services, non-scheduled shuttle service is also provided to and within the region with small aircraft.

The primary mechanism for ensuring service to the region are the Route Dispersal Guidelines (RDGs) which require scheduled airlines to necessarily allocate capacity on these often-unprofitable routes in exchange for permissions to operate the more desirable, i.e., more heavily trafficked, routes elsewhere in the country. Thus, the social obligation of providing basic connectivity to remote areas and to promote economic development is delegated to the airlines.

RDGs are set out by MoCA with a view to achieve better regulation of air transport services and take into account the need for air transport services of different regions in the country. All

routes are divided into three categories: I, II and III. Category I routes are those that traditionally generate surpluses, and form the trunk civil aviation network connecting the metropolitan cities. Category II routes connect remote areas and are considered loss-making. These include those connecting airports in the North East, Jammu and Kashmir, the Andaman and Nicobar islands, and Lakshadweep. All other routes are subsumed into the third category. Category II routes are further classified into II(A) routes referring to those that exclusively connect airports within the specified regions. Capacity deployments based on historical ASKs then determined the following RDG specification:

- On Category II routes, airlines are required to deploy at least 10 per cent of the capacities allocated to Category I routes.
- On Category II(A) routes, airlines are required to deploy at least 10 per cent of the capacities allocated to Category II routes.
- On Category III routes, airlines are required to deploy at least 50 per cent of the capacities allocated to Category I routes.

The RDGs are subject to the following additional restrictions. First, a service operated on a Category I route as a part of international air service will not be reckoned for the above purpose. Second, multiple-sector flights that connect two metropolitan cities, for example, before providing onward service on a Category II or Category IIA route, capacities on the individual sectors are accounted towards RDG fulfilments. These aside, all airlines are free to operate anywhere in the country subject to compliance with the RDGs.

The major issues of concern are that the RDGs only provide a partial solution to the issue of regional productivity as even on category II and III routes, airlines cherry-pick the routes which are comparatively more lucrative leaving the unviable sectors underserved. This internal cross-subsidisation is not sustainable in the long run given the financial stresses the airline industry is presently undergoing. There is a strong view that in order to achieve social objectives of connectivity and of economic development in these regions, more innovative mechanisms need to be introduced.

Examples of such mechanisms abound. These include direct budgetary transfers to an airline leading to a reduction in cost price of the air ticket. Alternatively, airlines can be made exempt from landing fees at remote airports reducing their costs and increasing route viability. Direct cash or voucher transfers can be made to passengers. Finally, taxes can be imposed on airlines that provide services on financially viable routes, and then used to subsidise the unviable routes. Direct budgetary

transfer can be supported through a process of minimum subsidy bidding⁷¹.

Australia offers a pertinent example of the implementation of one mechanism. It is a large country with a population that is highly concentrated in its largest cities along the Eastern coast. Then, there are dozens of smaller towns and hundreds of communities in the continent's vast hinterland, many of which are several days' drive from their closest neighbours. In this geographic setup, the policy

For essential air services on routes that are strategically important but commercially unviable, the State should provide explicit subsidy support

goal for Australian civil aviation is to maintain an open interstate domestic aviation market that maximises benefits to the Australian economy, but also provides assistance for regional and remote air services, where many routes remain vulnerable to low demand and high per-passenger costs.

These remote routes are essential for economic and social well-being of the communities they serve and the Australian government aims to target assistance to these remote areas. The Remote Air Service Subsidy Scheme (RASS) in Australia 'subsidises a regular weekly air transport service for the carriage of passengers and goods such as educational materials, medicines, fresh foods and other urgent supplies to communities in remote and isolated areas of Australia'⁷². Communities apply directly to the Department of Infrastructure and Regional Development which considers the application against set criteria such as demonstrated need and sufficient 'remoteness'. Air operators are contracted with the Australian government for a fixed term and the subsidy is paid directly to the air operator.

The essential air services programme in the US and in other countries operate on similar lines and are also often based on minimum subsidy bidding. They have many features in common: they are aimed at linking small communities with larger ones, support generally comes from central budgetary allocations, mechanisms involve transparent public competitive tender or application process for carrier selection, provision of subsidies, concession or license granted is contractual and time-limited and the regulatory elements cover frequency, capacity, levels and conditions of air fares and standard of service⁷³.

The Naresh Chandra Committee Report recommended an Essential Air Services Fund (EASF) for India

as a replacement for the RDGs. 'As regards maintaining essential air services on routes that are strategically important but are commercially unviable, the government should provide explicit subsidy support, preferably through direct budgetary transfers or the imposition of a sector-specific cess or a combination of both. In addition, such support should be allocated through a transparent process of minimum subsidy bidding. Here it is noteworthy that competitive tendering of subsidy for maintaining essential air services is a well-established practice in several countries, as it allows such routes to survive but on the basis of fair competition and at the lowest cost possible to the tax payer'.

These recommendations are a worthy replacement for the current RDG system. The EASF should be non-lapsable and exclusively aimed at providing explicit and direct subsidies to airlines to make up for viability gaps on defined routes. As noted in the section on regulation, budgetary support will be required for this fund but the ministry may also consider augmenting the fund through a cess on domestic passengers chargeable through tickets issued by airlines. The EASF could also be utilised for the development of low-cost regional airports and heliports⁷⁴.

FINANCE

Insofar as transport infrastructure for aviation is concerned, in an environment in which private enterprise in providing air carriage service is encouraged, the government's major responsibility falls towards ensuring that efficient airports are available to meet demand. In recent years, the government has entered into partnerships with private entities to develop and expand airport facilities at a handful of the most important airports in the country. However, it remains responsible for the expansion of all other existing airports, and for the development of several new ones in India's smaller towns and cities⁷⁵.

PUBLIC AND PRIVATE OWNERSHIP OF AIRPORTS

In India, the management of all non-private airports is under the purview of the AAI⁷⁶. The AAI executes its agenda with the public interest in mind rather than with profit considerations. This, however, should not preclude the setting of clear objectives and the adoption of best commercial practices.

71. In a minimum subsidy auction, the government identifies a project and a maximum subsidy. Companies compete for the project by bidding down the value of the subsidy. The bidder requiring the lowest subsidy wins.

72. <http://www.infrastructure.gov.au/aviation/regional/rass.aspx>.

73. NTDPCC Working Group Report on Civil Aviation.

74. About one-third of EASF could also be ear-marked for providing critical viability gap funding to regional airports in underserved areas.

75. The discussion in this section is based in part on ICAO (2001) and on The Convention on International Civil Aviation.

76. In other countries, public ownership and control of airports can vest with state governments or municipal authorities.

Some of the most important airports are developed as joint-venture partnerships between the AAI and private enterprises. For example, for Delhi and Mumbai airports, the AAI retains a 26 per cent equity stake, but is eligible for revenue shares that are as high as 46 per cent. The joint-venture model was intended to attract private capital to a sector undergoing rapid expansion in the 2000s and in dire need of investment funds. It was also envisaged that the JVs would bring a new standard of service to the sector eliminating the congestion, delays and poor customer experiences that had become the norm. Much of the airport development in the 11th Plan period was funded from these public-private partnerships that resulted in funding that was well in excess of that allocated to the AAI.

Investment in airport infrastructure is capital-intensive with significant concomitant risk and long payback periods. Private promoters continue to bring in very low equity and thus the debt-to-equity ratios are extremely high, sometimes reaching 80:20 proportions. Such a debt-equity structure translates into fixed cash outflow in the form of huge interest repayments. Short-term debt servicing costs can be as high as 18 per cent per annum with longer-term returns to debt of around 12 per cent. This results into long payback periods to equity investors.

The revenue-sharing models noted above are a departure from the international norm. Operators of airports developed under joint ventures have expressed concerns that their commitments for 'high' revenue share could potentially affect their viability unless there are alternative sources of raising revenue to airports. Raising the level of non-aeronautical revenue is limited by the scope of activities for commercial exploitation under 'city side development'.

As noted earlier, it is fair to state that the PPP-model has delivered airport infrastructure that is internationally comparable. The infrastructure was built, largely on time, and largely on budget, even going by the usual benchmarks for these projects. Some of the key outcomes were recorded in the form of higher user satisfactions for passengers, increased focus on land use and real estate activities, better utilisation of fixed and variable assets with a focus on non-aeronautical revenue generation, and better coordination with local bodies and state governments. The entry of leading private air-cargo companies has brought in a wave of increasing automation, mechanisation and process improvement initiatives at major air-cargo terminals in the country.

On the other hand, contracts under PPP have also proved problematic, primarily because of the large tariff increases that have eventuated. The contracts were awarded without a proper regulatory authority in place. Issues arising out of agreements already

Operators of airports developed under joint ventures have expressed concerns that their commitments for 'high' revenue share could potentially affect their viability

made prior to the introduction of a new tariff and performance regulator had to be resolved by AERA which resulted in uncertainty in the system. Projects incurred large cost overruns due to PPP infrastructure being based on very preliminary rough estimates. Mid-course corrections requiring revision in design and planned capacity were necessitated due to unprecedented upswing in the air traffic. A lack of clarity as regards accountability of PPP entities to public authorities like CAG, RTI, and CVC etc is also causing lot of uncertainty in the system. Operationally speaking, difficulties have been reported in performance monitoring in respect of soft performance dimensions. As the governance system matures with implementation of several projects under PPP model, it is hoped that further refinements could be made to the design of the PPP model for obtaining robust results.

FOREIGN INVESTMENT IN INDIAN CARRIERS

It may be recalled that the basic rationale of opening up of certain sectors to competition, including participation of foreign investors, has been to cater to the enormous size of investments required for a growing economy and the need to bring in cutting-edge technology and the associated best practices of the industry. There is a view that the airline industry qualifies in all these respects and therefore the need to facilitate larger capital inflow from abroad into the country. Foreign investment is not just a source of equity investment for developing economies, it also brings with it considerable benefits, viz. technology transfer, management know-how, and access to international markets. The mechanism of the relationship has been through inflow of investment funds, infrastructure and technology transfers, enhancement of human capital, improvement in the quality of the factors of production, faster growth of output and employment, increased productive efficiency, consumer benefits and access to global markets.

FOREIGN DIRECT INVESTMENT

Until recently, government policy prohibited FDI by foreign airlines in the equity of locally incorporated scheduled and non-scheduled passenger airlines. A revised policy sponsored by the Ministry of Commerce, issued late in 2012, now permits foreign airlines to invest in such airlines up to a limit of 49 per cent of their paid-up capital. The policy also permits

The EU is the first region in the world to remove airline ownership restrictions. One of the best ways to access the EU market is through cross-border acquisition. Other motives for cross-border acquisition are to provide feeder traffic to a home hub and for slot acquisition

foreign institutions other than foreign airlines to invest up to 49 per cent in scheduled carriers and, subject to government approvals, up to 74 per cent in non-scheduled carriers⁷⁷.

The issue was hotly debated, as it has been on several occasions in India's recent economic history. The major thrust of the debate is whether civil aviation is a sensitive industry—from both an economic or security perspective—and thereby deserving of protection from foreign ownership and its attendant effects. Recent turmoil in the industry and the urgent need for fresh capital injections in many airlines, prompted the government to issue this revised policy. However, Air India remains exempt from its provisions.

The policy also makes provisions for Indian carriers to undertake MRO works or to train pilots and other staff at facilities operated by the foreign carrier. That said, certain restrictions are in place that reduce the influence that foreign airlines can bring to bear on their domestic equity partners. For example, all technical equipment and staff associated with such investments require security clearances. No more than a third of the Board of Directors of an Indian airline may be sponsored by the foreign equity partner.

The policy is a welcome change and a much needed fillip for the domestic aviation sector. In the ongoing debate on whether to remove the caps on foreign investment entirely, the following observations may prove helpful: In the process of economic liberalisation, the airline industry remains an exception globally. In terms of both operations and of ownership and control, the airline industry remains restricted. In most jurisdictions, foreign ownership restrictions remain intact on fears of job losses or access issues in national emergencies if a country's commercial airlines are under foreign control, hence keeping the issues of sovereignty and national interest in consideration⁷⁸. A majority of countries both in the developed and developing world have imposed a 49 per cent ownership limit in the airline industry, and India's new policy is in line with this. The US, otherwise a freer economy than most, is more restrictive in the airline sector, limiting the amount

of foreign ownership to 25 per cent. Canada too has stayed with 25 per cent foreign ownership limit in Canadian airlines.

The EU is the first region in the world to remove airline ownership restrictions. One of the best ways to access an otherwise inaccessible EU market is through cross-border acquisition. (The lack of accessibility is due to capacity constraints at airports rather than due to government policy⁷⁹). Other motives for cross-border acquisition are to provide feeder traffic to a home hub and for slot acquisition.

The Open Skies agreements that the US shares with 56 countries could provide a framework for the reciprocal elimination of restrictions on foreign ownership, foreign control and cabotage rights if it ever would want to take the lead on liberalising global air transport market. This attempt towards liberalisation could result in conventions wherein nations could exchange rights on a multilateral basis to form a unified, global and fully liberalised market for air transport.

OTHER INVESTMENT CONSIDERATIONS

It is noteworthy that during the initial phases of growth in a capital-intensive industry such as this, the CAPEX to sales ratios will be very high, leaving little scope for meeting the working capital requirements. The rapidly changing air transport environment dictated by global economic fortunes is forcing airlines to seek structural adjustments in order to survive. Developments in the early 1990s, including the bankruptcies and mergers of airlines with heavy debt burdens, have prompted a re-examination of the limits placed on foreign capital. Investment by foreign airlines offers an alternative to the borrowing that has undermined the financial health of some airlines. Therefore, this should result in lower costs of capital to the airline industry, particularly in developing countries where these costs are higher.

Given the high-cost debt environment prevailing in the country on account of structural issues, it would be difficult if not impossible to raise these resources at relatively easy terms. It was reported by CAPA in July 2010 that the three large airline groups in India have a combined debt of approximately \$ 13.5 billion with an annual interest burden of over \$ 1 billion. For the financial year 2011-12, it is estimated that this would touch \$20 billion for the entire airline industry. And they will require capital raising of a further \$10-12 billion over the next two to three years to finance scheduled aircraft deliveries. Because of the low equity base, raising additional capital by these enterprises will be a challenging task.

External Commercial Borrowings (ECB) could become an important source of funds to the airline

77. Non-resident Indians may wholly own both scheduled and non-scheduled airlines without seeking government approval.

78. The authority to sovereignty was first codified multilaterally in the 1919 Paris convention treaty recognising that every nation has exclusive sovereignty over its own airspace.

79. For example, the International Airlines Group is the holding company for both British Airways and Iberia (Spain's national airline). The merger was motivated on the grounds that it would give BA better access to Iberia's Latin American network.

industry which is adversely affected by high cost of loans in India. Further relaxation of restrictions on ECB to the sector will provide much needed relief. This measure would be of very high relevance at this juncture when cost of debt is prohibitively high in India.

DATA AND INFORMATION TECHNOLOGY

The Committee has noted at several points in this report that good decisions axiomatically begin with good data. Extensive coverage and quality data make it possible for airlines to efficiently plan their networks and schedules to best meet extant and latent demand. Data on airlines' finances and operations assists regulators in efforts at maintaining a market that is viable, competitive and functions smoothly. Authorities that regulate airports, meanwhile, must have access to current and expected airport cost structures, and to current and expected usage. The development of new airports, capacity expansion at existing airports, and the identification of strategies for network management each requires the use of sophisticated economic models to analyse and forecast passenger and cargo traffic. This sophistication notwithstanding, the quality of the results on which these important decisions are based will only be as good as the data supplied.

By rights, the aviation sector should be particularly predisposed to the collection, management and dissemination of complete and robust data. Each of the major agencies that participate in the sector—airlines, airports, government authorities and regulators, MRO service providers, freight forwarders and logistics firms, and so on—are established and recognised, and are subject to the oversight of some combination of domestic and international governments, shareholders, customers, and specialised institutions that set safety and other operational standards. These agencies must operate robust information and technology systems to perform their activities. The closed nature of these systems means that the agencies are in complete control of all the data generated by their activities. As a simple example, airline databases maintain origin-destination records of every passenger, and every maintenance exercise undertaken on every aircraft in their fleet. Moreover, there are in-built checks and balances within the system. For international travel, government customs and immigration databases can be used to verify the origin-destination record for any given passenger. Both airlines as well as MRO service providers maintain logs of the maintenance on an aircraft. Airports and airlines must both account for passenger traffic numbers. In short, the aviation sector normatively lends itself to the collection of high-quality data. That said, there is still much that can be done to ensure the data is deployed and made widely available to best use.

CIVIL AVIATION STATISTICS

A number of domestic government departments and international organisations are responsible for collecting and disseminating data on the aviation sector. The Economic Analysis and Policy Section of ICAO collects, compiles and analyses data pertaining to global civil aviation. It is empowered to do so under the statutory provisions of the Chicago Convention of 1944, and has, over the years, expanded its remit to cover more components of the aviation sector. Presently, this includes performance data relating to airlines and the operation of airports, and important data from the management of air navigation services. The Organisation has prescribed a number of reporting forms and all contracting states, including India, are required to provide data pertaining to these. Much of the data is reported annually, though passenger traffic data is available at higher frequencies. Table 3.19 highlights the data collected and made available by the ICAO for each of its member-states. While allowing for easy cross-country comparisons, a limitation of this data is its heavier focus on the international operations of airlines. This is clearly insufficient for Indian purposes, as the growth of domestic aviation is likely to substantially outpace international passenger and freight traffic.

The two organisations responsible for collecting and maintaining the bulk of data pertaining to civil aviation in India are the DGCA and the AAI. The Statistics Division of the DGCA, under authorities delegated from the Aircraft Rules of 1937, requires every entity to which an operational permit has been granted to submit to the DGCA (i) monthly returns regarding the operations of permitted air transport services and (ii) annual returns showing the financial results of results of the services or operations during each calendar year.

Other divisions of the DGCA, such as those responsible for air safety and aircraft certification, maintain data on air accidents and the civilian aircraft register respectively. The Directorate of Air Safety maintains data on each accident, date, time and location of the accident, the type of aircraft, the damage to the aircraft, counts and extents of injuries and fatalities, and the ultimately determined causes of the accident. This data documenting the characteristics of accidents is separately available for scheduled and non-scheduled airline operations, flight training, private aircraft, and other purpose-determined categories. The Directorate on Air-Worthiness maintains an aircraft register with details on the registration number, type and other details of the aircraft, date of registration or de-registration, details of the

Investment by foreign airlines offers an alternative to the borrowing that has undermined the financial health of some Indian airlines

owner and operator, and so on. Finally, the Directorate of Licensing and Training maintains data on the number and type of licenses issued to personnel authorised to maintain and operate aircraft.

Data collected by the AAI on airport operations and air navigation services is also eventually entered into DGCA databases and disseminated thereon. At the AAI, the Department of Corporate Planning and Management Services collects, compiles, analyses and publishes data on aircraft movements (scheduled and non-scheduled, international and domestic), passenger movement (information on embarkation, disembarkation and transit for both international and domestic passengers), and on cargo and mail (loaded and unloaded, for both international domestic carriage). The DPMS also conducts surveys like normative planning surveys, airport benchmarking surveys, capacity assessment studies and customer satisfaction studies. The aim of these surveys is to assess the peak-hour and annual capacity of existing passenger and cargo terminals, the traffic potential at greenfield airports, and customer satisfaction on services delivered.

Data on aircraft movement is collected from ATC, and on passenger and freight movement from the airlines providing government oversight of this important data. ATC manages the air navigation services which has the primary responsibility for reporting on the en-route facility services.

The Air Traffic Management Unit of the AAI maintains the data on over-flying traffic from 12 airports currently. Data is also collected on various parameters such as the date and time of departure, flight identification, type of aircraft, destination, flight altitude in 100ft increments, and time and location of exit from Indian airspace. This radar-collected data is stored only for 30 days before being deleted.

Data collected by the DGCA and AAI is published in both print and electronic format at least an annual frequency. Traffic data that is summarised by airline and airport is available at monthly and quarterly frequencies.

DATA DEFICIENCIES

TIMELINESS

The usefulness of data is limited to a good degree by the timeliness of its availability. At present, the traffic data collected from Indian and foreign scheduled carriers, from non-scheduled operators and from airports is generally available soon after the end of a defined period. Some operators and airports, however, do not fulfil their data submission obligations for several months at a stretch, compromising the production and usability of aggregate traffic statistics. Deadlines for the submission of financial

data are respected even less. Given the fast-changing nature of the airline industry—and especially the high elasticity of its viability to the business climate and to fuel prices—accurate monitoring of the financial health of airlines by the regulatory authorities is crucial.

Given that much of the traffic data is known in near real-time by airlines and airports, an electronic system for the collection of this by the DGCA should help in compliance with submission deadlines. The DGCA should identify data standards, and then implement these standards in internet-based software. Airlines and airports should, over time, be encouraged to update their own internal MIS systems to link directly with the DGCA's software to provide real-time data on traffic and performance.

IMPROVING TRAFFIC DATA

The quality of the data collected on several fronts, other than those relating to traffic and performance, needs to be substantially improved. The quality of the data on freight, non-scheduled operators, over-flying traffic, and other areas is compromised by ill-defined standards, incompatible competing electronic formats, and ad-hoc collection and dissemination processes. This sub-section considers several specific examples of these practices, and provides recommendations for addressing the resulting data shortcomings.

Data on traffic generated by over-flying aircraft is insufficiently collected and analysed. At present, the data is collected from radar stations at only a few airports and is discarded periodically. The data provides an up-to-date perspective on the changing patterns of flight over Indian airspace, and is therefore useful to devise long-term strategy for the development of airports and other facilities, to guide airlines in planning their route networks and schedules, and to ensure that present and planned ATC systems will be adequate for the forecast airspace congestion. The ANS Directorate should be suitably strengthened and staff skilled to collect, compile and publish this data regularly.

Freight data submitted to the DGCA should be separately identified: freight carried by dedicated cargo airlines, and freight carried by scheduled and non-scheduled passenger airlines. This is already available for domestic carriers, and it ought to be a simple step to extend the practice to foreign carriers. Further, mail is not accounted for in the data on international cargo.

The activities and the operational and financial performances of non-scheduled operators are insufficiently monitored by the DGCA, and the resulting data is inconsistently published. Non-scheduled operators, especially those catering to the seasonal leisure and travel sectors, have steadily increased the

Table 3.19

ICAO Prescribed Forms for the Collection of Civil Aviation Statistics

FORM	SUBJECT	FREQUENCY	MAJOR PARAMETERS
A	Commercial Air Traffic	Monthly/ Quarterly/ Annual	Aircraft kilometres flown, aircraft hours, aircraft departures, passengers carried, Available Seats per KM, Revenue Seats per KM, Passenger load factor, Freight carried, Available Tonnes per KM, Revenue Tonne per KM, Weight Load Factor
B	International Origin-Destination and revenues (scheduled services)	Quarterly	Revenue traffic by city pairs, passengers carried, freight carried, mail
C	Revenue traffic by flight stage	Annual	Traffic data on number of flights and type of aircraft by airport, capacities available, revenue traffic carried
D	Fleet and personnel (commercial carriers)	Annual	Fleet statistics on number and size of aircraft, utilisation of aircraft, personnel, annual expense on each category of personnel
EF	Financial information (commercial carriers)	Annual	Income statement, Revenues and expenditures, operating results, balance sheet, assets and liabilities
G	Aircraft accidents	Annual	Details of accidents of light (less than 5700 kg MTOW) and heavy (more than 5700 kg MTOW) aircraft
H	Registered civil aircraft	Annual	Summary of all aircraft on register, No. of large aircraft by type
I	Airport traffic	Quarterly	Airport traffic data, number of aircraft movements, number of passengers embarked, number of passengers disembarked, freight loaded, freight unloaded, mail loaded, mail unloaded
J	Airport financial data	Annual	Income statements, revenues and expenses, investments
K	En-route facility financial data	Annual	
L	En-route facility traffic statistics	Annual	

Source: Economic Analysis and Policy Section, ICAO.

numbers of passengers carried in recent years. As such, to better understand this industry and the role that it plays in the promotion of and access to Indian tourist facilities, non-scheduled traffic patterns beg to be studied at length. Data on these operators is clubbed together with that on the operations of helicopters, balloons, and private aircraft operators, and is less useful for this aggregation. Meanwhile, the coverage on these non-scheduled operators should also expand to account for those based offshore; at present, only the domestic operations of domestic operators are captured by the data. Package tourism has made the country accessible for many millions of foreign visitors. This tourism often relies on charter flights, and further development of such tourism will surely require better monitoring and regulation of non-scheduled operators.

Not all carriers supply data on traffic between city pairs, and those that do, do not do so in a standardised format. This data is essential for the accurate forecasting of the changing patterns of demand for air travel. For example, it can help decide on the regional hubs and spokes of the future or identify latent demand that is insufficiently or inefficiently met by existing routes or schedules.

RECOMMENDATIONS

1. Aviation as part of a multi-modal transport network

- Every decision on air transport infrastructure should, ultimately, be able to be traced back to a sense of place and purpose within the wider transport network that is inclusive

of all modes.

- b. Network-centric thinking should prevail in planning air transport infrastructure. Efforts should be directed at building complementary regional, national and international air networks.
- c. Good land transport networks should be available to quickly distribute passenger and cargo traffic to and from the region served by an airport. Depending on economics, demographics and geography, this may include mass rapid transit options.
- d. The great advantages of air travel in terms of the savings in time that it offers will be muted if the air network does not cohere well with land-based transport. This is especially true for time-sensitive cargo.

2. Capacity enhancement

- a. Airport capacity sufficient to process 1150 million passengers per annum (mmpa) is required by 2031-32. This will require the creation of additional capacity of around 1100 mmpa at a total cost of Rs 5,900 billion.
- b. Expansions in airport capacity should be made with cognisance of systemic endogeneity: decisions made on airports today will influence the airline route maps of the future; equally, the expected airline route maps should, by rights, determine the distribution of today's investment.
- c. Airport-specific investment plans should be dynamic in their response to changing traffic patterns and demand, and yet proactive, by building airport capacity in advance of the period when capacity constraints start to bite.
- d. A National Master Plan should be devised and maintained which identifies clear economic reasons for building airports in generally specified locations. This Plan should address the critique that new airport projects are announced with overlapping or insufficient catchment areas, without regard for airspace issues or the potential for airlines to operate there.
- e. Long-term forecasts indicate that several cities will require second and in some cases third airports in the 20-to-30-year timeframe. Land scarcity means that this will not only become a significant political issue but requires search for the land for second and third airports to commence now with appropriate zoning for such land and reservation of such land for connecting transport corridors.
- f. An Airport Approval Commission should be established within MoCA to review the business plans of proposed airports prior to granting clearance.
- g. There is an urgent need to build airport capacity to process cargo. At the larger airports, capacity can be added through dedicated car-

go terminals with land-side facilities let out to freight forwarders and logistics providers. Consideration should also be given to building airports that are entirely dedicated to freight. These may be public airports sited at locations that have other excellent transport facilities or are proximate to metropolitan cities and other final destinations for cargo. These may also be private airports that are operated by providers of logistics services. Off-airport cargo processing facilities similar to inland ports and container depots are required to reduce congestion and delays at airports. Air cargo terminals attached to airports may be considered only as transit points if on-site processing facilities are infeasible or costly. Customs services should liberally recognise and make secure bonded facilities off-airport to facilitate the rapid sorting, handling, collection and break-bulk of air cargo.

- h. Sufficient capacity to process passengers is determined by gate and apron capacity to accommodate aircraft; terminal capacity to accommodate passengers; ground traffic management and ancillary aviation processes that ensure quick aircraft turnarounds. Also helpful are improved air traffic and air space management practices, and new radar technology that allows narrower separations in the air and more closely spaced aircraft movement, as well as movements in adverse weather. Efforts at improving capacity must thus be directed at all of these; pinch-points on any one front reduce capacities across the system.
- i. Capacity is also determined by size and of aircraft deployed by carriers and by frequency of service. It is recommended that air carriers be free to determine these operational details subject to other regulations.
- j. Helicopters can be enormously useful in tourism, mining, corporate travel, and in providing air ambulance services and homeland security. The development of heliports is important to support the growth of general aviation in India, especially in areas that cannot have runways for financial or terrain-related challenges. A PPP policy for the development of heliports needs to be formulated, and one that especially applies to remote area service. There is also a need to develop standardised route operating procedures for helicopters.

3. Institutional arrangements and policy

- a. Reforms in the civil aviation sector should emphasise the streamlining of decisions taken by various authorities that regulate the sector aided by clarifications as to their agenda, remit and powers.
- b. The regulatory and policy functions should be clearly separated: the Ministry should focus

- on devising national policy, and on encouraging and guiding state governments in their efforts to develop the aviation sector.
- c. Meanwhile the DGCA should be replaced with a Civil Aviation Authority responsible for the operational regulation of airlines and aircraft covering areas such as air-worthiness, safety and licensing, with separate divisions for airspace management, environment, competitiveness, and consumer protection.
 - d. The Centre should progressively withdraw from airport operations where feasible and commercially sustainable. If anything, state governments should play a much more active role in the airport sector since aviation is a key enabler of local economic development and they would be the appropriate partners for investors. Therefore, MoCA should engage with and encourage the states regarding the potential benefits of establishing a more conducive environment for the aviation sector based upon their understanding of the significant economic benefits of airports on their local economies.
 - e. With respect to other airports run by the AAI, the government should clarify the future role of the agency. As a first step, the AAI should be separated into two distinct functions: Airport Operations and Air Navigation Services. Each function should initially be corporatised, preparing its own financial statements, continuing under State ownership but managed independently along commercial lines. The Airport Operations Division currently has no clear commercial goals and is involved in a large number of projects, of which many are economically unviable. There would be advantages to breaking these activities into smaller units, separating airport construction from airport management, in turn further breaking these down by region. Further, budget accountability is essential, considering that as the AAI enhances its prime assets and progressively privatises them, it will be left with the task of continuing to invest in airports that are initially not viable. It is also possible for the public sector authority or corporatised entity to act as a landlord while terminal operations are run by private entities.
 - f. Air accident investigation should be made independent of the DGCA (or from its proposed new replacement, a Civil Aviation Authority), and a fully autonomous Accident Investigation and Safety Board is proposed. All accident reports should be published publicly.
 - g. Greater cooperation between the authorities, civic agencies, and the administrators of other transport modes should also be mandated.
 - h. The taxation regime that applies to the entire industry from aircraft purchase to aviation turbine fuel to insurance and lease rentals should be revised in view of the distortionary nature of the present system of taxes and their unbundling from the economic tax base.
 - i. The present policy on slot management, and especially the ban on the trading of landing slots, is not conducive to a well-functioning and competitive sector. Reviewing and gradually revising India's current slot allocation system will help to reduce a key market barrier to competition and in turn create a framework of more predictable and efficient slot allocation outcomes, as it has in other markets globally. Despite recent changes, there is an urgent requirement for the slot allocation process to become more transparent and for strict oversight of due process as described in stated policy.
 - j. Stated policy on the development of international hub airports require re-visiting as no Indian airline presently has the reach to service such an airport. Further, more important priorities may lie in the development of domestic hubs in view of the huge latent domestic demand for air travel. Instead, more active consideration should be devoted to the development of a regional hub for low-cost carriers, with Chennai being a promising candidate.
 - k. The newly reorganised Airports Authority should then turn its attention to developing new airports together with State governments so as to stimulate their participation in the sector.
 - l. At present the AAI's business model is highly complex as it manages the largest portfolio of airports in the world under a single operator and, in addition to the management and construction of airports, it also has the onerous task of providing air navigation services. Therefore, a recommendation is made for clear structural and commercial reorientation of the authority with a rolling programme of privatisation of the new assets that it creates.

4. Airlines and market competitiveness

- a. Regulatory agencies must walk a fine line between continuing to encourage industrial competitiveness to maximise consumer surpluses and ensuring that the competitiveness is not achieved at the price of unsustainable or irresponsible actions on the part of the airlines.
- b. It is important to ensure that the barriers to entry are not insurmountable for firms that clearly qualify on account of their financial standing or industry experience and expertise.
- c. It is equally important to manage the exit of airlines from the market with grace and efficiency so as to not impose negative externali-

- ties of these exits on the remaining airlines.
- d. Regulatory authorities must take into account (and have the expertise to do so) the financial strength and stability of airlines while permitting entry and also continuing operations. Prospective airlines seeking to enter the market should be scrutinised for the strength of their business plans, capitalisation, and liquidity.
 - e. The 20-5 rule should be done away with in favour of more systematic, flexible and transparent rules.
 - f. The National Airport Master Plan should incorporate steps to increase capacity of support to, and flexibility for, general aviation. This would include ensuring adequate parking and hangar space, allowing MRO activities on the airport, and developing ATC procedures capable of accommodating increased movements of small aircraft.
 - g. Consideration should be given to the development of disused or low-traffic secondary airports, where state governments could support their revival to stimulate air taxi operations for business and tourism.
 - h. The DGCA should establish a dedicated Division to deal with General Aviation through, for example, the appointment of a Director for General Aviation.
 - i. Given the distortions created in the market and the resulting financial impacts on the entire industry, the government should clarify both the role for Air India, and make a firm policy commitment towards its agenda, its budget and its finances. In a highly competitive, volatile, capital-intensive environment, there should be sound reasons for continued government involvement in airline operations. In the absence of these reasons, the government should instead outline a plan for gradual disinvestment in the airline.

5. Air India

- a. The government should clarify the future role of Air India. In the present environment, reasons for government to operate an airline in a highly competitive, volatile, and capital-intensive environment must be clearly defined. The Committee has not found persuasive arguments for continued exclusive government ownership and operation of the airline. In the event that these reasons are not defined, a plan for the progressive disinvestment of the government's stake in Air India over a period of three to five years, based on a phased scheme with defined milestones should be identified. The airline will need to be recapitalised, restructured organisationally, its working capital debt burden written off and some divisions made independent and corporatised, with government retaining perhaps a

26 per cent stake. It would essentially be a new airline. It should start completely anew while Air India's current liabilities are separated out and dealt with. It is apparent that with its excessive and unproductive manpower, its failure to invest in the technology required to keep it competitive and with its sub-scale operations, Air India's future prospects remain precarious. Air India must therefore be provided the opportunity to reinvent itself with new professional management, managerial and operational autonomy, while taking over all existing productive assets. If such a makeover cannot be done in a public sector or joint sector framework, it will need to be privatised. Failure to implement such a plan will continue to drain over \$ 1 billion per annum of tax payers' money each year over the next 10 years, which is surely unacceptable in the light of our national priorities. Meanwhile, Indian civil aviation will suffer and India will not be able to develop major hubs.

6. Funding

- a. The government must decide clear and stable rules governing the foreign ownership and operation of domestic airlines. This foreign ownership may also be expected to bring additional benefits of access to cheaper debt finance, technology transfers, management knowhow and access to international markets.
- b. Careful regulations for assessing the stability of private equity and debt funding of domestic airlines should be developed, with a view towards promoting the overall financial health of the sector.
- c. The unique features of the aviation industry with the largest costs and substantial revenues determined in offshore markets mean that there is support for the relaxation of restrictions on External Commercial Borrowings by airlines.
- d. Each airport funded by the AAI should be endowed with a set of operations goals and a development plan, have measurable targets by which performance can be gauged, and be encouraged to adopt transparent reporting processes.
- e. For joint-venture airports, the task before regulators and administrators is to devise proposals that attract participants with both suitable financial resources and technical expertise such that stable long-term ventures can be successfully negotiated.
- f. The instabilities seen in the viability of some PPP airports has been manifest in excessively high increases in landing charges sought and approved well after the project is launched. To combat this, the permissible structure for charges (and their growth structure) should

be made known to all parties at time of tender. This is to allow consortia to bid accordingly, and to ensure appropriate levels of investment in the airport network.

- g. Airport development under PPP has proceeded well insofar as projects have been delivered and are operated largely to the desired standard. New public-private models will be required to fund the redevelopment of airports in non-metropolitan cities with lower traffic.
- h. At all airports, substantial scope exists to raise revenues from non-aeronautical activities, including from restaurants and food service, car parking, and rentals for concessions, retail, banking and other services.

7. Pricing

- a. There is substantial scope for airports to ensure that their pricing regimes for landing charges, passenger services, cargo, parking and hangar space, and other items like security and noise-related charges, are fairly determined and transparently applied.
- b. The regulation of tariffs at airports operated under the PPP model must be strengthened with more careful accounting of benefits and costs to various stakeholders, restructuring of tariff schedules, and with a view towards maintaining the dynamism of Indian civil aviation.
- c. Aviation Turbine Fuel pricing should be reformed. The tax structure on the fuel should, at a minimum, be rationalised and simplified, and also more closely justified by observed market failures or tied directly to the expected future development of the aviation industry. Further, with ATF being much more expensive in India than regional airports offshore, there is also a case for reducing taxes to this baseline. Competition in the ATF market should be encouraged and any efforts at cross-subsidising (as with other fuels) should be avoided.
- d. The pricing of air services should largely be subject to market considerations, and remain under the purview of airline operators on a day-to-day basis. However, substantial regulatory vigilance is required to maintain market integrity and for consumer protection. This is motivated on the grounds of ensuring pricing that is fair and reasonable, non-predatory and non-discriminatory, and transparent. To that end, clearer rules are required

8. Managing the environmental impact

- a. Globally, the airline sector has set itself the goal of reaching carbon-neutral growth by 2020 and that of reducing aviation's overall carbon-dioxide emissions by half between 2005 and 2050. Relative to the expected size of the

industry in 20 years time, India is well-placed to adopt an environmentally-friendly growth path, which is preferable to post-hoc remedies to entrenched systems. With aviation equipment being internationally fungible, India is likely to automatically benefit from technological advances that improve fuel efficiency, and reduce emissions. The major domestic regulatory impetus will lie on policies that encourage more efficient flight paths, glide landings, fleet modernisations and renewals, and higher capacity utilisations.

- b. As cities and airports both expand, increasing shares of India's urban populations will lie under a flight path, and will expect reasonable efforts on the part of authorities to shield them from the worst excesses of aviation-related noise.

9. Human resources

- a. Institutions that regulate civil aviation will need to be strengthened with the addition of substantial numbers of staff skilled in network economics and regulation, certification, safety, setting and implementing standards, finance, and law. Existing private institutions do not offer sufficient depth and variety in their course content, and the infrastructure facilities available to them are insufficient.
- b. Thus, the desired growth in Indian aviation will require the country's technical colleges and flying schools to churn out engineers, pilots, air traffic controllers and other key staff in substantially greater numbers than at present.
- c. On the management and regulatory front, there is a requirement for an improved and larger cadre of airline administrators and managers, regulatory economists and planning professionals.
- d. An institute for training civilian helicopter pilots should be set up.
- e. There is an absence of formally recognised educational programmes at the degree and diploma level in the field of civil aviation. Budgetary support should be provided, and industry support encouraged, for the expansion of aviation programmes at universities, especially at the graduate level. In conjunction with industry and academia, the State should also boost the value of these programmes by defining qualitative and quantitative standards for the academic programmes. More generally, the systems of accreditation of the various training institutes should be reviewed with a view towards ensuring minimal standards in educational outcomes.
- f. The training of a new corps of air-traffic control officers requires immediate priority. Partnership options with international ATC training institutes and with the Indian Air Force

- should be explored to enhance ATC-capacity.
- g. Foreign participation or investment in an Indian university for aviation management should be encouraged.

10. Air connectivity in remote areas

- a. Air travel can be the quickest, cheapest, and most environmentally-friendly class of transport links that can be extended to remote regions with challenging geography or topography.
- b. The current arrangement for ensuring essential air services is not satisfactory. Air connectivity in remote areas is largely concentrated on routes connecting state capitals. Meanwhile, the Route Disbursal Guidelines intended to ensure minimum connectivity to remote and inaccessible regions cast a burden on the commercial health of airlines in India. Essentially being a cross-subsidisation tool, several distortions arise from its implementation, and further reliance on these guidelines will be unhelpful at a time of industry-wide financial stress.
- c. The RDGs create a market distortion and also a potential moral hazard for airlines to find ways to bypass the obligations. Hence, there should be a move towards a direct subsidy model with viability-gap funding.
- d. The establishment of a non-lapsable exclusive fund to provide explicit and direct subsidies to airlines as a form of viability-gap funding is a preferable alternative to ensuring service to remote and inaccessible, and so financially non-profitable, areas of the country.

11. Statistics and data

- a. Data furnished by airline operators to the DGCA should be processed, subject to cross-verification. The DGCA should work closely with MIS personnel at the carriers to define systems for data collection, verification and dissemination.
- b. A country-specific forecasting model should be developed for the Indian aviation market to aid infrastructure planning, route management and expansion, and regulation. Effort should be devoted to studying the decomposition of airfreight and passenger traffic in greater detail, and a database built of origins, destinations, and the nature and value of shipments. This will provide valuable information on the candidate sites for dedicated passenger and cargo facilities.
- c. Aviation is grossly underestimated in the national accounts; the present compilation of

National Account Statistics should be modified to reflect the wider array of activities that relate to the aviation sector. A system of satellite accounting for the civil aviation sector should be introduced, especially in cases where direct data collection is not possible.

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4. PORTS AND SHIPPING





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4.

PORTS AND SHIPPING

India's current transport modal mix is dominated by road and road that account for nearly 94 per cent of freight transport; the share of water is about 6 per cent¹. This is low when compared to other large economies such as China (47 per cent), US (12.4 per cent) and Japan (34 per cent)².

PORTS AND SHIPPING

The most important reason why development of ports is critical to India's economy is that Indian ports handle over 95 per cent of the country's total international trade volume and around 70 per cent of total trade value. India's 7,517-km coastline has 212 ports, and the quality of our ports has a significant influence on the cost structure of India's exports and defines its competitiveness in the global market.

Best-in-class ports can also help India emerge as a transshipment hub, and superior port infrastructure ensures quicker and more reliable coastal shipping. Shipping is also necessary to keep supply lines open for essential commodities both during peacetime and emergencies such as war and famine. The existence of a strong and viable national fleet serves as a balancing factor in the freight market. Inland Water Transport (IWT) is one of the most environment-friendly modes with its excellent fuel efficiency and lower emission levels. IWT has the potential to serve as an important economic lifeline for the integral socio-economic development of the region adjoining the waterway network.

Increasing the share of water in freight transport is key to achieving a more balanced modal mix, since it is a cheaper mode of transport as well as more environmentally-friendly as compared to road. Balancing the modal mix will also significantly contribute to reducing the waste caused by poor logistics

infrastructure, estimated to be as high as \$45 billion³ annually.

CURRENT STATUS

PORTS

India's 12 Major Ports are administered by the Union Government, while the 200 notified Non-Major Ports are under the state governments and union territories.

In 2011-12, total cargo handled by Indian ports was 913.9 million tonnes. The CAGR since 2006-07 had been 7.1 per cent, down from 11.1 per cent between 2001-02 and 2006-07. The drop reflects the effects of the global economic crisis and consequent slowdown in global and domestic growth.

During the 10th Plan, growth in cargo handled by Major and Non-Major Ports was 10 per cent and 14.1 per cent per annum respectively. In the 11th Plan, however, Major ports grew very slowly, at 3.8 per cent a year, while Non-Major ports grew at about 14 per cent. 2011-12 was a challenging year for Major Ports.

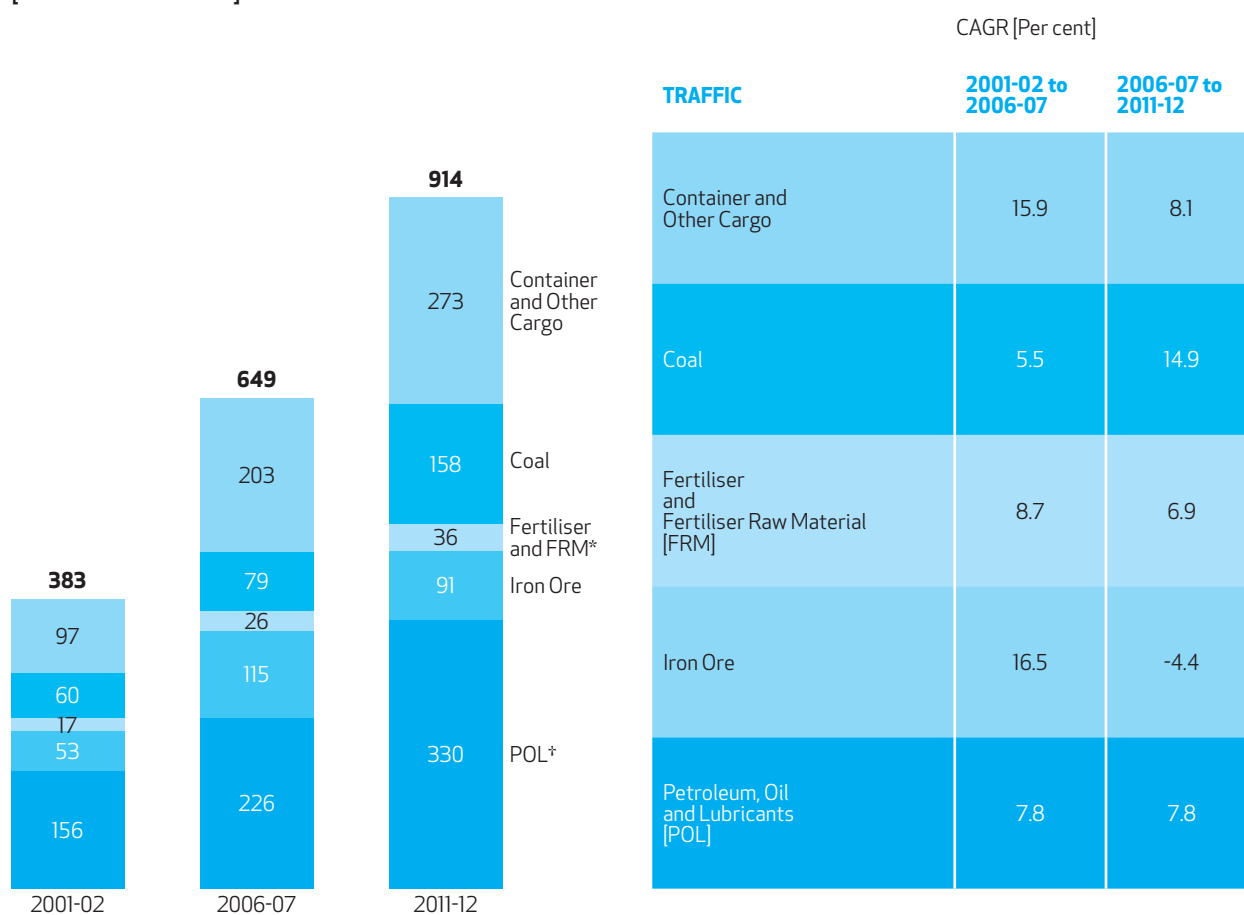
Growth in major industrial countries which are significant markets for Indian merchandise decelerated from 3 per cent in 2010 to 1.6 per cent in 2011. India's own GDP growth slowed from 8.4 per cent in 2010-11 to 6.2 per cent in 2011-12. While growth in manufacturing slowed from 7.6 per cent in 2010-11 to 2.5 per cent in 2011-12, the mining sector did a U-turn, from

1 NTDP Research

2 Note: The share of different countries pertains to different years: US – 2008, Japan – 2010, China 2009. Source: EU Transport in figures, 2012.

3. For details, see McKinsey report, "Building India: Transforming the nation's logistics infrastructure"

Figure 4.1
Commodity-wise Overall Port Traffic, 2001-02 to 2011-12
 [Million Tonnes]



* FRM: Fertiliser Raw Material

† POL: Petroleum, Oil and Lubricants

Source: NTDP Working Group Report on Ports and Shipping

5 per cent in 2010-11 to -0.9 per cent in 2011-12. Figure 4.1 shows the growth in traffic at Indian ports between 2001-02 and 2011-12.

MAJOR PORTS

India's Major Ports, with the exception of Ennore, are structured as trust ports under the Major Port Trusts Act, 1963, functioning as semi-autonomous bodies under the administrative wing of the Ministry of Shipping. These are Kandla, Mumbai, Jawaharlal Nehru Port Trust (JNPT), Mormugao, New Mangalore, Kochi and Port Blair on the west coast; and Kolkata, Paradip, Vishakhapatnam, Ennore, Chennai and Tuticorin on the east. Ennore, a satellite port of Chennai, has been corporatised with the Government of India holding a two-third stake, and the Chennai Port Trust the rest.

TRAFFIC TRENDS

The 12 Major Ports handled 560 million tonnes of cargo traffic during 2011-12, more than 60 per cent of the country's total seaborne cargo. This figure comprises cargo loaded, cargo unloaded and transhipped to the tune of 194 million tonnes, 341 million tonnes

and 25 million tonnes respectively. The capacity utilisation—560 million tonnes against 697 million tonnes—was approximately 80 per cent.

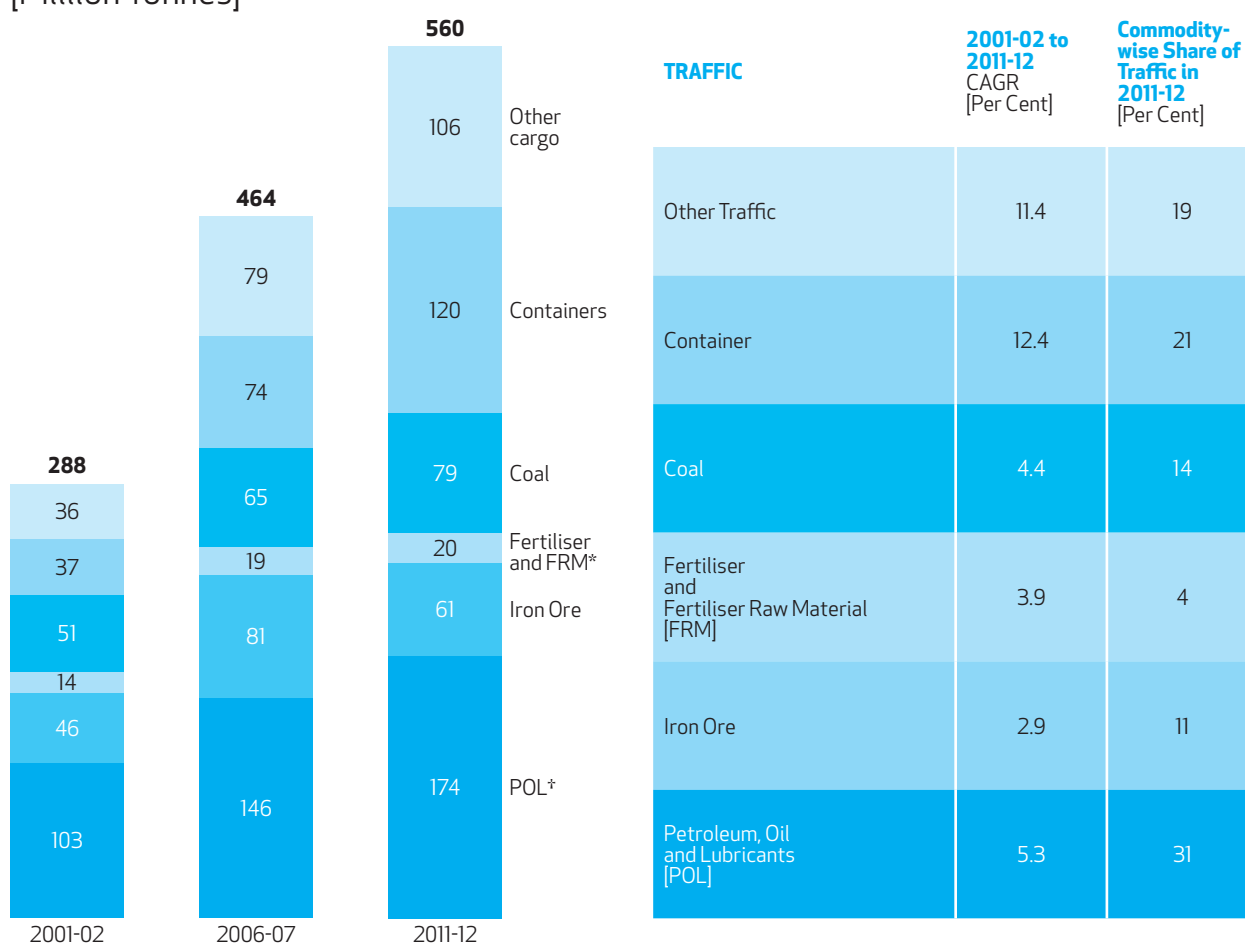
The CAGR of traffic at Major Ports for the period 1950-51 to 2011-12 has been 5.7 per cent, whereas during the post-liberalisation period—from 1990-91 to 2011-12, it was 6.4 per cent. During the 11th Plan, the CAGR has been 3.8 per cent, sharply lower than the 10 per cent seen during the 10th Plan.

In the last 10 years (see Figure 4.2), the highest CAGR—12.4 per cent—has been noticed in container cargo, followed by other cargo traffic (11.4 per cent), POL (5.3 per cent), coal (4.4 per cent), fertiliser and fertiliser raw material (3.9 per cent) and iron ore (2.9 per cent). During 2011-12, POL maintained a predominant share of 31 per cent in total cargo traffic followed by container cargo (21 per cent), other cargo (19 per cent), coal (14 per cent), iron ore (11 per cent) and fertiliser and FRM (4 per cent).

DRAFTS

The very low draft at Indian ports does not match international standards as per the Maritime Agenda

Figure 4.2
Commodity-wise Traffic for Major Ports, 2001-02 to 2011-12
 [Million Tonnes]



* FRM: Fertiliser Raw Material
 † POL: Petroleum, Oil and Lubricants

Note: Iron ore handled by major ports in the last 5 years [2006-07 to 2011-12] grew at a CAGR of -5.5 per cent
 Source: NTDP Working Group Report on Ports and Shipping

2010-20. This is a major constraint in traffic handling. Most Major Ports in India have a minimum draft under 10 m, except for a few newer ports which have drafts of more than 14 m (Annex 4.1). The world's top 20 container ports have drafts exceeding 15 m. Some ports in China and other countries have enhanced drafts still further to accommodate Super Post Panamax and larger vessels.

Dredging plays an important role in facing the challenges of increased vessel sizes and handling port operations. Total volume of capital and maintenance dredging for all ports during the 11th Plan was projected at of 675.25 million cubic metres (mcm) and 429 mcm respectively. Against these targets, only 278.93 mcm (41.31 per cent) and 291.63 mcm (67.82 per cent) were achieved. In Major Ports, the actual capital dredging was only 32 per cent of target. The shortfall was mainly due to delay or failure in implementing port development projects, financial and environmental constraints, paucity of engineering studies to assess the quantum and type of dredging to be performed, and poor response from bidders to

undertake the work. Overall, the ports had done better in achieving the targets relating to maintenance dredging as opposed to capital dredging. Inadequate draft at Indian ports entails extra time and costs as cargo originating from and bound to India is routed through transshipment ports like Colombo and Singapore. As vessels keep getting bigger, Indian ports need much deeper drafts, which calls for increased investments on capital dredging.

RAIL/ ROAD CONNECTIVITY

Ports are nodes for interchange amongst various modes of transport and a vital element in the global logistics chain. It is thus critical to provide connectivity and other infrastructure for enabling quick evacuation within the ports as well as to the external hinterland, and to also enable the commodity to reach the consumer from the source of production in the shortest possible time and in the most cost-effective way.

Connectivity to a port can be through all three modes—rail, road and inland waterways. To a lim-

ited extent, inland waterway connectivity exists in Kolkata, Mormugao and Kochi. As far as rail and road connectivity are concerned, a Committee of Secretaries (CoS) under the chairmanship of Member Secretary (Planning Commission) recommended that each Major Port should have minimum four-lane road and double-line rail connectivity within a fixed timeframe.

Four-lane road connectivity has already been achieved or is in an advanced stage of completion at JNPT, Paradip, Tuticorin, Kochi, New Mangalore, Kandla and Haldia. At Mumbai, Vishakapatnam, Chennai and Ennore, four-laning is in progress. At Mormugao, certain sections of the planned stretch remain to be four-laned, but work has been stuck since 2004. Kolkata is the only port where four-lane connectivity has not been provided. Overall, all Major Ports have reasonable road connectivity linking various highways. But special focus is needed on the reorganisation/ overhauling of approach roads of Mumbai and Kolkata ports and their linkage with the national highway network.

JNPT, Vishakapatnam, Tuticorin, Haldia, Chennai and Paradip are connected to double-line rail tracks, whereas at Kandla and Cochin, the connectivity work is on. Although Mumbai, Ennore and Kolkata ports are linked by double-line rail tracks, the lines require doubling. New Mangalore and Mormugao are connected only to single-line rail tracks. A serious effort is needed to improve hinterland connectivity, especially by rail.

NON-MAJOR PORTS

The 200 Non-Major Ports are located in the maritime states of Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, West Bengal and union territories of Puducherry, Daman and Diu, and Lakshadweep. Out of these, only a few ports are well-developed and provide all-weather berthing facilities. In 2011-12, only 61 ports—including ports at the Andaman and Nicobar Islands—were reported to have handled cargo traffic.

TRAFFIC TRENDS

Non-Major Ports in India collectively handled 354 million tonnes of traffic in 2011-12; up from 96 million tonnes in 2001-02. The CAGR in traffic during the decade was 14 per cent; double that for Major Ports.

The Non-Major Ports' share of the total cargo traffic handled by all ports increased from 25 per cent in 2001-02 to 39 per cent in 2011-12. This has largely been due to lower levels of regulatory and financial control compared with Major Ports. Non-Major Ports have been more successful in attracting higher private investment, because they are perceived to be more business-oriented, customer-friendly, cheaper and in general, more efficient.

POL and its products (44 per cent) was the single largest commodity handled at Non-Major Ports in 2011-12 and its share has ranged up to 55 per cent (in 2001-02). In the last 10 years, the relative shares of commodities in the cargo basket have not shown any pronounced shift (see Figure 4.3).

DRAFTS

Non-Major Ports achieved only 47 per cent of their capital dredging targets during the 11th Plan; 177 mcm against 377 mcm. This was however much better than that of the Major Ports (32 per cent).

RAIL/ROAD CONNECTIVITY

Of the 200 Non-Major Ports, 61 handle export-import cargo and the others are mainly fishing harbours. Even out of these 61, only six enjoy rail connectivity up to the port. Another eight to 10 need last mile connectivity. There is an urgent need to improve rail connectivity. Even road connectivity is a serious bottleneck. This is bit one illustration of the necessity for integrated planning of port location along with rail and road investments.

The existing projects and those in the pipeline will provide reasonable road connectivity to ports like Mundra, Hazira, Machilipatnam, Dighi and Jaygad. The others may have only skeletal kachcha (unpaved) road networks; they are not connected through two-lane highway-quality roads to the nearest national highway. As for rail connectivity, a few projects have been launched and are in the pipeline for Dehaj, Gangavaram, Dhamra, Mundra, Krishanapatnam, Rewas, Dighi and Jaygad.

CURRENT REGULATORY SCENARIO

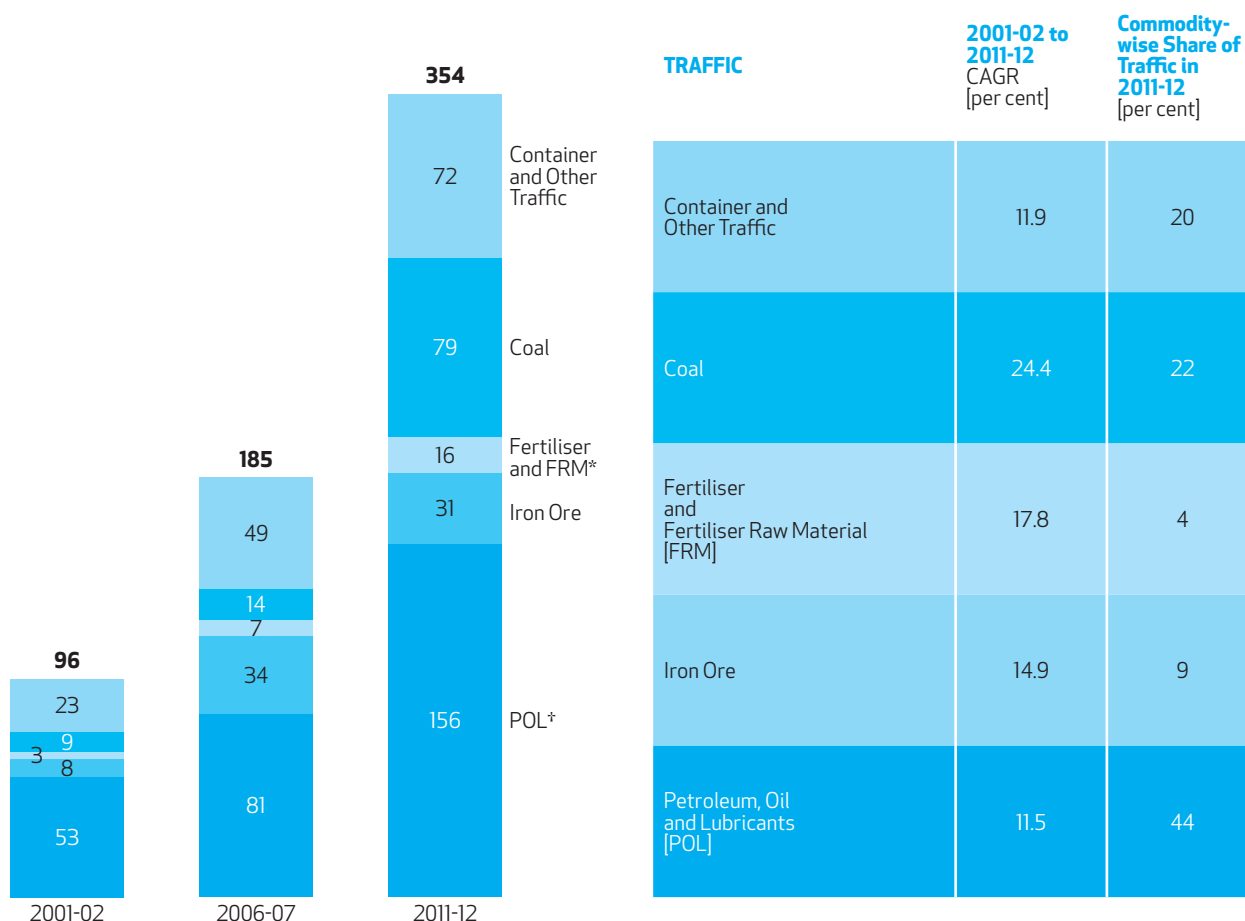
All Indian ports are regulated under the Indian Ports Act, 1908. This Act defines the jurisdiction of central and state governments over ports, and lays down general rules for safety of shipping and conservation of port facilities. It regulates matters pertaining to the administration of port dues, pilotage fees and other charges.

KEY AGENCIES

Ministry of Shipping The Ports Wing under the Department of Shipping covers all development and management aspects of Major Ports. Its key powers and responsibilities are:

- Administration of the Indian Ports Act, 1908, and the Major Port Trusts Act, 1963
- Formulation of infrastructure policy for ports, shipping and inland waterways
- Shipping policy and legislation, implementation of various international conventions relating to safety, prevention of pollution and other mandatory requirements as laid down by the International Maritime Organisation (IMO), promotion of maritime education and

Figure 4.3
Commodity-wise Traffic for Non-Major Ports, 2001-02 to 2011-12
 [Million Tonnes]



* FRM: Fertiliser Raw Material
 † POL: Petroleum, Oil and Lubricants

Note: Iron ore handled by Non-Major Ports in the last five years (2006-07 to 2011-12) grew at a CAGR of about -2.0 per cent
 Source: NTDP Working Group Report on Ports and Shipping.

training

- Planning, development and regulation of inland waterways

Ministry of Finance Mainly handled by the Infrastructure and Investment Division of the Department of Economic Affairs, the key port-related functions are:

- Examination of investment proposals which require approval of the Public Investment Board and the Cabinet Committee for Economic Affairs
- Matters related to infrastructure financing and promotion
- Policy matters related to public-private partnerships (PPP)
- All proposals for foreign direct investment (FDI) to be approved by the Foreign Investment Promotion Board (FIPB)

Maritime States Development Council (MSDC)
 MSDC was constituted in 1997 to have an integrated

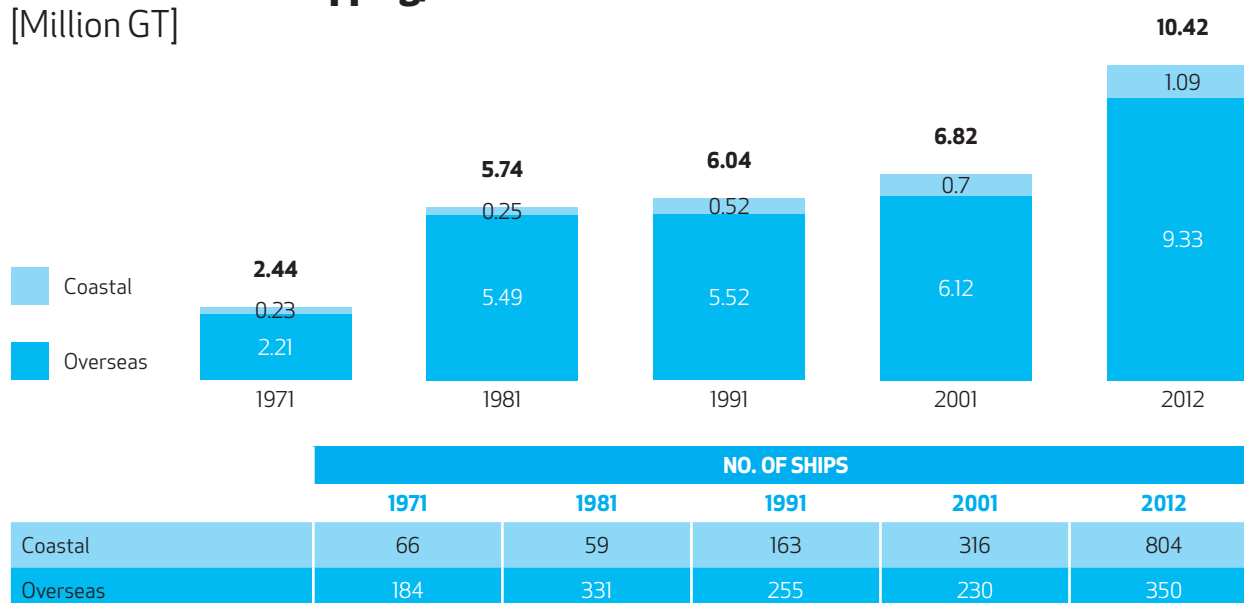
approach for development of both Major and Non-Major Ports. MSDC consists of ministers in charge of ports in all maritime states and union territories. MSDC functions as a policy coordinating body between the central government and the maritime states

Tariff Authority for the Major Ports (TAMP) TAMP is the economic regulator for the Major Ports and is charged with fixing and revising tariffs, including tariffs of privately owned terminals. Guidelines issued in 2008 comprise a tariff cap, which is set upfront, prior to inviting bids for a PPP project. With respect to tariff increases of existing terminals, a cost-plus approach is applied as per 2005 guidelines.

MANAGEMENT OF MAJOR PORTS

Every Major Port is governed by a Board of Trustees constituted by the central government.

Figure 4.4
Growth of Indian Shipping, 1971 to 2012
 [Million GT]



Source: Indian Shipping Statistics, 2012

The members of the trust are in principle selected to represent various interests. The Trustees follow the government's policy decisions within their delegated financial powers. Port dues and port and terminal services rates are externally fixed by TAMP. There is a ceiling for capital expenditures; amounts above such ceiling have to be approved by the government.

MANAGEMENT OF NON-MAJOR PORTS

The responsibility for the development of Non-Major Ports vests with the concerned state government. No permission is required from the central government to establish a Minor Port. They are placed in the Concurrent List of the Constitution and are administered under the Indian Ports Act, 1908.

The department in charge of ports or the State Maritime Board is responsible for formulation of water-front development policies and plans, regulating and overseeing the management of state ports, attracting private investment in the development of state ports, enforcing environmental protection standards and so on. Maritime boards have so far been constituted in Gujarat, Maharashtra and Tamil Nadu.

KEY POLICY DEVELOPMENTS

The Indian government has long recognised the need to operate ports on commercial lines. In 1996, the sector was opened for private participation in select areas based on the expectation of improved service delivery for users and commercial viability for the private investor. The government decided to move towards the Landlord Port concept, where new ports would be established as companies under the Com-

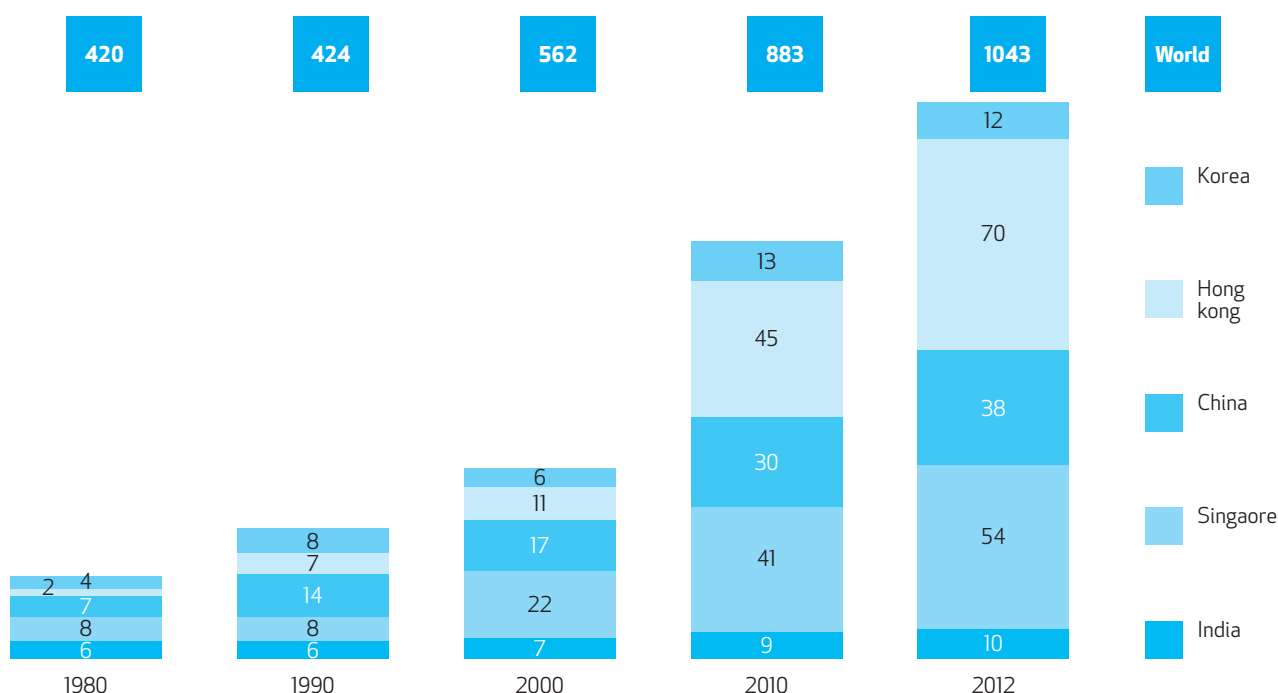
panies Act, and existing port trusts would be corporatised. However, this plan has not been implemented, with the exception of Ennore Ltd (2001). However, many isolated initiatives have been taken by the central government and the maritime states since then.

National Maritime Development Programme (NMDP) Formulated in 2005 by the Ministry of Shipping to provide guidelines for capacity augmentation and hinterland connectivity improvements at Major Ports, the programme mandates that over 60 per cent of the required funds be raised from private sector. The government has also shown intentions of delegating powers to port trusts for speedier decision making and implementation. In addition, a series of measures have been announced recently to promote foreign investment in the sector:

- No approval required for foreign equity up to 51 per cent in projects providing supporting services to water transport
- Automatic approval of foreign equity up to 100 per cent in construction and maintenance of ports and harbours. However, the proposal needs to be referred to FIPB for investments exceeding Rs 15 billion.
- Open tenders to be invited for private sector participation on build-operate-transfer (BOT) basis
- Permission granted for formation of joint ventures between Major Ports and foreign ports, Major Ports and Non-Major Ports, and Major Ports and companies

Model Concession Agreement (MCA) Approved in 2008, MCA governs the functioning of Major Ports with respect to PPP projects. It consists of all the ele-

Figure 4.5
Gross Tonnage for Select Countries, 1980 to 2012*
 [Million GT]



* As of January, 2012
 Source: Review of Maritime Transport, 2012, UNCTAD

ments and issues that usually form part of an international terminal concession. The tariffs cannot be adjusted by the concessionaire but are dependent on the decisions of TAMP. The new MCA approved by the government in 2009 allows a port trust to directly approach the inter-ministerial PPP Appraisal Committee for final project approval without having to first acquire in-principle approval.

B K Chaturvedi Committee Report The Committee observed that the tariff fixing process by TAMP sometimes led to delays that slowed down the entire procurement process of PPP projects, and that performance standards as used by TAMP for tariff fixing and those agreed between the parties in concession agreements could differ. The Committee proposed the following policy changes regarding TAMP:

- Short term: Expanding tariff setting capabilities through in-house capacity building and streamlining of procedures
- Medium term (1-2 years): Delegation of tariff setting to the Major Port Trusts while TAMP acts as the appellate authority
- Long term (2 years): Leave tariff setting to market forces. Port terminals where competition already exists may be left to market forces immediately.

India has a fleet strength of 1,154 vessels with gross tonnage (GT) of 10.42 million tonnes. Of these vessels, 804 (70 per cent) with 1.09 million GT (10 per cent) were engaged in coastal trade and the remaining 350 vessels with 9.33 million GT were deployed for overseas trade. Indian shipping tonnage, which had been stagnating at 6-7 million GT till June 2004, increased to 10.42 million GT by December 2012. One of the reasons attributed for the upswing was the introduction of tonnage tax in 2004. The major share of Indian tonnage belongs to Shipping Corporation of India, a public sector undertaking whose share is 32.5 per cent (3.39 million GT with 86 vessels). Figure 4.4 provides an overview of the growth in Indian shipping between 1971 and 2012.

INDIAN TONNAGE: GROWTH, AGE STRUCTURE, COMPOSITION

The maximum number of vessels (635) in the Indian fleet are dry cargo liners⁴ followed by oil tankers (139), dry cargo bulk carriers (128) and off-shore supply vessels (117). In terms of GT, 53 per cent of the Indian tonnage (5.54 million GT) was in the oil tanker⁵ category, followed by dry cargo bulk carriers (32 per cent). Dry cargo liners which accounted for highest number of vessels in Indian fleet (55 per cent) contributed a mere 11 per cent (1.2 million GT).

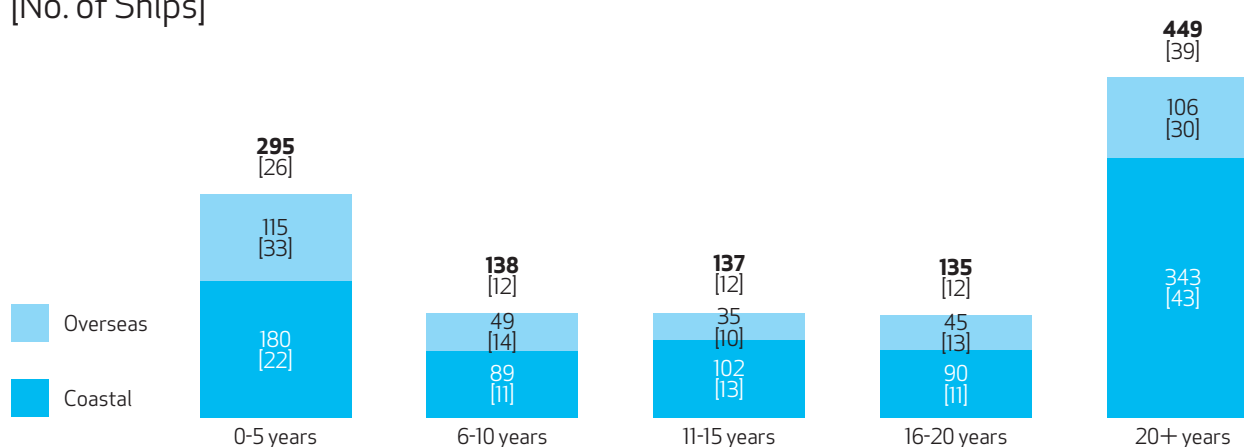
India's CAGR in shipping as per the national flag registrations (in terms of GT) from 1980 to January,

SHIPPING

⁴ Includes cellular containers, tugs, ro-ro vessels, dredgers, barges, motor launch and supply vessels

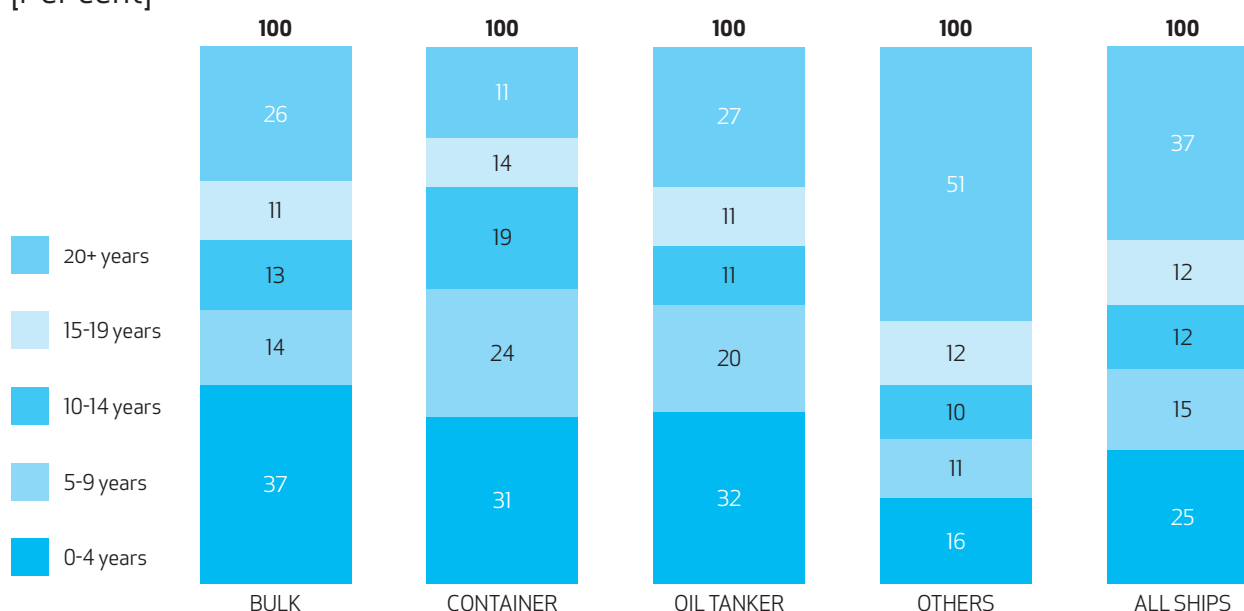
⁵ Includes acid, LPG and gas carriers.

Figure 4.6
Age Composition of Indian Fleet, December 2012
 [No. of Ships]



Note: Figures in parenthesis indicate percentage shares
 Source: Indian National Ship Owners Association

Figure 4.7
Age Composition of World Shipping Fleet, January 2012
 [Per cent]



Source: ISL shipping Statistics and Market Review, January, 2012

2012 has been much lower than growth in tonnage at the global level, for Asia and particularly competitors like Korea and China (see Figure 4.5).

The Indian fleet is clearly over-aged; more than 39 per cent of the fleet is above 20 years old, and about 26 per cent in the age group of below five years (Figure 4.6). In contrast, age profile of the world fleet reflects that 40 per cent of global tonnage was less than nine years of age (Figure 4.7). The share of vessels in the age group 20 years and above was around 37 per cent. A younger age profile leads to higher efficiency and productivity of the tonnage.

Figure 4.8 is a comparison of the composition of tonnage of fleets of various countries, plus global tonnage.

In India, “flagging out” or migration to flags of convenience or open registries has been rather limited. The share of vessels under foreign flags in the Indian fleet as of January 2012 was around 19 per cent compared to 85 per cent for Taiwan, 82 per cent for Japan, 45 per cent for China, and 40 per cent for Korea (Review of Maritime Transport, UNCTAD, 2012).

COASTAL SHIPPING

Despite a 7,517-km-long coastline, coastal shipping is still in its infancy in India, with 804 ships accounting for just over 10 per cent of the total Indian tonnage. The average age of the coastal fleet is much higher

Figure 4.8
Composition of Merchant Fleet, January, 2012]
 [Thousand GT]

COUNTRY	BULK CARRIER	CONTAINER	GENERAL CARGO	OIL TANKERS	OTHERS	GT
INDIA	2,952	224	342	5,016	1,228	9,762
China	18,435	5,268	3,941	7,389	2,890	37,924
Hong Kong	38,712	12,827	3,370	14,061	1,236	70,206
Korea	7,337	779	1,487	846	1,635	12,084
Malaysia	212	65	431	3,465	3,439	8,197
Developing Countries of Asia	92,144	34,755	25,263	62,900	21,571	236,633
Developing Countries	34,350	40,264	24,117	51,816	39,090	189,638
Open Register	209,586	95,586	48,236	155,541	61,731	570,680
World	343,524	171,741	109,685	281,950	136,132	1,043,033

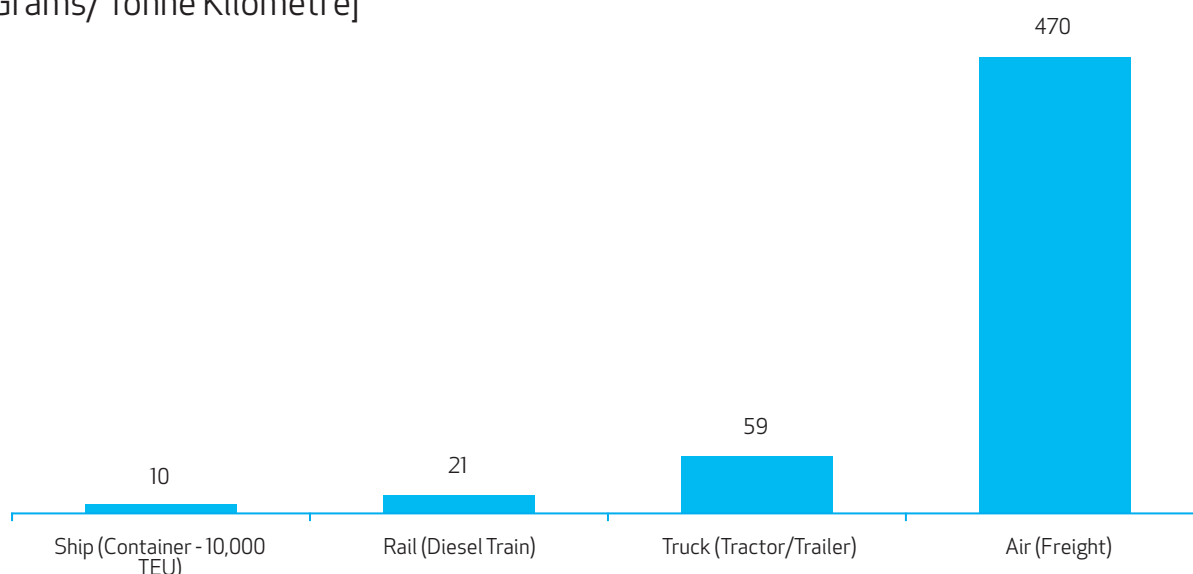
Source: Review of Maritime Transport, 2012, UNCTAD

Figure 4.9
Tonnage and Composition of Indian Coastal Vessels, December, 2012
 [No. of Ships]

TYPE OF VESSELS	NO. OF VESSELS	G.T. (THOUSANDS)
Tug	277	92
Offshore Supply Vessels	111	121
Port Trusts & Maritime Boards	95	46
Dry Cargo Liners	74	120
Passenger Services	59	22
Specialised Vessels for Offshore Services	38	88
Passenger-cum-Cargo	33	90
Dredgers	30	128
Dry cargo Bulk Carriers	26	240
Tankers (Product Carriers)	13	40
Ethylene Gas Carriers	3	9
Tankers (Crude Oil Carriers)	2	50
Ro-Ro	1	1
Grand Total (Vessels) Coastal Trade	804	1,087

Source: Indian Shipping Statistics, 2012

Figure 4.10
Carbon Dioxide Emission
 [Grams/Tonne Kilometre]



Source: Network for Transport and Environment/World Shipping Council 2009

than that of the overseas fleet (Figure 4.6). Coastal cargo was about 159 million tonnes or about one fifth of the export-import cargo in 2011-12. Figure 4.9 provides an overview of the tonnage and composition of coastal vessels.

The need to promote coastal shipping has been increasingly deliberated within government and policy makers. The National Action Plan of the Prime Minister's Council on Climate Change identified promotion and use of coastal shipping and inland waterways as the first action point for the transport sector. Some of the key reasons as to why coastal shipping in India needs to be promoted are:

- Cost of transportation significantly lower than conventional modes by 25 per cent, according to some studies
- Lower carbon emissions vis-à-vis other modes of transport
- Coastal shipping can help reduce concentration of traffic on the already strained road network
- It can lead to optimal use of India's natural advantage and resource a long coastline.

The interim Planning Commission report on low carbon strategies for inclusive growth, while discussing possible interventions in the transport sector that would lead to increased efficiency accompanied by lower emissions, specifically made a mention of the usage of smarter options such as inland and coastal waterways as alternative modes of transport. Figure 4.10 is a comparison of CO₂ emissions across transport modes with ships being the lowest. Figure 4.11 is a summary of emission data for various types of ships compared with a truck.

India needs a viable scheme to incentivise and support a modal shift of cargo to water transportation from road and rail. The European Union has set a target of moving more than 50 per cent of its road and rail transport to short sea shipping by 2030.

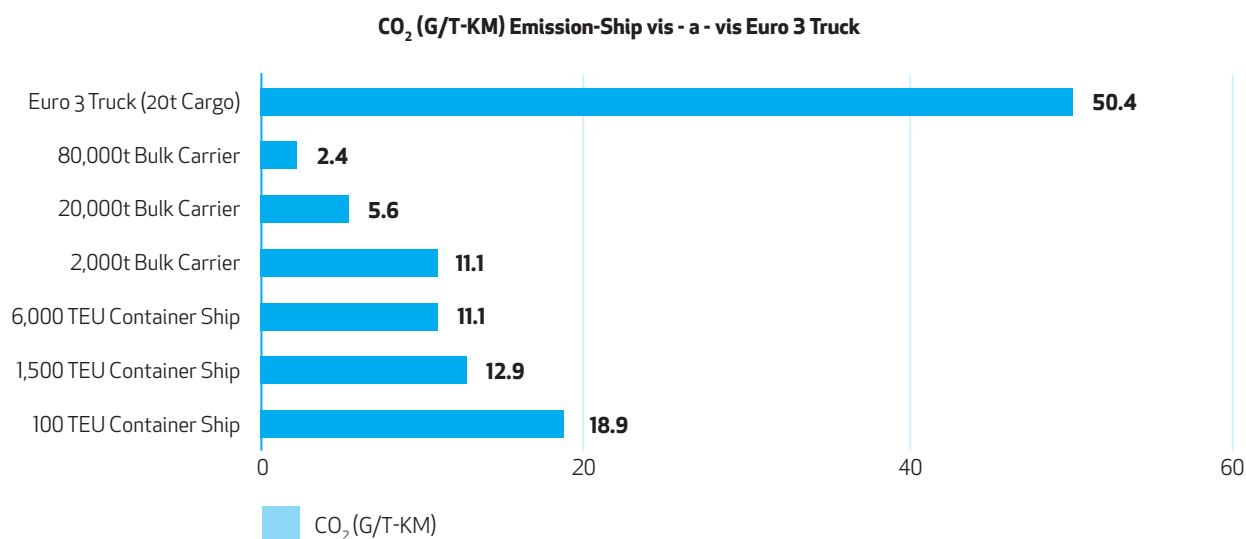
For any policy intervention to be effective, a careful assessment and cognisance of several issues specific to the sector are required.

INADEQUATE INFRASTRUCTURE AT NON-MAJOR PORTS

Draft Presently, most coastal shipping operations in India are centred around a Major Port as the Non-Major Ports suffer from inadequate draft and large inventories of dysfunctional equipment. Ship owners currently prefer to operate coastal vessels having a draft of 7-9.5 m due to their economic feasibility. Adequate depth for such vessels is not available at the Non-Major Ports. Even a river-sea vessel would require a draft of around 3.5 m to carry out coastal operations economically.

Berthing Lack of adequate berthing facility number of berths, sufficient length for proper berthing of the vessels at the Non-Major Ports is another problem, which forces incoming vessels to keep waiting idly. Further, Major Ports usually provide priority to foreign-going vessels, as they operate in a competitive environment and would want to project a better revenue and cargo performance. Therefore, coastal vessels end up with step motherly treatment.

Figure 4.11
Carbon Dioxide Emission: Ships vs Euro 3 Truck
 [Grams/T-Km]



Source: Inland Navigation and Emissions Suzanne Ebert WWF International Danube Carpathian Programme April, 2005

Cargo handling equipment Most Non-Major Ports do not have proper material handling equipment in place which could facilitate a quick turnaround. This discourages coastal vessels.

Space for infrastructure development Availability of space for infrastructure development is a huge concern at most Non-Major Port locations,

Last mile connectivity This is indispensable for attracting cargo traffic at any port. National Highways Authority of India (NHAI) has the mandate to provide road connectivity to Major Ports while Rail Vikas Nigam Limited (RVNL) is the nodal agency to increase rail connectivity to ports and development of corridors to the hinterland including multi-modal corridors for movement of containers. However, Non-Major Ports do not have the requisite hinterland connectivity. Roads leading to ports are too narrow for containers/ cargo movement. The inefficient and underdeveloped supply chain is a bottleneck in the development of coastal shipping and renders the end-to-end logistics costs uneconomical while also increasing total transportation time.

Several small players currently dominate coastal shipping, and the resultant divided capacity hampers economies of scale. Further, most players operate on wafer-thin margins which are not commensurate with the risks and capital involved.

INLAND WATER TRANSPORT

Till the first half of the 20th century, inland water transport (IWT) played a significant role in trade and commerce. The Inland Waterways Authority of India

(IWAI) was constituted for development and regulation of the sector. However, IWT has remained underdeveloped; in part because public investment has been very low compared to other modes of transport.

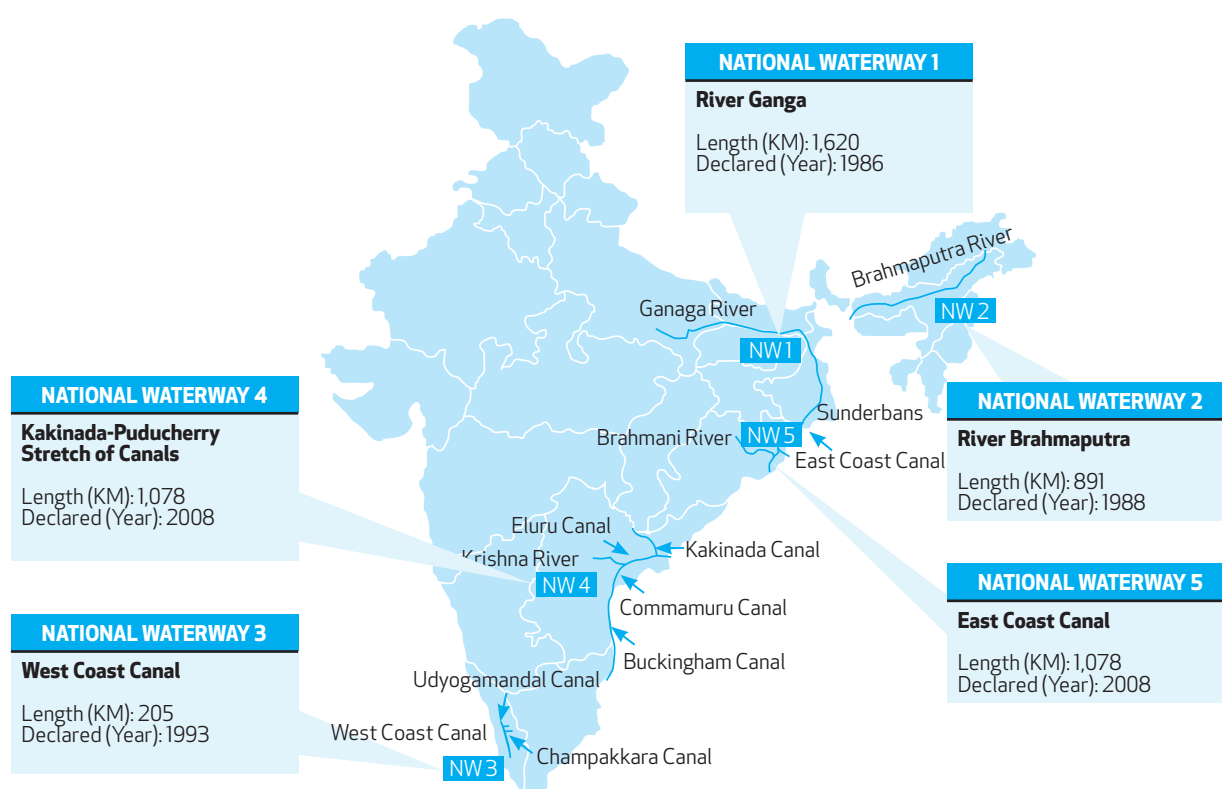
NATIONAL WATERWAYS

India has five National Waterways (NW): the River Ganga (NW-1), River Brahmaputra (NW-2), West Coast Canal (NW-3), Kakinada to Puducherry Canal System along with River Godavari and River Krishna (NW-4); and the Brahmani and Mahanadi delta along with East Coast Canal (NW-5). Figure 4.12 provides basic details. River Barak is likely to be declared as the sixth NW. Development and regulation of NWs is in the purview of the central government while the rest of the waterways come under respective state governments.

IWAI has been mandated to develop and maintain infrastructure for fairway, navigational aids and terminals to develop an enabling environment for private investment in cargo vessels and operational services. It has been successful on NW-1, NW-2 and NW-3 to a reasonable extent. It has developed systems and procedures for regular O&M (operation and maintenance) of the critical infrastructure and also strived to ensure dissemination of information. Since its inception in October 1986, IWAI spent about Rs 10.36 billion till 2010-11, which included about Rs 8.86 billion on NW-1, 2 and 3, and the balance amount on subsidies, training, technical studies and so on.

The average yearly expenditure of IWAI has gone up substantially from Rs 70 million during the 8th Plan to Rs 1.08 billion during the 11th Plan. However, the total expenditure on infrastructure in 25 years

Figure 4.12
National Waterways in India



Source: NTDP Working Group Report on Ports and Shipping

declared as NWs in 2008, the Planning Commission could not allocate any funds; so development works on these waterways could not commence.

OTHER IMPORTANT WATERWAYS

Besides NWs, other waterways extensively used for IWT includes Goa Waterways for transportation of iron ore for export, and Mumbai Waterways for coal, steel and so on.

Goa Waterways: These comprise 50 km stretches each of river Mandovi and Zuari, and a 20 Km stretch of the Cambarjua canal. These waterways provide connectivity to Mormugao Port and Panaji Port and carry 50 MMT of iron ore for exports. The cargo movement on Goa Waterways increased from 36 MMT in 2005-06 to 43 MMT in FY 2011-12, an overall growth of around 19 per cent. Cargo movement has increased from 1.8 btkm in 2005-06 to 2.2 btkm in 2011-12.

Mumbai Waterways: The tidal inland waterways of Mumbai, such as River Amba, River Ulhas and Dharamtar creek carry mainly coal and steel. The cargo increased from 11.2 MMT in the FY 2005-06 to 20 MMT in FY 2011-12, a strong growth of almost 79 per cent. In terms of btkm, cargo movement rose from 0.603 btkm to 1.1 btkm.

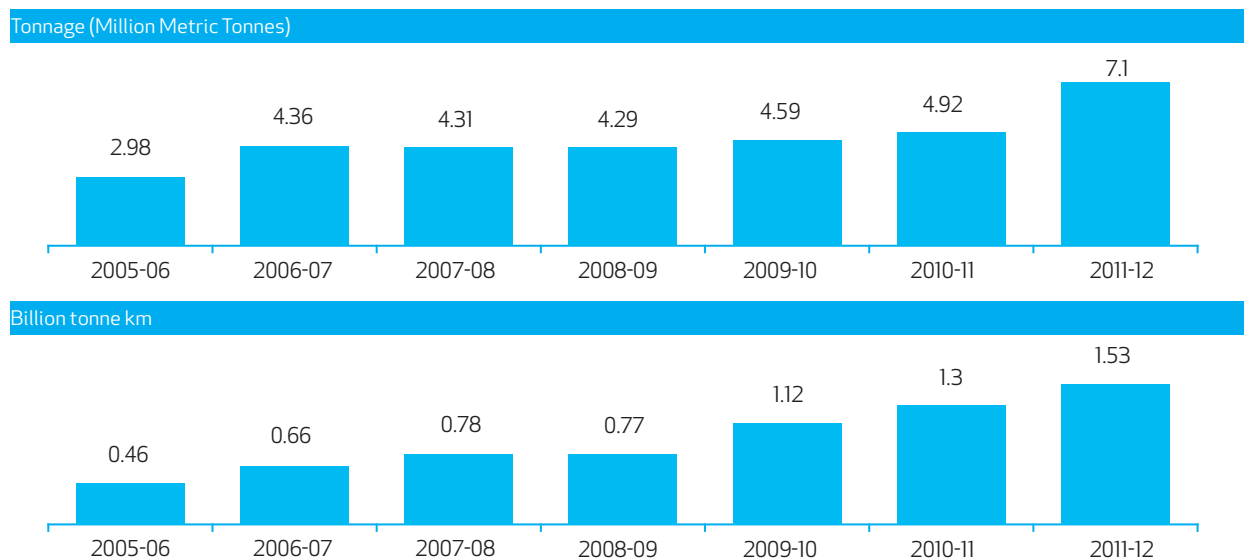
Indo-Bangladesh protocol on IWT: An Inland Water Transit and Trade Protocol exists between India and Bangladesh, under which inland vessels of

one country can transit through specified routes of the other. The existing protocol routes are: Kolkata-Silghat-Kolkata, Kolkata-Karimganj-Kolkata, Rajshahi-Dhulian-Rajshahi, Silghat-Karimganj-Silghat.

The protocol also allows trade through IWT. Five ports of call have been designated in each country. These are: Haldia, Kolkata, Pandu, Karimganj and Silghat in India, and Narayanganj, Khulna, Mongla, Sirajganj and Ashuganj in Bangladesh. More than 1.5 million tonnes of fly ash is transported between Kolkata/Haldia and Bangladesh every year under the protocol. Recently, more than 90 consignments of project material for the Palatana power plant of ONGC, being constructed near Agartala in Tripura, have been transported from Kolkata/ Haldia through the protocol route up to Ashuganj in Bangladesh, and thereafter by road to Palatana, 40 km away.

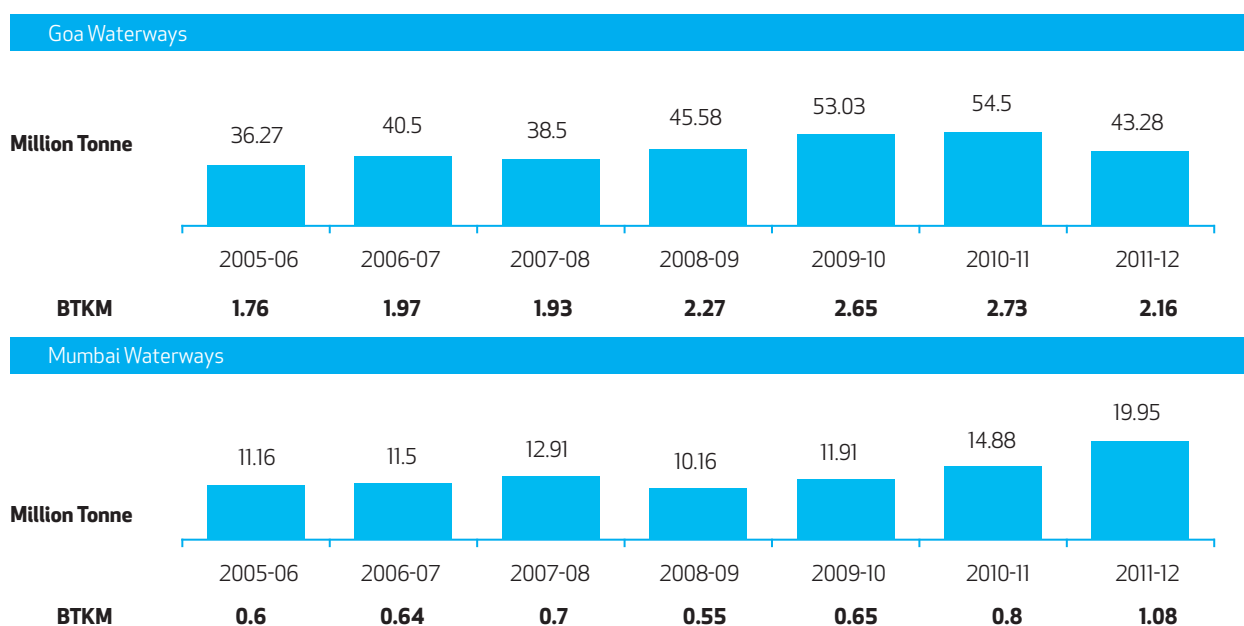
Kaladan Multimodal Transport Project: The project, conceptualised by the Ministry of External Affairs (MEA) to provide alternative connectivity of Mizoram with Kolkata/ Haldia ports through River Kaladan in Myanmar, envisages coastal shipping/ maritime shipping from Haldia to Sittwe, IWT from Sittwe to Paletwa in Myanmar, and thereafter by road from Paletwa to Mizoram. The project is piloted and funded by the Ministry of External Affairs (MEA) which appointed IWAI as the project development consultant (PDC). Construction of Sittwe port is in progress.

Figure 4.13
Cargo Movement on National Waterways



Source: NTDP Sub Group Report on Inland Water Transport

Figure 4.14
Cargo Movement on Goa & Mumbai Waterways



Source: NTDP Sub Group Report on Inland Water Transport

TRAFFIC TRENDS

Cargo transportation by IWT has been steadily increasing. Movement on NWs 1, 2 and 3 has increased from 3 MMT in 2005-06 to 7.1 MMT in FY 2011-12, an overall growth of around 137 per cent. In btkm terms, it has risen from 0.46 btkm to 1.53 btkm.

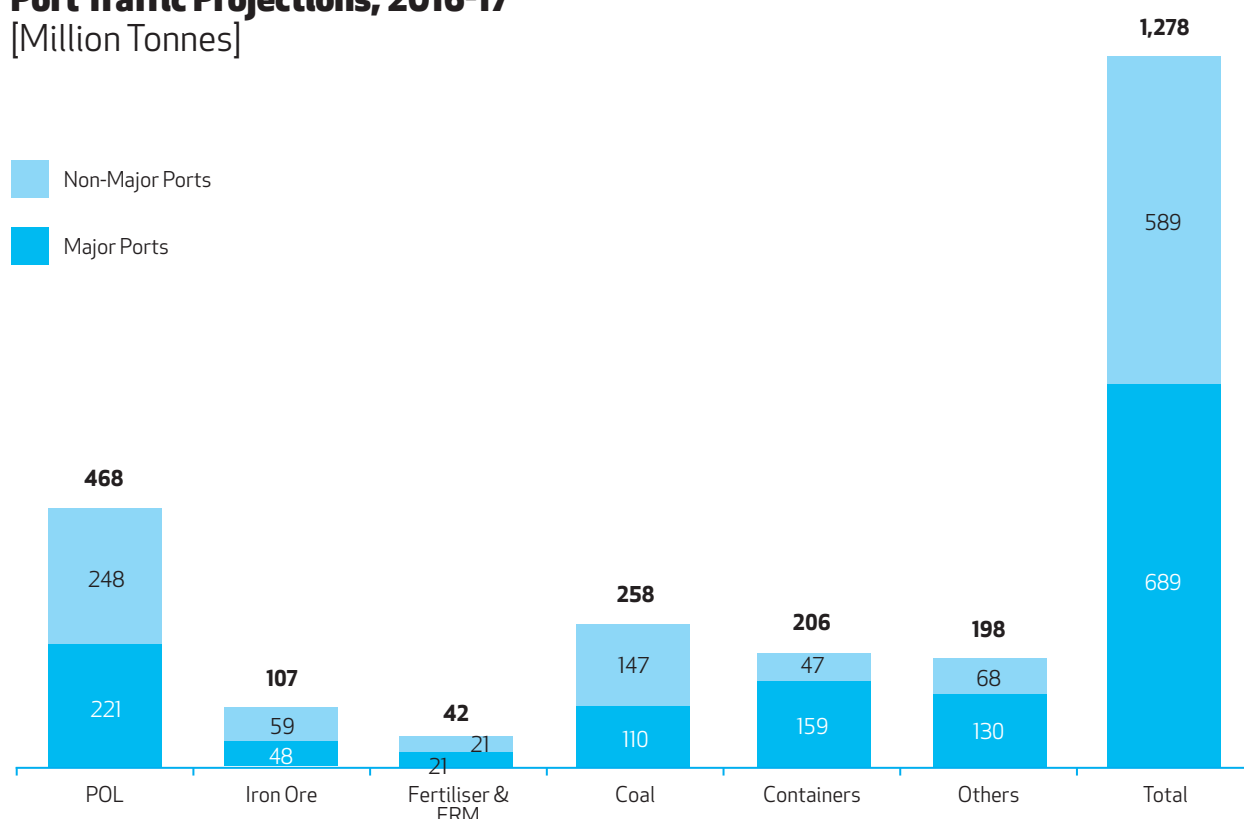
Tables 4.13 and 4.14 provide growth in traffic on National Waterways and Goa/Mumbai Waterways respectively.

FUTURE OUTLOOK

PORTS

As stated earlier, Indian ports handle over 95 per cent of the country's total trade volume and around 70 per cent of total trade value. It is thus imperative to build adequate capacity at our ports over the next two decades.

Figure 4.15
Port Traffic Projections, 2016-17
 [Million Tonnes]



Source: NTDP Working Group Report on Ports and Shipping

(1986 to 2011) is only Rs 10.36 billion, which, though dependent on demand, is insignificant compared to what has been invested in the road and rail sectors. In fact, with respect to NW-4 and 5, which were declared as NWs in 2008, the Planning Commission could not allocate any funds; so development works on these waterways could not commence.

OTHER IMPORTANT WATERWAYS

Besides NWs, other waterways extensively used for IWT includes Goa Waterways for transportation of iron ore for export, and Mumbai Waterways for coal, steel and so on.

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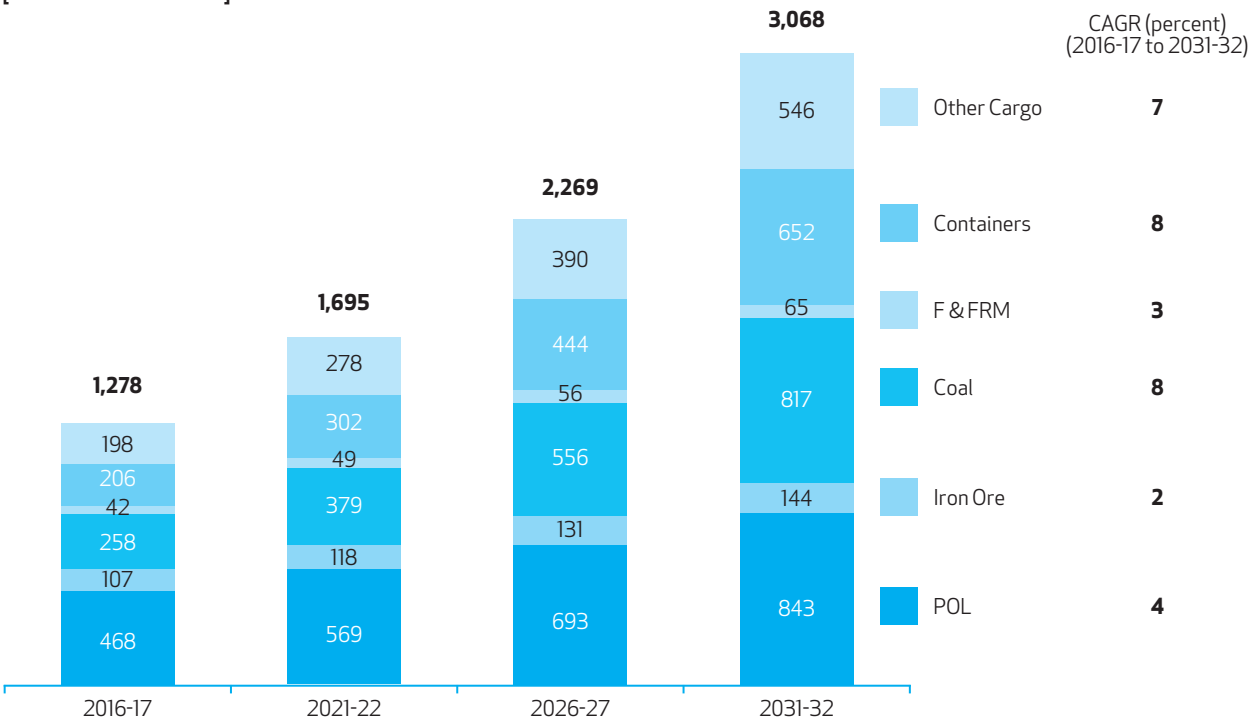
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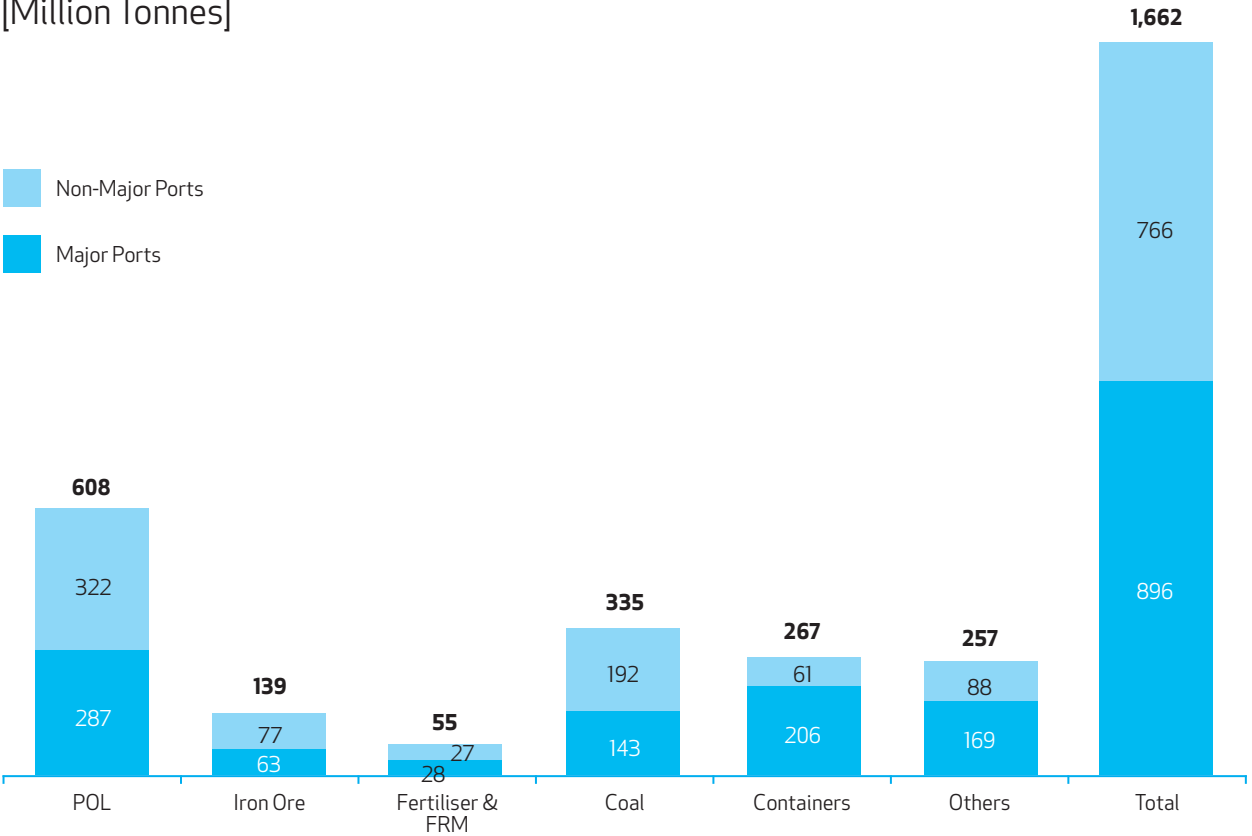
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Figure 4.16
Commodity-wise Traffic Projections, 2016-17 to 2031-32
 [Million Tonnes]



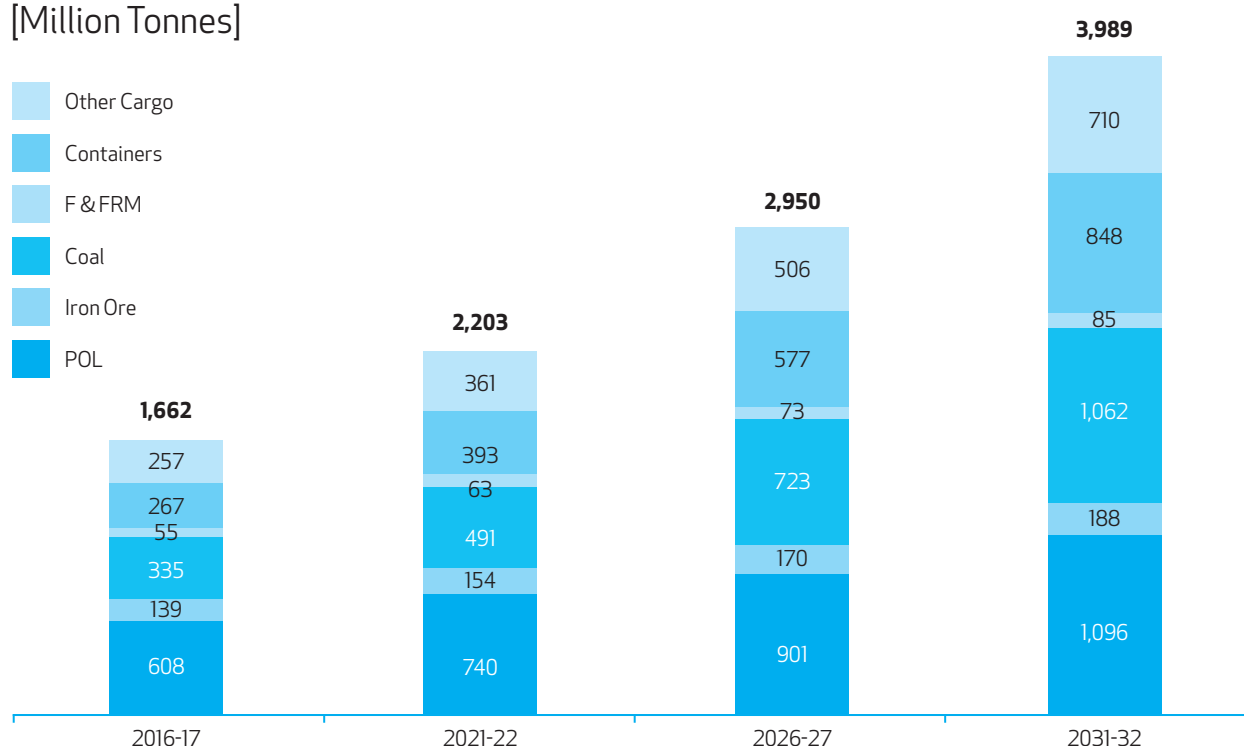
Source: NTDP Working Group Report on Ports and Shipping

Figure 4.17
Capacity Required at Indian Ports, 2016-17
 [Million Tonnes]



Source: NTDP Working Group Report on Ports and Shipping

Figure 4.18
Commodity-wise Cargo Capacity Projections, Major & Non-Major Ports, 2016-17 to 2031-32
 [Million Tonnes]



Source: NTDP Working Group Report on Ports and Shipping

ed and funded by the Ministry of External Affairs (MEA) which appointed IWAI as the project development consultant (PDC). Construction of Sittwe port is in progress.

TRAFFIC TRENDS

Cargo transportation by IWT has been steadily increasing. Movement on NWs 1, 2 and 3 has increased from 3 MMT in 2005-06 to 7.1 MMT in FY 2011-12, an overall growth of around 137 per cent. In btkm terms, it has risen from 0.46 btkm to 1.53 btkm.

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FUTURE OUTLOOK

PORTS

As stated earlier, Indian ports handle over 95 per cent of the country's total trade volume and around 70 per cent of total trade value. It is thus imperative to build adequate capacity at our ports over the next two decades.

TRAFFIC PROJECTIONS

A sharp slowdown in world trade and domestic growth hit cargo traffic handled by Major Ports in 2012-13; growth was -2.6 per cent. Considering weak global growth prospects and weakening of domestic

growth dynamics, this is expected to grow at about 6 per cent for the remaining four years of the 12th Plan. For Non-Major Ports, the annual growth in cargo traffic is assumed at about 11 per cent. Keeping in view the trends in the share of commodities, total cargo traffic at Indian ports is estimated to increase from 914 million tonnes in 2011-12 to 1,278 million tonnes by 2016-17 (Figure 4.15).

Cargo traffic for subsequent years upto 2031-32 (Figure 4.16) has been projected using expected growth rates for various commodity groups, based on perceptions of user Industries and long-term growth rate trends.

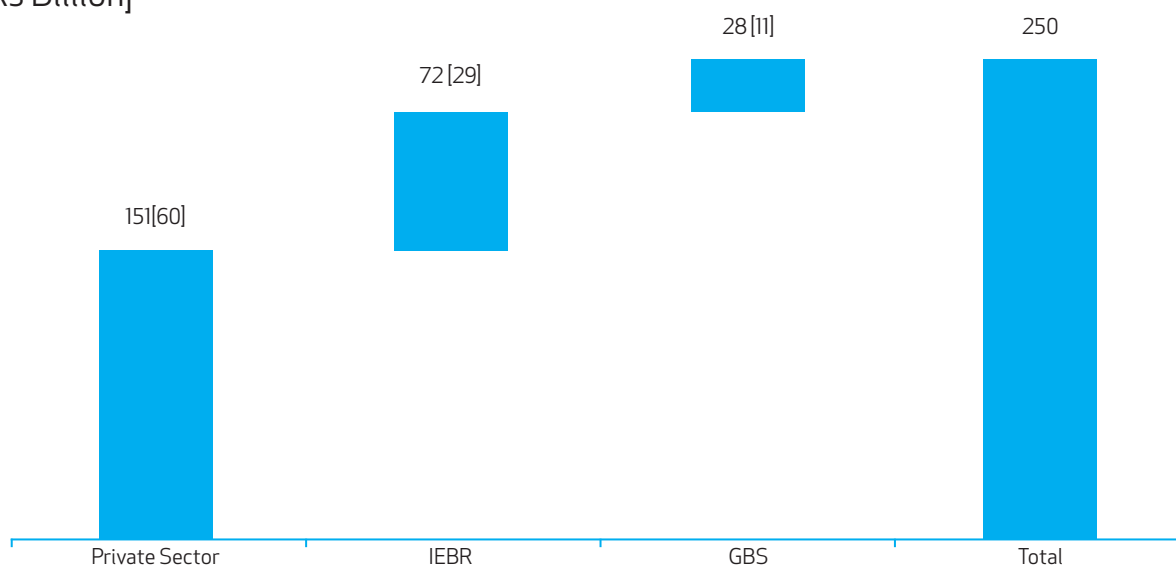
CAPACITY REQUIREMENTS

The international practice for ports is to plan for cargo handling capacity of 30 per cent more than the projected traffic so that pre-berthing detention of ships is minimised. Capacity needs to be planned separately for each commodity group as each requires different facilities. The total capacity required at Major and Non-Major Ports at the end of the 12th Plan period is estimated at 1,662 million tonnes (Figure 4.17).

MAJOR PORTS

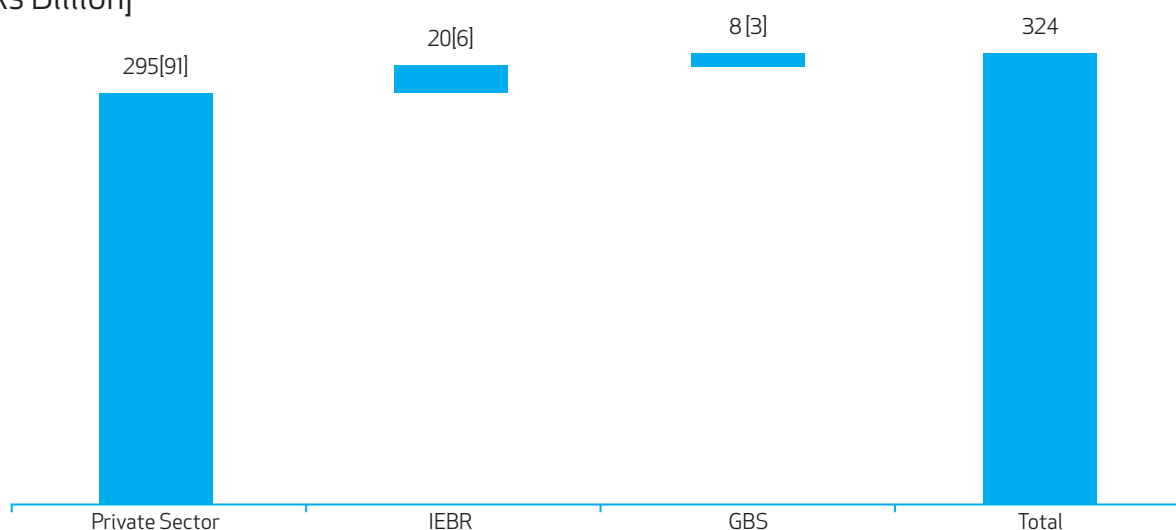
The capacity at the end of the 11th Plan period at Major Ports was 697 million tonnes, while traffic

Figure 4.19
Investment in Major Ports during the 12th Plan
 [Rs Billion]



Note: The figures in parenthesis are percentage shares
 Source: NTDP Working Group Report on Ports and Shipping

Figure 4.20
Investment in Non-Major Ports during the 12th Plan
 [Rs Billion]



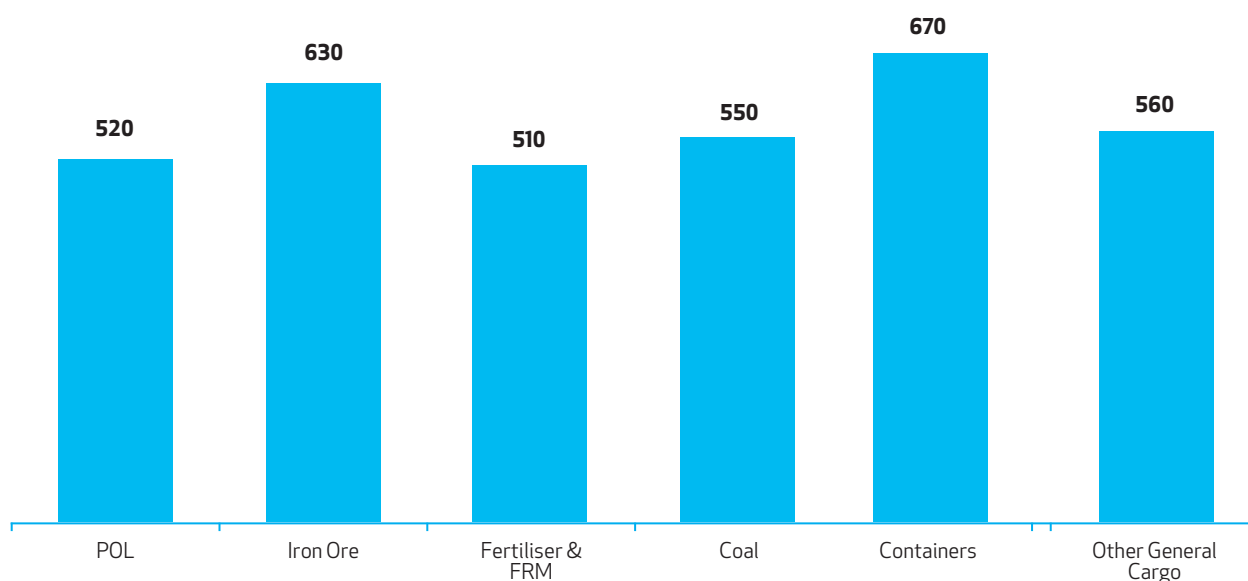
Note: The figures in parentheses are percentage shares
 Source: NTDP Working Group Report on Ports and Shipping

handled was 560 million tonnes. The Major Ports plan to increase capacity to 896 million tonnes during the 12th Plan to meet traffic demand of 689 million tonnes.

It is envisaged that ports in India should achieve draft of at least 14 m by the end of the 12th Plan and 17 m in the first half of the 13th Plan for some ports. Presently, 14 m drafts are available at four ports: Paradip, Kochi, New Mangalore and Mormugao. Efforts are being made to increase the draft to 14 m at

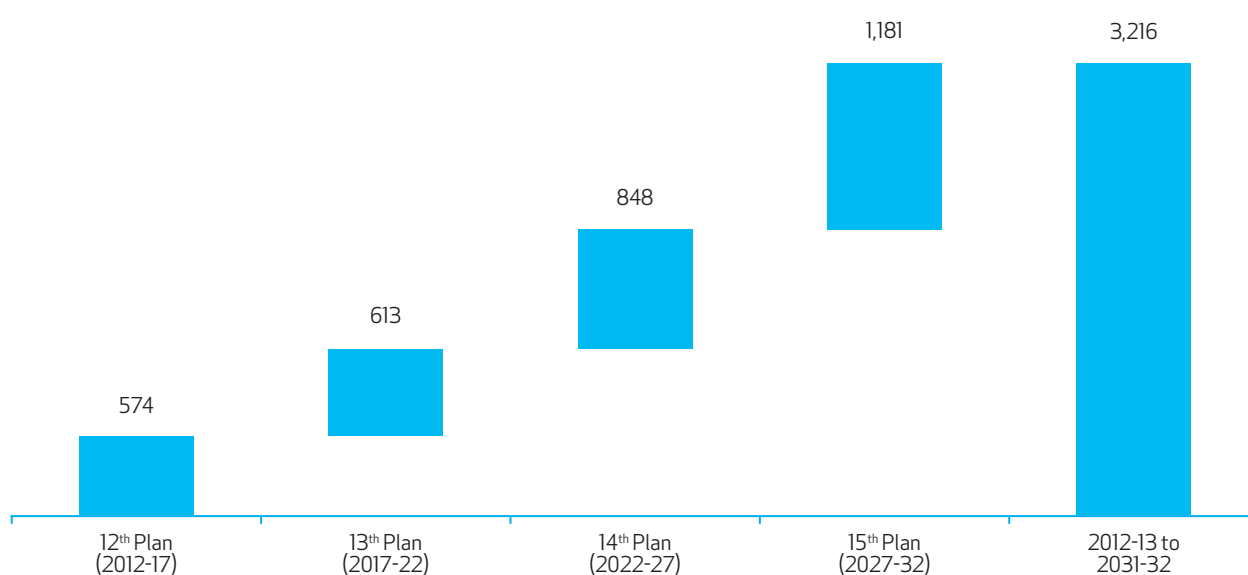
Vishakapatnam, Ennore, Chennai, Tuticorin, JNPT and Kandla. At present, only Paradip Port has a draft of 17 m available in the inner channels/ berths. While for some ports such as Tuticorin, JNPT and Kandla, the feasibility to increase the draft to 17 m is still to be studied, there is no 17-m plan at Mumbai port. It is a very difficult and impractical proposition to increase the draft to 17 m or even 14, at both Kolkata and Haldia.

Figure 4.21
Commodity-wise Capital Cost Incurred for Capacity Addition
 [Rs Million Per Tonne]



Source: NTDP Working Group Report on Ports and Shipping

Figure 4.22
Investment Requirements in Ports, 2012-13 to 2031-32
 [Rs Billion]



Source: NTDP Working Group Report on Ports and Shipping

NON-MAJOR PORTS

The maritime states plan to increase the capacity of Non-Major Ports from 445 million tonnes in the 12th Plan period to 766 million tonnes to meet the traffic demand of 589 million tonnes.

Non-Major Ports have projected a total requirement of 544 mcm during the 12th Plan, of which 418 mcm

is capital dredging and 129 mcm is maintenance. The requirements of the states of Odisha, Andhra Pradesh and Gujarat constitute 58 per cent of total capital dredging due to development of Gopalpur and Dhamra ports in Odisha, development of Machilipatnam, Krishnapatnam, Kakinada and Gangavaram ports in Andhra Pradesh, and Hazira in Gujarat.

INVESTMENT REQUIREMENTS AND SOURCES

Table 4.1

Investment Requirements in Shipping During 12th Plan

[Rs Billion]

PARTICULARS	EQUITY	DEBT	TOTAL	TOTAL GT
Business as Usual				
Tonnage remains at the existing percentage, i.e., 1.1 per cent of the world tonnage	7.5	17.5	25.0	12.4M*
Accelerated Growth Scenarios				
Indian tonnage expands to 2.5 per cent of world tonnage	96	224	320	26.6M
Indian tonnage expands to 5 per cent of world tonnage	240	560	800	53.3M

Source: 12th PlanNote: *12.4 MGT is as per 12th Plan. However, based on Indian tonnage of 10.42 MGT as of 31 December 2012, the projected tonnage at the end of 12th Plan under Business as Usual (being the same percentage as at present, i.e. 1.1 per cent of the world tonnage) case would be 11.0 MGT.**OF FUNDING**

The investments required to create capacity for cargo handling in a port depends on several factors such as type of cargo, port topography, channel depth and width, and type of equipment. The cost of creating additional capacity also depends on the commodity or group of commodities to be handled. Moreover, investment required to create additional capacity through brownfield expansion at an existing port is markedly different from greenfield capacity creation through new ports. Thus, it is a challenging task to arrive at exact investment figures corresponding to projected capacity requirements. This report attempts to arrive at broad estimates through aggregation of investment estimates received from various port trusts and maritime boards.

A number of development projects have been identified by Major Ports and states to be taken up by the final year of the 12th Plan (2016-17). Most of these projects have been conceptualised as public-private partnerships.

THE 12TH PLAN

Estimated investments and sources needed to increase capacity of Major and Non-Major Ports are shown in Figures 4.19 and 4.20.

BEYOND THE 12TH PLAN

Considering the constraints in estimating investment required during 2017-18 to 2031-32 to create capacity at ports for handling the projected cargo, the following methodology has been adopted.

The projected cargo for 2017-18 to 2031-32 has been estimated separately for different commodities or groups. Here, it is pertinent to note that investment required to create one million tonnes of capacity varies from commodity to commodity. And as stated previously, the investment necessary to create

capacity in an existing port is different from what is needed for greenfield capacity expansion.

TAMP decides upfront tariffs based on capital cost to be incurred for creating capacity at an existing Major Port. Based on TAMP-approved tariffs for projects from 2011-12 onwards, the average capital cost to be incurred by Major Ports for handling one tonne of cargo for different commodity groups at 2011-12 prices have been calculated and listed in Figure 4.21.

Ports also require investment for creating facilities like deepening and maintaining of channels, rail and road connectivity and other infrastructure. Figure 4.22 outlines Investment needs during various plans. The assumption is that capacity expansion is achieved through brown field expansion at existing ports. In case capacity addition is done through greenfield projects, investment requirement could be higher by 40-50 per cent.

SHIPPING

The potential for the shipping industry to cater to India's import-export trade is phenomenal. In this context, there is a great need to increase the Indian fleet strength.

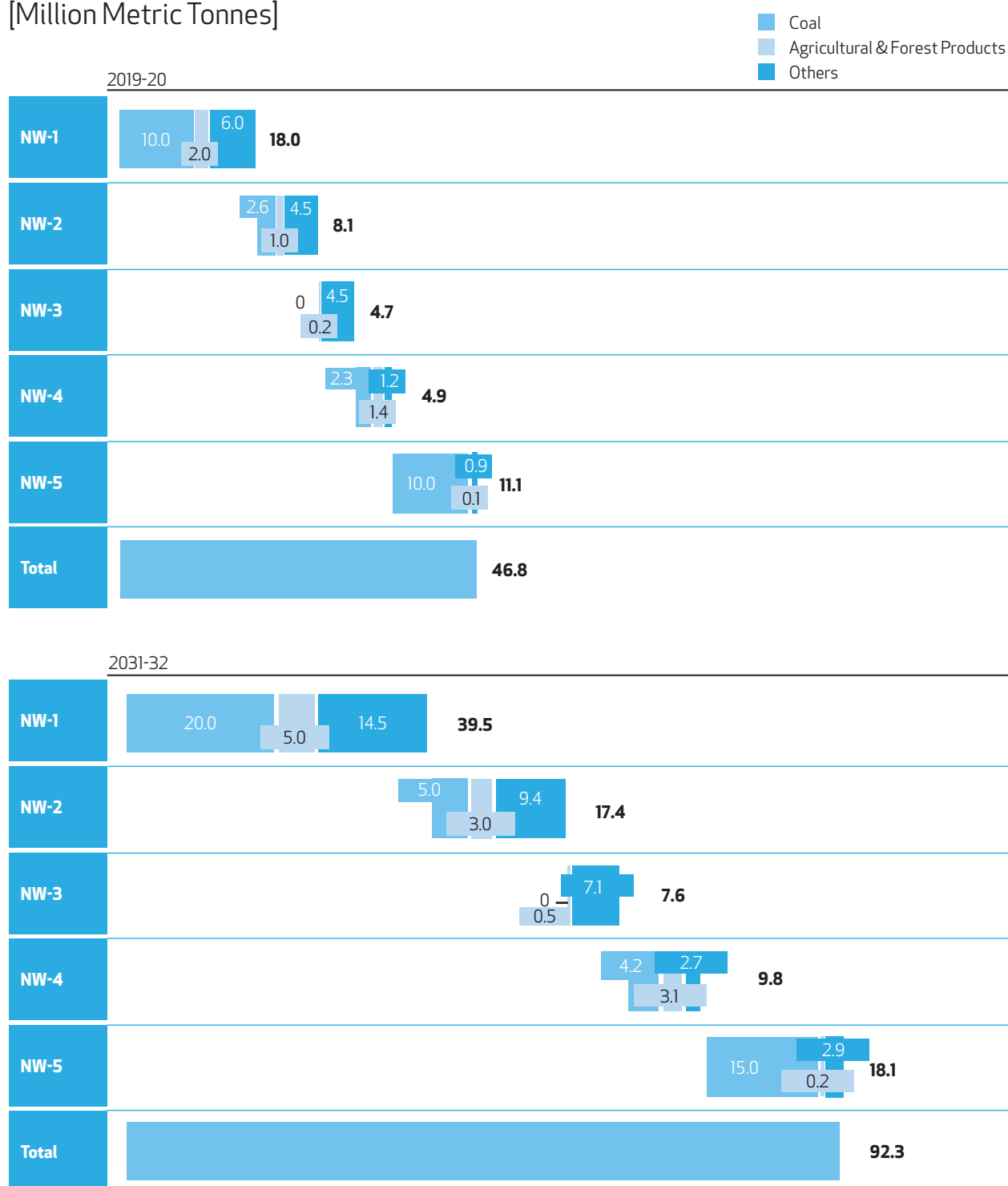
Further, India has an ageing fleet: around 39 per cent of vessels are already above 20 years old. This calls for early replacement of ships. The fund requirement for acquisition of new tonnage has been estimated by the Sub-group (Finance) of the Working Group on Shipping and IWT (Ministry of Shipping) for the preparation of 12th Plan under two scenarios Business as Usual and Accelerated Growth (Table 4.1)

INVESTMENT REQUIREMENT

Figure 4.23

Projected Cargo Potential on National Waterways

[Million Metric Tonnes]



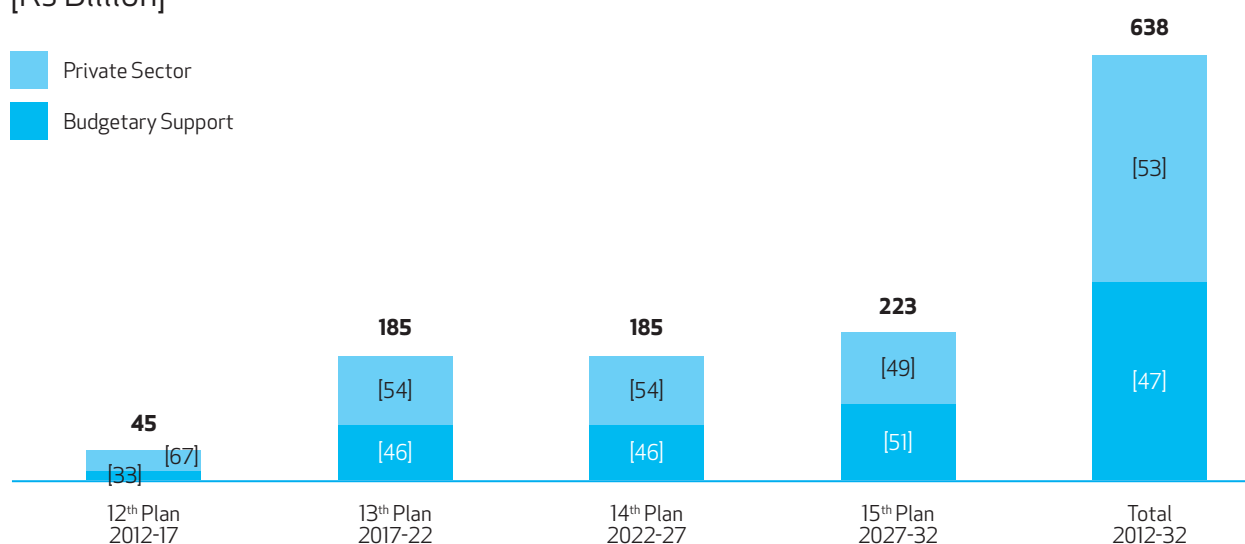
Source: NTDP Working Group Report on Ports and Shipping

The two growth scenarios assumed (Table 4.1) would require major changes in the fiscal environment. The Indian shipping industry needs cheaper funding avenues to boost acquisition of tonnage. However, the government is pressed to curtail or optimally allocate additional expenditure, considering India's fiscal pressures. Therefore, possible mechanisms to facilitate easier access to international funding sources may need to be considered.

The remittance of interest on external commercial borrowings (ECB) taken on or before 1 June 2001 did not suffer any withholding tax. However, this exemption has been withdrawn post this date. Currently, interest paid by Indian shipping companies to foreign lenders on acquisition of ships attracts a withholding tax of 20 per cent plus surcharge.

As observed in the 2002 report of the Expert Committee to Review Indian Shipping chaired by Dr Rakesh

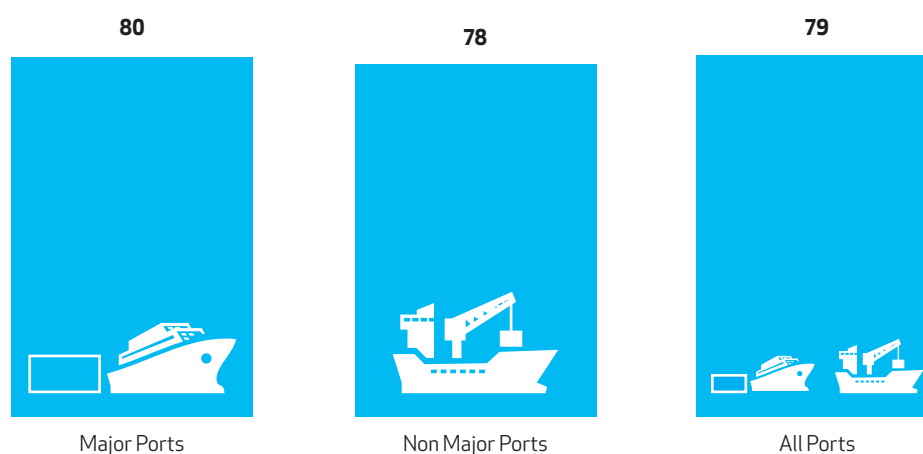
Figure 4.24
Investment Requirements in IWT and Sources of Funding
 [Rs Billion]



Note: The figures in parentheses are percentage shares
 Source: NTDP Working Group Report on Ports and Shipping

Figure 4.25
Capacity Utilisation at Ports, 2011-12
 [Per cent]

INDIAN PORTS ARE CAPACITY CONSTRAINED WITH HIGH UTILISATION AND REQUIRE ADDITIONAL INVESTMENTS



Source: Basic Port Statistics, 2011-12 & Ministry of Shipping

Mohan, Advisor to the then Finance Minister, ship acquisition costs to the tune of 60 to 80 per cent are financed through ECBs. As a rule, lenders require interest payment to be effected net of all Indian taxes. Subsequent to the withdrawal of exemption, interest costs have increased substantially, and this is passed on by the lenders to the borrowers. Accordingly, the Rakesh Mohan Committee recommended that it would be appropriate to restore the exemption.

INLAND WATER TRANSPORT

Currently, the share of water in India's modal mix is a mere 6 per cent. Even though IWT is the most economical mode of transportation, especially for bulk cargo like coal, iron ore, cement, food grains and fertiliser, it remains severely underutilised in India.

TRAFFIC PROJECTIONS

The traffic projections for inland waterways are done from a commodity-wise demand standpoint and do not factor in any capacity constraints, as was done for ports and shipping:

ALMOST ALL MAJOR PORTS ARE CAPACITY CONSTRAINED WITH HIGH UTILISATION AND REQUIRE ADDITIONAL INVESTMENTS

Source: Basic Port Statistics 2012

- **Coal** A 1,000 MW thermal plant needs 5 MMTPA of coal and 100 cusecs water. Due to their high water requirement, they ought to be located along large water bodies. As of now, 10 thermal power stations are operational in proximity of NW-1. Further, 11 more stations are expected to come up in Bihar and Uttar Pradesh in the next five to eight years with a total installed capacity of over 15,000 MW. The total requirement of coal is estimated to be around 70 MMTPA. Around 14 MMT of imported coal would need to be carried to these power stations from Haldia. Hence all the existing and proposed thermal power plants along River Ganga are potential shippers for IWT if IWAI can provide assured channels of 2.5 m depth or more (a study to provide 3 m deep channel in the Allahabad-Ghazipur stretch of River Ganga by river training/ barrage-cum-lock approach is already underway by IWAI). Up to 25 MMT of coal could be transported by IWT mode on NW-1 every year.
- **Over Dimensional Cargo (ODC)** With 11 more power plants scheduled to be commissioned in the next five to eight years, the requirement of ODC is expected to be around

- **Fly Ash** With average ash content of 25 per cent in coal, total production is estimated to be around 17.50 MMTPA. With the likely use of fly ash in the manufacturing of cement and in construction of road, waterways could be utilised for evacuation of fly ash from power plants on the banks of NW-1 and thereafter moved to respective destinations through multimodal transport systems.
- **Fertiliser** There is substantial potential to transport fertilisers from plants located near Allahabad (IFFCO at Phulpur and Indo Gulf at Jagdishpur) and Haldia (Tata Chemicals) to various locations in Uttar Pradesh, Bihar and West Bengal. The total consumption of fertiliser in India is estimated to be around 25 MMTPA, of which around 10 MMTPA are consumed in these three states. A part of this could be moved by inland waterways.
- **Foodgrains** The foodgrain surplus is mainly confined to the northern states; transportation involves long distances. There is a huge requirement of foodgrains in Uttar Pradesh, Bihar, West Bengal and the North Eastern states, which are transported by road/ rail as of now.

However, as the IWT sector in India is still in an early stage of its development, it needs to gain the confidence of the user.

NW-2 The main cargo identified to be moved on this waterway include coal, limestone, cement, fertilisers, iron and steel, and building materials.

NW-3 This could be an efficient channel to transport project cargo, foodgrains, bulk goods, fertilisers and POL. Container traffic, which has commenced from February 2011 and is of the order of 200 containers per day, could also pick up substantially.

NW-4 The hinterland of NW-4 could be divided into four cargo belts—Kakinada, Krishna, South Andhra and Chennai. Coal, cement, fertiliser and foodgrains account for a majority of the total traffic in the hinterland. The main cargo identified to be moved on this waterway comprise coal, limestone, cement, fertiliser, iron and steel, building materials, paddy, tobacco, oil seeds, pulses, cotton, timber, bamboo, firewood, beedi leaves, chillies, general merchandise and civil supplies.

NW-5 Figure 4.23 projects the quantities of cargo that could be moved through the NWs, including NW-5, in case the requisite infrastructure is provided. The proposed NW-5 waterway passes through major towns like Talcher, Paradip and Dhamra in the river section, and Bhadrak, Balasore, Jaleswar and Haldia in the canal section. The river section of the waterway is rich in minerals coal and iron ore and industrial products such as ferro-chrome, steel alloys, tyres, granites and forest produce. The canal section of the waterway carries mainly agricultural products, handicrafts and textiles.

Investment requirements and sources of funding are indicated in Figure 4.24.

CHALLENGES

PORTS

India's ports are highly constrained for capacity and are expected to remain so in the near future. Port usage was at an average of 80 per cent in 2011-12, despite slowdown following the global recession, and four of the 12 Major Ports had utilisation rates above 100 per cent (Figure 4.25 and 4.26).

Development of port infrastructure has traditionally been driven largely by public investment. The limited number of private investors that port development and expansion has attracted has been due to the unique economic characteristics of seaports.

- Provision of basic port infrastructure such as sea locks, breakwaters, port basins, common areas, and main hinterland connectivity entails large fixed costs. Such infrastructure is common to all port terminal operations and

While Non-Major Ports have been relatively successful under the management of maritime states, and have attracted significant private participation, India still lacks a consistent national ports policy aimed at transforming the Major Ports into viable and autonomous undertakings which can function properly within a market-oriented economy.

is typically funded through public investment.

- Relatively large minimum initial capacity of port infrastructure is required from a technical standpoint. Moreover, port infrastructure is frequently indivisible, implying that increase in port capacity can only be realised in quantum chunks.
- The initial development costs cause large capital investment opportunity losses as a result of underutilised capacity during the initial phases of the port lifecycle.

Consequently, private investors invest primarily in port terminal facilities but not in the underlying infrastructure. Typically, private investors develop terminal infrastructure under the BOT model on behalf of the public port authority under a concession of 30-40 years.

In the Indian situation, problems emerge at each stage. All stakeholders lose time and money due to two major reasons: pre-tendering delays and weak implementation of projects.

PRE-TENDERING DELAYS

There are significant delays in regulatory approvals, security, environmental clearances during the pre-tendering phase, due to lack of defined timelines during this phase. In addition, the approvals across various departments and levels happen sequentially rather than in parallel. Delayed approval at one stage can therefore stall the entire process. Hence PPP projects take time to move from conceptualisation to the tendering stage.

WEAK IMPLEMENTATION OF PROJECTS

Even after uptake, most projects suffer from time and cost over-runs due to several factors.

Low quality design and engineering: The detailed project report (DPR) forms a much smaller percentage of project costs in India compared to global benchmarks. This is because engineering consultants are chosen for a project primarily based on price, with some small weightage for quality. Such consultants might cut corners, leading to inaccurate surveys and low quality DPRs. This can often result in surprises during construc-

It is a common assumption that cargo moves to the nearest port from the origin because of distance advantage, but it has been seen that in reality, exporters' preference for a particular port is governed by efficiency in port operations, freight advantage, connectivity and port tariff. Thus, cargo from Kerala is transported to distant Mumbai instead of Kochi port

tion and a change in project scope or plans, adding to delays and costs.

Shortage of skilled manpower: The pool of skilled and semi-skilled manpower, such as welders and fitters, has not kept pace with the construction needs of infrastructure. In effect, 70 to 80 per cent of the existing workforce is untrained. This affects the quality of project implementation. Some of the other reasons behind delays in project execution are absence of specified financial institutions, delay in financial closures, involvement of multiple parties and inadequate hinterland connectivity.

REGULATORY FRAMEWORK

Multiple attempts have been made over the last two decades to modernise the port sector and introduce an appropriate regulatory framework including the right port management structure.

While Non-Major Ports have been relatively successful under the management of maritime states, and have attracted significant private participation, there is still no consistent national ports policy aimed at transforming the Major Ports into viable and autonomous undertakings which can function properly within a market-oriented economy. Some basic elements of the Landlord Port model have been implemented for Major Ports, such as introduction of privately owned terminals, but it can be rightly argued that partial implementation of the model creates more problems than it solves.

GOVERNANCE MODEL

All Major Ports operate on the Public Service Port model predominant till the 1990s, with the exception of the corporatised Ennore. Since then, globally, most ports have been converted to the Landlord model or in some cases such as the UK, been completely privatised. While the Service Port model in India was consistent with a centralised economy, it does not fit well in a market-oriented economy.

- Service ports are generally less efficient, not commercially oriented and often characterised by severe over-manning, sub-standard equipment, congestion and chronic service failures.
- All investments in port infrastructure, superstructure and equipment need to come from

public sources. Private funds would become available only if the terminal operations could be performed by the private sector on a long-term basis.

- Container handling, which now dominates the break-bulk sector, is significantly faster and more efficient than traditional (manual) cargo handling. Publicly managed terminals are less able to benefit from the productivity improvement associated with this as compared to private terminals.
- Service ports are prone to political interference which often disrupts professional port management. Frequent changes in government also have a negative impact, introducing an element of instability in the system.
- Service ports are particularly vulnerable to labour problems.
- In service ports, the port trust is both the landlord and the terminal operator. When private terminals come up alongside port trust-run terminals, there is a conflict of interest.

Even a corporatised port does not serve the function of a landlord port, where the landlord authority oversees port administration and is separated from all terminal operations.

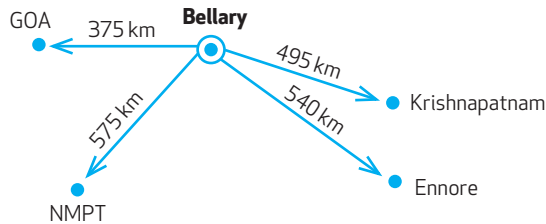
ROLE OF REGULATORY AUTHORITY

Tariff regulation, in general, is a controversial issue in the international port sector. The objective of tariff regulation is to limit monopoly profits through regulation of price and rate of return. However, in the current Indian situation, where the key challenge is to dramatically increase port capacity, this may not be the foremost consideration. The primary objective of regulation must be to encourage accelerated development of new port and terminal infrastructure through greater public-private participation with optimal risk sharing and to ensure that terminal operators meet minimum performance standards through provisions in the concession agreements.

Not only is the notion of tariff regulation by a central authority unsuitable for development of the port sector, but the methodology followed for tariff setting also needs to be re-examined. TAMP had issued a new set of guidelines for PPP projects for Major Ports in February 2008. These aim at providing comfort to investors by announcing the tariff in advance, before they submit their financial bids, thereby reducing regulatory uncertainties. But since a normative approach is adopted to fix tariff, the tariff does not necessarily account for the actual costs of an individual operator. The underlying expectation is that the revenue share to be offered by the bidders will be the leveller between the standards assumed and the actual cost of an operator. Nonetheless, the efficacy of the upfront tariff system hinges upon the reasonableness of the norms adopted and reliability

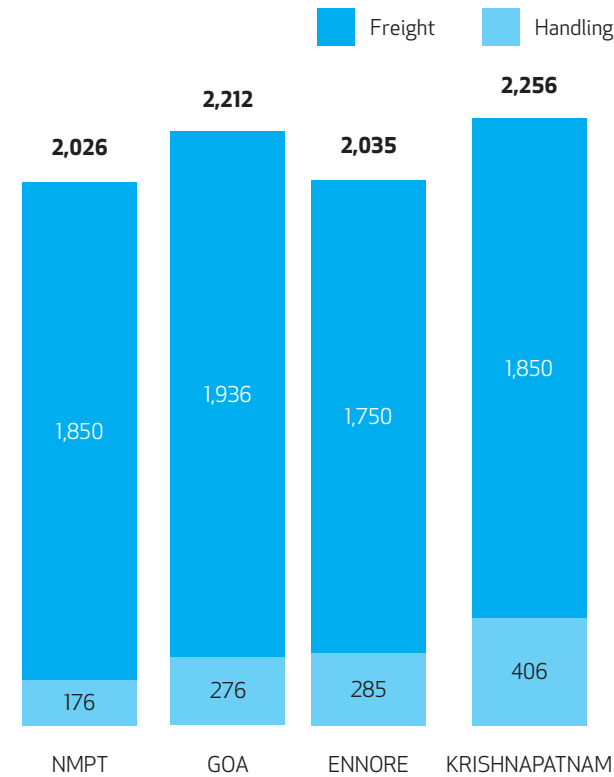
Figure 4.27

Lead Distance between Ports in South India and Bellary-Hospet



Source: NTDP Working Group Report on Ports and Shipping

Consolidated Charges for Handling Iron Ore
Rs per Tonne



of the capital estimates considered. Investors may desire that these issues are addressed and a fool-proof procedure is evolved for implementation.

In particular, there are two issues with the current tariff fixation methodology:

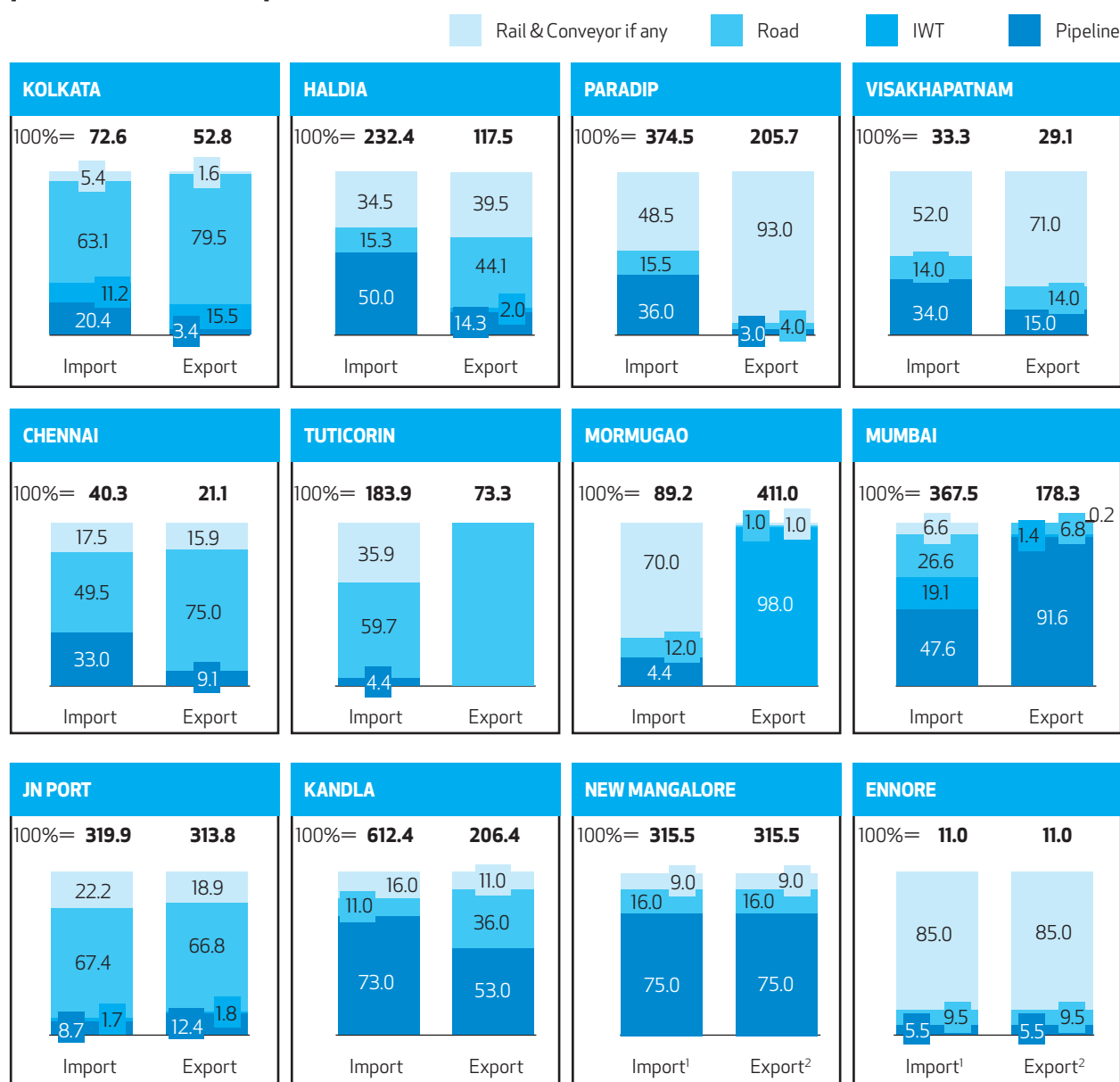
- The major pitfall is keeping the same tariff base unaltered for the whole concession period of 30 years. Indexation of tariff at WPI-X alone may not provide adequate comfort to investors as it does not capture the additional financial commitments which they might have to make in view of the environmental, market and technological changes that may take place after commencement of the concession. Most importantly, the seaward services at Major Ports are not offered for PPP and the related services and facilities continue to be provided by the port trusts.
- On the other hand, the 2005 TAMP guidelines for tariff fixation follow a cost plus method. Consequently, cost of inefficiency and redundancy seeps into tariff computation in the name of the actual. Inadequate maritime infrastructure and high marine cost at the ports may adversely affect the business of private terminal operators providing land side services. There is, therefore, an immediate need to review the cost plus regime of tariff fixing. Further, a significant part of the demurrage costs should be borne by ports.

In an effort to address the issues with tariff regulation and therefore lack of private investment, the Ministry of Shipping, in 2013, has issued draft guidelines for tariff setting in Major Ports. They propose a shift to a more progressive market-driven tariff regime, that would enable Major Ports to compete with other ports, including those operated by private players, by allowing them to fix tariffs based on market conditions. As per the draft guidelines, though TAMP will fix the reference tariff for each port for different commodities, the Major Port Trusts (MPTs) can set their own tariff, which can be higher or lower than the reference tariff. TAMP will also specify minimum efficiency standards for cargo terminals. If the actual tariff proposed to be levied is higher than the reference tariff, a proposal including the upgraded efficiency standards to be maintained by the private operator or government-owned port shall have to be submitted to TAMP in advance. Government aims to boost investor confidence with the market-driven progressive tariff regime, though with certain riders.

HINTERLAND CONNECTIVITY

The fact that Indian ports are constrained for capacity indicates that cargo evacuation facilities are under great strain, warranting effective quick evacuation within the ports as well as to the external hinterland.

Figure 4.28
Transport Modal Share in Evacuation of Cargo at Major Ports
 [Lakh Million Tonne]



¹ Only aggregate import and export volumes available for New Mangalore and Ennore ports
 Source: NTDPCC Working Group Report on Ports and Shipping

FLows: ACTUAL VS IDEAL

It is a common assumption that cargo moves to the nearest port from the origin because of distance advantage, but it has been seen that in reality, exporters' preference for a particular port is governed by efficiency in port operations, freight advantage, connectivity and port tariff.

Thus, cargo like umbrellas from Kerala is transported to distant Mumbai instead of Kochi port. Similarly, cashew moves over a longer distance to Tuticorin rather than Kochi. Textile units situated in and around Bangalore transport their products in various directions up to Mumbai, New Mangalore, Tuticorin and Kochi despite the longer distances. Tobacco processed in Andhra Pradesh moves to

Chennai rather than Visakhapatnam. Actual flows do not conform to the ideal flows.

The same holds true for container cargo. Cargo from the northern hinterland destined for China and South East Asian countries moves through JNPT and other west coast ports rather than the East coast, resulting in longer sailing distance and higher cost. One of the reasons for this imbalance is lack of adequate/ dedicated rail connectivity between production centre and gateway port.

Further, freight costs by railways/ road for containers are exorbitant in India and more often, the ocean freight for bringing cargo from the Far East and

Table 4.2
Leading KPIs to Monitor Port Objectives

Operations Related KPIs

PORT OBJECTIVES (HIERARCHICAL)	LEADING KPI
1 Low Cost of Import/Export	■ Cost Per Ton of Import/Export
2 Fast Cargo Transit	■ Cargo Dwell Time
3 Fast Vessel Turnaround	■ Vessel Turnaround Time
4 Optimum Asset Utilisation	■ Asset Utilisation/Productivity
5 Contribution to Employment and Economic Value for Nation	■ Number of Jobs or Amount of Value Added Per Ton of Goods Handled
6 Maximum Shareholder Return	■ Return on Invested Capital
7 Minimum Environmental Impact	■ Emission Per Ton of Goods Handled

Table 4.3
KPIs Derived from Operations-Related Performance Indicators

LEADING KPI	PERFORMANCE DRIVERS	DERIVED KPIS	PARTIES INVOLVED
1 Cargo Dwell Time (excluding vessel related time)	<ul style="list-style-type: none"> ■ Terminal management system (IT system and yard operating system) ■ Dwell-time incentives (free storage time)/ customer preferences (to use port as forward storage location) ■ Customs clearance process 	<ul style="list-style-type: none"> ■ Vessel preberthing time ■ Yard dwell time ■ Gate transit time 	<ul style="list-style-type: none"> ■ Customs/port authority ■ Terminal operator, customs, cargo owner ■ Customs, shippers
2 Vessel turnaround time	<ul style="list-style-type: none"> ■ Amount of traffic to be loaded/unloaded ■ Distance from anchor point to berth ■ Efficiency of port service operators (tugs/pilots) ■ Efficiency of terminal operator (working hours, number of cranes, crane speed) 	<ul style="list-style-type: none"> ■ Pre-berthing time (hours) ■ Berthing time/unit of cargo handled ■ Post-berthing time 	<ul style="list-style-type: none"> ■ Customs/port authority (service providers) ■ Terminal operator
3 Asset Utilisation	<ul style="list-style-type: none"> ■ Handling equipment (number of cranes, crane spacing, crane speed, operating hours) ■ Yard storage system (RMG, RTG, straddle carrier, forklifts, etc.) ■ Amount of cargo throughput 	<ul style="list-style-type: none"> ■ Cargo throughput (TEU/ton) per quay meter ■ Cargo throughput (TEU/ton) per hectare of land 	<ul style="list-style-type: none"> ■ Terminal operator (quay design parameters) ■ Terminal operator (yard design)

Source: NTDP Working Group Analysis





















South East Asia are much less than the land freight within the country by rail. Unless proper rationalisation of freight structure is undertaken to make the rate more affordable, a shift may not make economic sense. Ideally, flows should conform to distance advantage, and connectivity plays an important role in making the ideal flows possible. The phenomenon of traffic shifting from one port to another is even more common in situations where

several ports are present in neighbouring states. Consider iron ore transported from Bellary in Karnataka. A comparison of lead distance between the various ports and Bellary reveals that Goa is the closest, followed by Krishnapatnam, Ennore and New Mangalore respectively. However, connectivity to Goa port is through a mountain road with steep grades, which gives other ports a competitive advantage. The railway freight from Bellary to Goa is Rs

Figure 4.29

Dwell Time at Indian Ports in Comparison with Global Best Practices

Indian ports have much higher dwell times than global best practices
Number of days, 2006

	DRY BULK		CONTAINER	
	IMPORT	EXPORT	IMPORT	EXPORT
Indian Average	 38	 27	 2.0	 3.8
Indian Best	 13	 13	 1.2	 1.0
Indian Worst	 64	 34	 8.2	 6.5
	 +171 Per cent	 +93 Per cent	 +186 Per cent	 +443 Per cent
Best Practice	 14	 14	 0.6-0.8	 0.6-0.8

NOTE: Based on best practices at Rotterdam and Singapore ports

Source: Report of the inter-ministerial group on reduction of dwell time in Indian ports, 2009

1,936 per tonne whereas the rate per tonne for Ennore is Rs 1,750. In case of New Mangalore and Krishnapatnam, the rail freight is Rs 1,850 per tonne. This is, however, still an incomplete picture. This railway freight charges are to be seen in conjunction with port handling charges while determining the competitive advantages of each port. Figure 4.28 shows that New Mangalore is the most favourable destination for iron ore from Bellary despite the distance disadvantage.

Another important factor in determining the flow of container cargo is the distribution and location of CFSs and ICDs. It is possible to alter hinterland-port linkages for ideal flows by changing the CFS locations. Containerisation has changed the flow pattern of cargo through ports. All over the world, most break-bulk cargo is being containerised, along with some liquid and project cargo. Thus, CFS and ICD have emerged as key nodes in handling and transportation of cargo within the hinterland. Availability of CFS and ICD facilities in a region attracts container cargo. In India, at present, there is surplus capacity in some of the CFS clusters at Mundra, Kandla, JNPT and Chennai, and deficit capacity at the remaining clusters in the eastern ports. Of all the regions, the container traffic handled at ICDs/



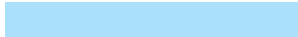





















CFSs in the northern region (including north-central region) is predominant at 54 per cent. Region-wise analysis of ICDs reflects:

- Northern and north-central region—Jammu and Kashmir, Punjab, Haryana, Delhi, Uttaranchal, Himachal Pradesh—has the highest ICD container volume. The major cargo centres are Amritsar, Jalandhar, Ludhiana, Panipat, Delhi, and Dadri. Top two ICDs in the country, namely Tughlakabad (Delhi) and Dhandarikalan (Ludhiana) are in this region. Long lead distances of cargo generating centres in the region generate high container volumes at ICDs.
- The second highest volumes are observed in the southern region, with Bangalore, Chennai, Coimbatore, Madurai and Tuticorin being the major cargo centres. ICDs at Bangalore and Chennai handle large volumes. Though the cargo centres are close to gateway ports, extensive rail network is one of the reasons for high container volumes at ICDs.
- Eastern and central regions have very low ICD movement, since the states in this region—Uttar Pradesh, Madhya Pradesh, Bihar and West Bengal are primarily agricultural states which do not lend themselves to container-

Figure 4.30 Vessel Turnaround Times at Indian Ports in Comparison with Global Best Practices

Indian ports have much longer vessel turnaround times than global best practices
Vessel time spent in port¹, hours, 2010

Indian Ports

ACTUAL TIME SPENT IN PORT NORMALISED FOR 1,000 TEU CALL		
Cochin		46	Cochin		59
Los Angeles		37	Pipapav		48
Chennai		32	Mundra		22
Tuticorin		29	Tuticorin		20
JNPT		28	Chennai		19
Dubai		27	Mumbai		18
Shanghai		18	Los Angeles		12
Pipavav		18	Rotterdam		12
Mundra (Adani)		17	Hong Kong		11
Rotterdam		16	Dubai		10
Singapore		14	Shanghai		10
Hong Kong		13	Singapore		10

¹ Derived from several months of Maersk Line's recorded statistics of port entry and exit times of their vessels
Source: Maersk Line Website

based movement.

Hence, the policy of setting up of CFS and ICDs may need a constant review to ensure balanced distribution within different regions, and to ensure optimal connectivity to ports from the originating centres through these nodes.

MODAL SHARES: ACTUAL VS OPTIMAL

Port traffic within India is carried largely by railways and road transport, with pipelines carrying some crude oil and petroleum products. Alternative modes such as inland waterways have remained largely undeveloped and the situation is unlikely to change substantially in the medium term. Figure 4.28 gives modal shares at various transport modes in evacuation of cargo at Major Ports during 2010-11.

These modal share estimates are based on some assumptions on commodity-wise optimal mode of transport, the geographical features of the regions, certain cargo characteristics, and distances travelled from the hinterland. For instance, cargo such as coal and iron ore would preferably be transported by railways unless alternative arrangements such as conveyors are available. The estimates⁶ suggest that while the railways should have carried 34 per cent of port traffic, it actually moved only 24 per cent. Roads,

by contrast, presently carry 36 per cent of the traffic as compared with the 22 per cent they should ideally carry.

Therefore, it is not just important to have overall sufficient levels of hinterland connectivity. It is important to have the necessary connectivity within each preferred mode for a particular port for a particular commodity.

PORT OPERATIONS

Operational performance indicators can help enhance port performance by identifying areas for closer attention. The next step is to collaborate with all stakeholders to facilitate the working of operational areas under their control.

KEY PERFORMANCE INDICATORS

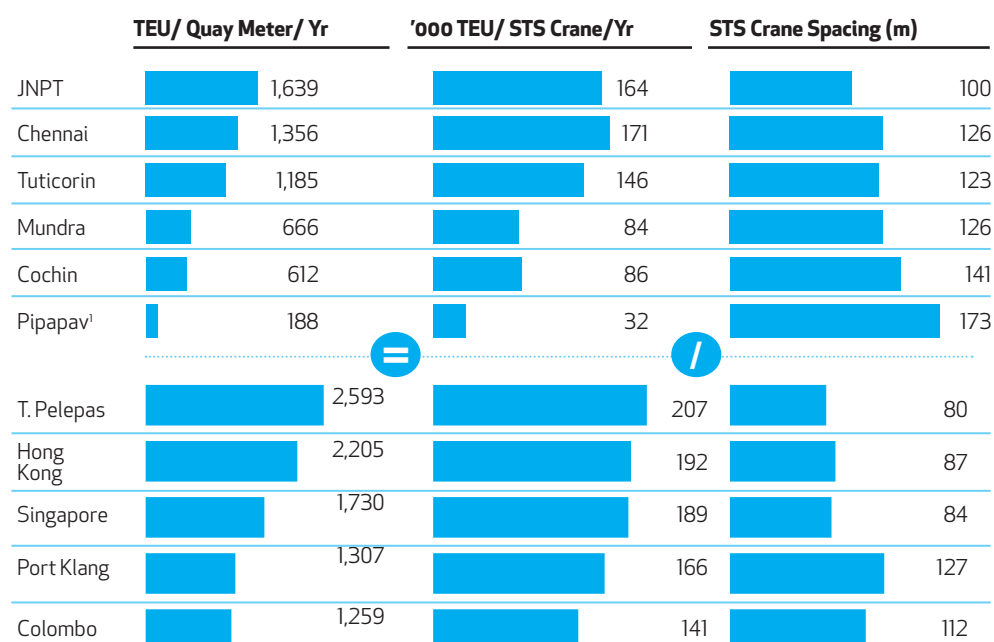
Ports serve different objectives during various stages of maturity (Table 4.2). Certain operations-related key performance indicators (KPIs) help measure and improve operational performance at ports.

Three of these leading KPIs are relevant in port operations: fast cargo transit, fast vessel turnaround and

6. World Bank Report 2007

Figure 4.31 Terminal Quayside Productivity at Indian Ports in Comparison with Other Countries

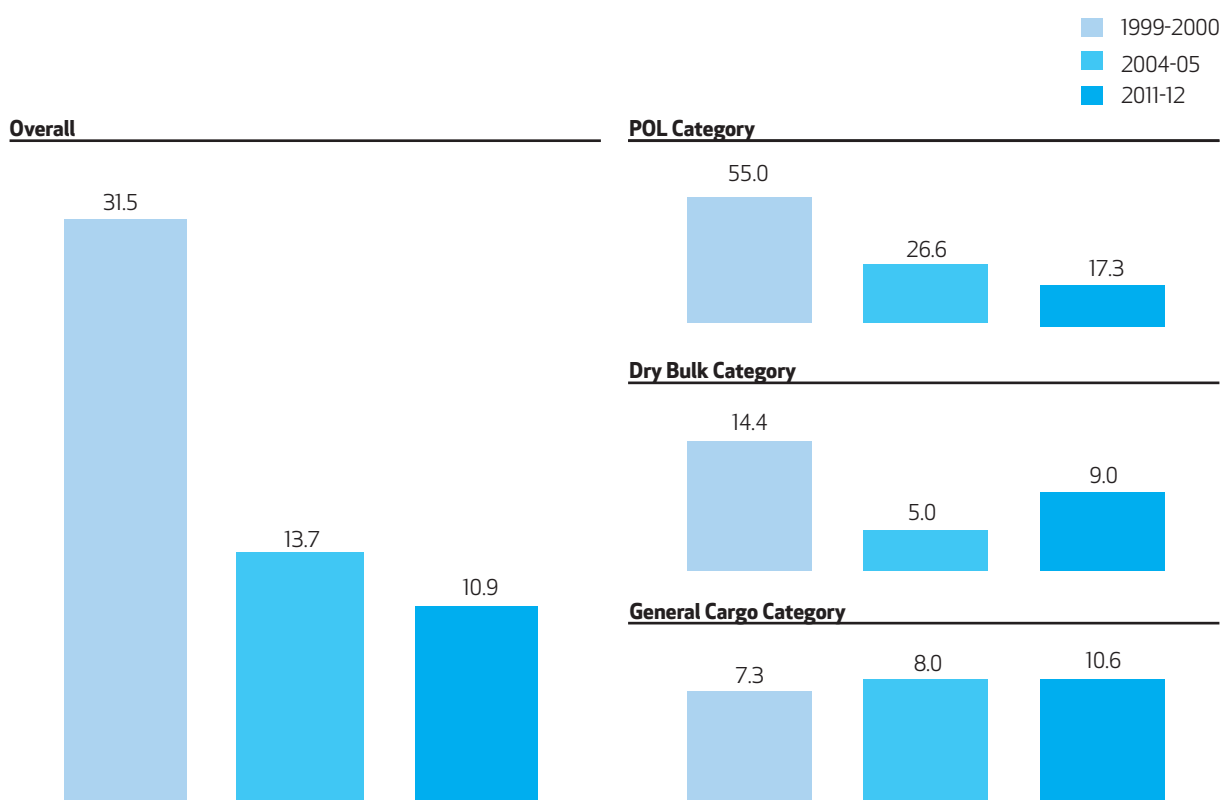
Terminal quayside productivity at Indian ports is far below global figures
2008



- JNPT is the only port that comes close to quayside performance of best practice ports
- Quayside performance partially affected by scale

¹ Pipapav is in ramp-up phase
Source: Containerisation International

Figure 4.32 Share of Indian Tonnage [Per cent, 1999-2000 to 2011-12]



Source: NTDP Working Group Report on Ports and Shipping

optimum asset utilisation. Each has its own performance drivers and parties involved in the outcome. And each can be broken down to a set of derived KPIs for better and easier monitoring (Table 4.3)

Cargo dwell time Cargo dwell time, or transit time, consists of the time before the ships are allowed to berth, the time they spend unloading and loading, and the time the cargo spends in the yard before being picked up or dropped off by shippers in the port. Parties involved in the overall dwell time of the cargo are the customs authority (clearance process), port authority (vessel planning), terminal operations (load handling) and shippers (port as inventory stock). Any cuts in cargo dwell time can reduce the inventory cost of shippers. Good information management systems, incentives to limit extra storage time and smooth customs processes are all drivers of shorter dwell time.

The average Indian port lags far behind on international best practices in this KPI the dwell times of both container and bulk cargo are at least double that of international best ports (Figure 4.29). While the best performing Indian ports are in line with international best practices, the worst performers in India are two to 10 times worse.

Vessel turnaround time This is the time needed for loading, discharging and servicing a vessel from berthing until its departure. The main parties involved in vessel turnaround are the port authority and the terminal operators. Seamless communication between these parties and the ship operators is essential for a quick vessel turnaround process.

Important drivers of vessel turnaround time are the amount of traffic to be loaded or unloaded, distance from anchor point to berth, efficiency of port authority in pilotage/ tugging and the efficiency of terminal operator in handling the vessel.

Indian ports have huge potential to reduce the average time a vessel spends in the port as compared to international best practices (Figure 4.30). To a certain extent, scale plays a role here, but even ports of the scale of JNPT and Chennai have 50 to 100 per cent higher turnaround times than international best practice ports like Singapore and Rotterdam.

Asset utilisation High productivity of port assets such as quay and land plays an important role in vessel turnaround time and cargo dwell time. Asset productivity is also important given the ultimate public ownership of ports and therefore the return on capital of assets.

Productivity, however, can be constrained by bottlenecks, which usually lie in quayside operations—the most expensive element of overall costs. On rare occasions, the bottleneck can also lie in yard layout

Coastal shipping is the cheapest and least polluting mode of transport (Rs 0.55 per tonne-km versus Rs 0.90 for rail and over Rs 1.50 for road). India's road and rail infrastructure in most high traffic areas are running at over 100 per cent utilisation. Coastal shipping can significantly help improve energy security and carbon footprint of India

or extreme water and soil conditions that hamper berth construction.

The main parties that manage asset productivity are the terminal operator and the port authority. While the port authority is principally involved in the design phase around the layout of the port and the location of the terminal, the terminal operator is responsible for the terminal layout and production system quay and yard cranes.

Indian container terminal operators are lagging behind their international peers in operational efficiency, in terms of TEU (Twenty-foot Equivalent Unit, representing a container of 20 feet length) throughput per metre of quay (Figure 4.31). This is due to a combination of crane spacing average distance between cranes and the productivity of individual cranes. Large-scale Indian container terminal cranes should be able to run at 170,000 to 190,000 TEU per crane per year, whereas smaller ones should at least be able to achieve 100,000 TEU. Crane spacing in India should be reduced to approximately 80 m for larger operations and 100 to 120 m for smaller terminals.

SHIPPING

India has one of the largest merchant shipping fleets among developing countries and is ranked 16th in the world in terms of gross tonnage under its flag.

DECLINING SHARE OF INDIAN BOTTOMS IN OVERSEAS TRADE

The overall share of Indian ships in the carriage of the country's overseas seaborne trade has been declining over the years. From about 40 per cent in the late 1980s, it is currently around 10.87 per cent (Figure 4.32)

TAX REGIME

The current treatment of indirect tax (service tax) on voyage and time charter makes Indian shipping expensive. Given the far greater tax advantage available to a majority of foreign players, it is felt that the rather restrictive regime in India fails to provide a level playing field to national shipping lines.

COASTAL SHIPPING

The choice of port management model adopted in a country is influenced by the socioeconomic structure of a country, the historical development of the port, the location (urban area or isolated region), and the types of cargo that are typically handled (liquid or dry bulk, containers)

Coastal shipping is an ideal solution to help de-bottle-neck India's infrastructure and logistics challenge.

It is the cheapest and least polluting mode of transport (Rs 0.55 per tonne-km versus Rs 0.90 for rail and over Rs 1.50 for road). With India's road and rail infrastructure in most high traffic areas running at over 100 per cent utilisation, there is urgent need to create additional capacity. Given land acquisition problems and other challenges, coastal shipping offers a relatively easier option. It can significantly help improve energy security and carbon footprint of India.

Yet, coastal shipping remains underdeveloped, because it faces the following challenges:

- Penetration of container shipping is low, with the east coast at zero penetration. As on 31 December 2012, monthly container capacity of Indian shipping companies' is 14,287 TEUs/month (all of it on the west coast) according to the Director General of Shipping.
- Lack of port infrastructure leads to higher turnaround times. This is primarily due to low priority for berthing of coastal container ships. Even a two-day wait for a coastal container ship increases the cost of the movement by close to 10 per cent given the short voyage durations.
- Duties are higher for coastal vessels. The total duty on bunkering for coastal ships is presently over 30 per cent. This makes shipping on the Indian coast more expensive relative to international shipping, as well as coastal shipping in other countries. This adds 10 per cent to the overall cost of movement. Further, the inconsistency in provision of fuel subsidy (diesel subsidy of Rs 9.28 per litre) between road / rail and shipping (no subsidy) creates price distortion.
- Evacuation infrastructure is poor, including road and rail connectivity at many key ports, leading to increased land bridging costs and reduced service levels.
- Coastal vessels are unable to attract adequately qualified sailors, given preference for ocean going vessels due to tax exemption. Personal tax exemption for sailors alone can reduce operating cost by 5 per cent.
- Getting adequate financing for coastal ships is difficult due to lack of dedicated agencies and inability to leverage the ECB route for lack of

foreign currency earnings.

- A judicious view must be taken on cabotage law with a longer perspective. Indian cabotage restrictions may discourage the growth of coastal shipping insofar as Indian tonnage is not adequate. It is also argued that international competition would bring about greater efficiency. A counter-argument is that relaxing cabotage laws will tilt the scales against Indian shipping. However, if the primary objective is to increase coastal shipping and make coastal tonnage competitive, it might be desirable to allow foreign vessels to compete for coastal cargo. A stricter cabotage law can be enforced later when there is sustained growth in coastal shipping. There is also a view that cabotage on carriage of empty and/ or transshipment containers should be partially relaxed with certain conditions. This may facilitate the efficient movement of containers as well as ease congestion at ports and port storage.
- Considering that coastal vessels do not have to conform to the different conservancy and safety requirements in different foreign ports and face the hazards of the high seas, there is a strong case for revisiting the issue of safety. Coastal vessels are constructed to specifications of oceangoing vessels even though they are not subject to the same stress and turbulence. This needlessly increases capital costs.

INLAND WATER TRANSPORT

India's IWT sector is relatively under-developed compared to other large economies due to a mix of natural reasons (such as inadequate depth and seasonal siltation) and policy lacunae (among them, lack of public investment and preferential treatment of other modes).

NAVIGATIONAL INFRASTRUCTURE

Absence of adequate navigation infrastructure is one of the biggest challenges facing the sector.

Inadequate: depth Large parts of Indian Waterways have inadequate depth for commercial movement of cargo. Sufficient depth or Least Available Depth (LAD) is required to enable navigability of larger vessels, essential to make IWT commercially viable through economies of scale. Moreover, Indian rivers (especially rivers in the northern plains) face severe problems of siltation round the year. The river bed rises, impeding movement of cargo during non-monsoon months.

Inadequate air draft: Multiple bridges with low vertical clearance obstruct the passage of bigger IWT vessels on waterways such as NW-3. There are several navigable canals in the states of Uttar Pradesh, Bihar, West Bengal, Tamil Nadu and Andhra Pradesh: Sarada canal, Ganga canal, Yamuna canal, the delta canal systems of the Krishna, Godavari, Mahanadi

Table 4.4
Port Governance Models

	INFRASTRUCTURE	SUPERSTRUCTURE	PORT LABOUR	OTHER FUNCTIONS
Public Service Port	Public	Public	Public	Majority Public
Tool Port	Public	Public	Private	Public / Private
Landlord Port	Public	Private	Private	Public / Private
Private Service Port	Private	Private	Private	Majority Public

Source: Port Reform Toolkit, World Bank, 2007

and Brahmani. But these cannot be utilised for cargo movement due to air draft restriction.

Shortage of IWT: vessels Vessel building is highly capital intensive and faces difficulties in obtaining project finance from banks and financial institutions since it does not enjoy 'infrastructure' status. The private sector is reluctant to invest in barges unless long-term cargo commitments for onward/return trips are made from user industries.

Lack of night navigation infrastructure: Rudimentary night navigational facilities and markings are also a major issue.

Shortage of MRO facilities: There is severe shortage of MRO (Maintenance, Repair and Overhaul) facilities for IWT vessels.

POLICY PARITY

The government needs to establish a level playing field between the various transport modes. While IWT is cost competitive in general with other transport modes such as rail and road, the situation is sometimes distorted by preferential treatment offered to other modes. An example is freight subsidy for transportation of fertiliser being extended to rail and road but not to IWT. This artificially makes rail and road more competitive on the cost curve and drives traffic away from IWT. Road and rail also enjoy preferential tax treatment.

MODAL INTEGRATION

Lack of intermodal IWT terminals on inland waterways inhibits door-to-door connectivity. There are IWT terminals on NW-1, NW-2 and NW-3, but most of these terminals are not properly linked with road/rail networks.

Given that IWT terminals are not final destinations in themselves but nodes in a larger logistics chain, it is imperative to establish good road and rail last-mile connectivity.

LACK OF PUBLIC INVESTMENT

While considerable emphasis has been laid on development of rail and road infrastructure in successive Five-Year Plans, IWT has received scant attention. Consequently, public investment in IWT has been far below the levels in other modes.

To illustrate the case in point, while development/maintenance cost of road is about Rs 50 million per km, the amount spent in the last 24 years on development of the fairway of 2,716 km of the existing three National Waterways is only about Rs 8 billion Rs 3 million per km only. To put the total investment figure in perspective, the corresponding investment in the road sector the NHDP programme for widening and upgrading of National Highways is Rs 3,000 billion and that for railways, Rs 593.60 nbillion for 2011-12 alone. At this rate of investment, the possibility of IWT becoming viable as a mode of transport is limited.

Since the extent of public investment is limited in the transport sector, this situation poses a choice for the government. Do funds need to be redirected towards IWT to make it a commercially viable mode? Or should the funds instead be used for the modes of transport that have the maximum potential impact because of the sheer volume of cargo and passenger traffic they carry? The answer is as important as the other decisions on technical, regulatory and operations issues in the ports, shipping and IWT sector.

LEARNING FROM GLOBAL BEST PRACTICES

PORTS

Port governance is structured by ownership and administration models and regulatory frameworks. A short summary of these models and frameworks may be useful before moving on to describing international case examples for a selected set of countries.

GOVERNANCE MODELS

Box 4.1

Public Private Partnership (PPP) in Ports

The role of the port authority is to provide and manage common facilities like the breakwater and entrance channel, utilities and road and rail access; and to plan and implement the expansion and development of the port. Most PPP models in the ports sector sit within a landlord port structure in which a public sector port authority (often autonomous) enters into PPP contracts for a series of individual terminals. The operators of the terminals are usually different, and the PPP model used may differ from one terminal to the next. The most common PPP models for individual business units are:

The management/ investment model for existing public assets: The private operator manages publicly owned assets and makes additional investments in them, in exchange for being given the right to use them for a specified period of time. Ownership of the public assets remains with the public sector throughout this period; this type of PPP model is generally associated with the port privatisation programmes which have taken place since the late 1980s in southern Europe, South America, Africa and South Asia.

The development rights model for new private assets. Here the private investor buys the right to build new port assets and have exclusive use of them for a fixed period of time before transferring them over to the public sector. This is a model which has been increasing in popularity in the ports sector as the stock of public assets suitable for private management has dwindled. However it raises the question of why private investors should have to give back their assets to the public sector, often free of charge, when a hotel complex built on the same waterfront site would be treated as freehold property.

The public-private joint venture model. In this, the public sector has an influential or controlling stake in the Special Project Vehicle (SPV) set up to hold either a management-investment contract or a development rights contract for new port facilities. These contracts otherwise operate broadly as described above, although the existence of a large public sector stake in the SPV has a significant effect on the detailed provisions of the contract. This type of PPP model has become the norm in China and Indonesia, but is rarely found elsewhere.

Management contracts, where the private sector operates port facilities on behalf of the public sector with minimal investment of its own, are also now quite rare. This is partly because they generate small returns in relation to the inputs of relatively scarce management time required. There is also a history of failure caused by conflicts over strategy, usually arising when private operators are not given the freedom they need to satisfy public sector objectives for the contract.

Short-term leases of public assets of up to 15 years, are more popular than management contracts because they give the operator greater commercial freedom.

Source: India Port Sector Policy Review Study, Ecorys, Rotterdam, March 2012. Adapted from Observations on PPP Models in the Ports Sector (2011), Sheila Farrell

During the past three decades, discussions on port reforms focused particularly on the relevance of a number of port management or administration models. The choice of model adopted in a country is influenced by the way the ports are organised, structured, and managed. These factors include the socioeconomic structure of a country, the historical development of the port, the location (urban area or isolated region), and the types of cargo that are typically handled (liquid or dry bulk, containers).

These models differ by whether the services are provided by the public sector, private sector or mixed ownership providers; their orientation (local, regional or global); who owns the superstructure and capi-

tal equipment; and who provides dock labour and management.

SERVICE PORT MODEL

This is a predominately public model in which the Port Authority owns the land and all available assets—fixed and mobile, and performs all regulatory and port functions. All cargo handling operations are performed by labour directly employed by the Port Authority. This model is used in a (decreasing) number of developing countries.

A Service Port is usually controlled by the Ministry of Transportation (and/or Communications). The Chairman of the Port Authority is usually a civil servant who directly reports to the appropriate Minister. In some cases, cargo handling services are per-

formed by separate public entities; this division of operations between separate public entities can present unique management challenges.

Under this model, the same organisation has the responsibility for performing regulatory functions, developing infrastructure and superstructure, and executing operational activities. In general, there is no private sector involvement.

The strength of this model is that facilities development and operation are the responsibility of only one entity, making for a streamlined and cohesive approach. On the other hand, the dearth of internal competition can lead to inefficient administration, lack of innovation, and services that are not user- or market-oriented. Dependence on government for funding may lead to wasteful use of resources or under-investment.

TOOL PORT MODEL

Here, operational responsibilities are divided. The Port Authority owns, develops, and maintains the port infrastructure and superstructure, including cargo handling equipment. Port Authority equipment is usually operated by its own labour, but other operations are performed by private cargo handling firms, on board vessels as well as on the quay and apron. The private operators are usually small firms. While duplication of facilities is avoided, since investment in infrastructure and equipment is provided by the public sector, the fragmentation in responsibility for cargo handling can lead to conflict between small operators and between stevedoring companies and port administrators. Another weakness of the model is the risk of under-investment. Strong stevedoring companies are not developed as a local economic benefit.

LANDLORD PORT MODEL

The Port Authority maintains ownership of the port, while the infrastructure is leased to private operating companies. The Port Authority's responsibilities as landlord include economic exploitation, long-term development of the land, and maintenance of basic port infrastructure such as access roads, berths, and wharves. The private operating companies that lease from Port Authority provide and maintain their own superstructure and purchase and install their own equipment. Dock labour is also employed by the private firms.

The advantage: the same entity both executes operations and owns the cargo handling equipment; so the planning is likely to result in better outcomes and is more likely to respond effectively to changing market conditions. However, sometimes, there may be a duplication of marketing effort as both terminal operators and the Port Authority visit potential customers; so the model needs fine planning and co-ordination between stakeholders.

The regulator for port competition should preferably have the character of an arbitrator rather than a court of law, and be accepted by the port community as being independent. In case boundaries between port authorities and terminal operators are vague or nonexistent for instance, a regulator might be a solution for guaranteeing a level playing field for all operators

PRIVATE SERVICE PORT MODEL

Here, the public sector (the State) no longer has any interest in port activities. Port land is owned by the private sector. All regulatory functions and operational activities are performed by private companies. This is the model used in many ports in the UK.

A particular strength of the model is that port development and tariff policies tend to be market-oriented. On the other hand, it could result in monopolistic behaviour as well as a loss of public involvement in developing long-term economic policy and strategies.

Today, the landlord model is the mainstream port governance structure worldwide and becoming the dominant port model in larger and medium-sized ports. The Landlord port is characterised by its mixed public-private orientation. Under this model, the publicly governed port authority acts as regulatory body and as landlord, while private companies carry out port operations (especially cargo-handling).

Though widely acknowledged, the landlord model is not fully implemented everywhere since it requires a level of institutional and managerial competence which is not always available in port organisations. Moreover, transition to the landlord model assumes a regulatory framework in place geared to encourage fair competition on a level playing field.

ECONOMIC REGULATORY FRAMEWORK

The shift in the role of the public sector from port services provider to a landlord calls for enhanced responsibilities as a regulator of activities that are now executed by the private sector.

Regulation in the port sector may entail controlling behaviour of port sector entities by rules or regulations or alternatively a rule or order issued by an executive authority, a regulatory agency or a Port Authority, having the force of law. Regulation may cover all activities of public or private behaviour—economic, social, environmental, safety and security—that may affect the development and management of ports and port terminals including their access roads, rail links, pipelines and waterways.

Economic regulation typically involves intervention in the functioning of markets in terms of setting and controlling tariffs, revenues, and profits; controlling market entry or exit; and ensuring that fair and competitive practices are maintained within the sector. The overarching philosophy of regulation under the landlord model is that of competition regulation as opposed to tariff regulation.

PORT COMPETITION

There are three categories of port-related competition:

- **Inter-port competition** The scale of inter-port competition often depends on the size of the hinterland of the concerned ports. For example, Rotterdam competes with Antwerp, Hamburg, and Bremen for cargoes destined for Central Europe. Trans-shipment container trade competition often concerns an entire region; for example, in South Asia, Colombo is competing with Singapore, Tanjung Pelepas, Dubai, Salalah, Aden, and possibly with Valparadam.
- **Intra-port competition** refers to a situation where two or more terminal operators within the same port area compete for the same type of cargoes. In general, intra-port competition is favoured by both government and port users, but is not always feasible. It depends on the volume of the cargo, which has to be sufficient to allow two or more operators to run profitable and effective businesses.
- **Intra-terminal competition** refers to two or more (stevedoring) companies competing within the same terminal. This situation is rare and usually only exists within small ports operating under the service port model with independent stevedores.

Establishing competition in the port sector requires four steps:

- Assessment of sector unbundling, especially in the case of a public service port. This relates to the financial and economic feasibility of creating more than one terminal handling the same commodity.
- Implementation of the new port management structure, if and when required.
- Conclusion of concession or lease agreements that include tariff regulation mechanisms, if required by the absence of intra-port competition.
- Introduction of regulatory oversight by the government (port competition act), but only with respect to those tariffs that relate to a monopolistic market situation.

When intra-port competition is deficient or absent, terminal operators, public or private, have an incentive to use their monopolistic market position to charge high tariffs particularly for captive cargoes which may justify regulation. The need for such reg-

ulation may lead to the creation of an independent port competition regulator. This regulatory function is usually instituted by law.

The main objective of the regulator is to ensure fair competition among operators in the port; control monopolies including public ones and mergers; and prevent anticompetitive practices. Generally, a port sector regulator has powers to interfere in anticompetitive practices such as:

- Use of a dominant position to prevent or lessen competition
- Cross-subsidisation from monopoly services to contestable services, where it threatens fair competition
- Price fixing among competitors
- When a firm or a person providing port services pursues a course that of itself has or is intended to have the effect of restricting, distorting, or preventing competition
- Monopoly situations, which are most likely to occur in medium size or smaller ports. In many ports, only one container or oil terminal exists. Generally, when a monopoly or merger situation is not in conflict with the public interest, it may be permitted.

The regulator for port competition should preferably have the character of an arbitrator rather than a court of law, and be accepted by the port community as being independent. In case boundaries between port authorities and terminal operators are vague or nonexistent for instance, when a port authority not only runs its own container terminal but also owns shares in a competing facility, as is the case in Sri Lanka, a regulator might be a solution for guaranteeing a level playing field for all operators. The regulator and a possible national level competition regulator may have a concurrent role where cases may be referred equally to either of them based on who is most suited for a required intervention. The regulator, however, should not jeopardise the legal powers of port authorities to operate freely in the market or the ability of a terminal operator to negotiate tariffs with its clients.

In principle, tariff setting or other price controls should not be exercised under the landlord model but left to the market. Rather, economic regulation pertains to establishing conditions for fair competition on a level playing field. Only under serious market imperfections, as mentioned above, some pricing control may be indicated.

PORT REGULATORY POLICY

To help design an economic regulatory policy, reflecting the above principles of enhancing competition, the following guidelines have been suggested in the World Bank Port Reform Toolkit:

- Government should have a clear understanding of the competitive environment of the

Table 4.5
Key Agencies in USA

KEY AGENCIES	ROLE
Department of Transportation (DoT)	<ul style="list-style-type: none"> To serve the United States by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets vital national interests and enhances the quality of life of the American people, today and into the future Oversees federal highway, air, railroad, and maritime and other transportation administration functions
U.S. Maritime Administration	<ul style="list-style-type: none"> The Maritime Administration is the agency within the U.S. Department of Transportation dealing with waterborne transportation. Its programs promote the use of waterborne transportation and its seamless integration with other segments of the transportation system, and the viability of the U.S. merchant marine

Source: India Port Sector Policy Review Study, World Bank

Table 4.6
Key Agencies in Canada

KEY AGENCIES	ROLE
Transport Canada	<ul style="list-style-type: none"> Transport Canada is responsible for transportation policies and programs. It ensures that air, marine, road and rail transportation are safe, secure, efficient and environmentally responsible.
Infrastructure Canada	<ul style="list-style-type: none"> The main trading ports are Canada Port Authorities (CPAs) and these fall under federal jurisdiction. Under the Canada Marine Act (CMA), the federal government owns the port lands and infrastructure of six CPA ports in the province [British Columbia] but leaves administration to local authorities The CMA was introduced to allow ports to be more responsive to market opportunities. The Port Authorities provide port infrastructure (e.g., vessel berths) and lease terminal sites to private operators

Source: India Port Sector Policy Review Study, World Bank

Table 4.7
Key Agencies in The UK

KEY AGENCIES	ROLE
Department for Transport	<ul style="list-style-type: none"> The Department for Transport provides leadership across the transport sector to achieve its objectives, working with regional, local and private sector partners to deliver many of the services.
Infrastructure Planning Commission (IPC)	<ul style="list-style-type: none"> The IPC is the independent body that decides applications for nationally significant infrastructure projects. These are the large projects that support the economy and vital public services, including railways, large wind farms, power stations, reservoirs, harbours, airports and sewage treatment works
Scottish Executive	<ul style="list-style-type: none"> The devolved government for Scotland is responsible for most of the issues of day-to-day concern to the people of Scotland, including health, education, justice, rural affairs, and transport.
Welsh Assembly	<ul style="list-style-type: none"> Devolved Government for Wales
Northern Ireland Executive	<ul style="list-style-type: none"> Devolved Government for Northern Ireland

Source: India Port Sector Policy Review Study, World Bank

- port sector
- A decision on economic regulation should be based on the risk of anti-competitive behaviour or on evidence that monopolistic behaviour is occurring and that other methods of intervention (for example, cease-and-desist orders, sanctions, or fines) are not feasible, adequate, or appropriate.
- The regulator should clearly define what form of economic regulation (for example, rate of return or tariff setting) is to be applied and under what circumstances
- Responsibilities for regulation of port opera-

- tions and competition should be formally separated and assigned to two different entities
- In the event that economic regulation is imposed, regulators will need to have a reasonable understanding of the cost structure of the operation; this means that regulators will need proprietary financial information and will have to weigh the trade-offs between the need for information and the burden of the reporting requirements on the operators
- When a determination is made that economic regulation is not necessary, but instead tariff monitoring or approval is warranted, then the

Table 4.8
Port Management Approaches in the EU

PORT MANAGEMENT APPROACHES IN EU				✓ Dominant model in a member state
MEMBER STATE	MEMBER STATE	GOVERNMENT DIRECT	PORT MANAGEMENT PUBLIC ENTITY	PRIVATE ENTITY
Belgium	Municipal/Regional		✓	
Cyprus	National		✓	
Denmark	Municipal/Regional	✓	✓	✓
Estonia	National		✓	
Finland	Municipal	✓	✓	✓
France	National/Regional	✓	✓	
Germany	Regional/Municipal	✓	✓	✓
Greece	National/Municipal		✓	
Ireland	National		✓	✓
Italy	National	✓	✓	
Latvia	National/Municipal		✓	
Lithuania	National		✓	
Malta	National		✓	
Netherlands	Municipal/Regional/ National		✓	✓
Poland	National/Municipal		✓	
Portugal	National		✓	
Slovenia	National		✓	
Spain	National/Regional		✓	
Sweden	Municipal	✓	✓	
UK	National /Municipal/ Regional	✓	✓	✓

Source: India Port Sector Policy Review Study, World Bank

regulator will need to clearly set out the tariff reporting requirements, the review process, and impose a time limit on itself as to when an approval decision is to be made

- The entire competition regulation policy should be conveyed to the port and shipping community, as should the disposition of anti-trust cases and regulatory policy decisions
- Policy and case deliberations should include the opportunity for affected parties to present their views
- Any decisions made by the regulator should be enforceable with recourse for appeal

KEY REGULATORY AGENCIES

Under the Landlord Port Model, the following entities are active as regulators:

- The Ministry responsible for port affairs, with

respect to drafting and implementation of transport and port laws, national and international conventions, regulations and decrees

- The public Port Authority issuing bye-laws inter alia with respect to safety of vessels in port or at anchor, reporting and communication with vessels, berthing, securing of vessels, shifting, control of dangerous goods in ports, delivery of sewerage, obnoxious and toxic wastes, specific use of terminal areas and other specific port-related issues. As part of its landlord function, a Port Authority concludes rent, lease and concession agreements with private operators and port users

Apart from generally applicable legislation by any competent authority, specific port related regulation can also be exercised by a Competition Regulator giving regulations and specific orders to prevent anti-

Table 4.9
Key Agencies in Australia

KEY AGENCIES	ROLE
Department of Infrastructure, Transport, Regional Development	<ul style="list-style-type: none"> The Department of Infrastructure, Transport, Regional Development and Local Government is responsible for infrastructure planning and coordination; transport safety, including investigations; land transport; civil aviation and airports; transport security; delivery of regional and rural specific services; maritime transport including shipping; regional development; matters relating to local government; and major projects facilitation
National Transport Commission (NTC)	<ul style="list-style-type: none"> The role of the National Transport Commission is to work closely in partnership with peak industry bodies and government to develop more consistent, practical and effective land transport policies, laws and practices.
State Government Departments of Transport	<ul style="list-style-type: none"> Infrastructure Australia will develop a strategic blueprint for the nation's future infrastructure needs and – in partnership with the states, territories, local government and the private sector – facilitate its implementation. It will provide advice to Australian governments about infrastructure gaps and bottlenecks that hinder economic growth and prosperity. It will also identify investment priorities and policy and regulatory reforms that will be necessary to enable timely and coordinated delivery of national infrastructure investment
Australian Transport Council (ATC)	<ul style="list-style-type: none"> The ATC was established in June 1993 to provide a forum for Commonwealth, State, Territory and New Zealand Ministers to consult and provide advice to governments on the co-ordination and integration of all surface transport and road policy issues at a national level
State Government Departments of Transport	<ul style="list-style-type: none"> Each State Department of Transport is responsible for road, rail and port policy in their respective states

Source: India Port Sector Policy Review Study, World Bank

Table 4.10
Evolution of Port Governance in China

PHASE	POLICY	KEY ELEMENTS OF POLICY
Phase I (1979-1984)	<ul style="list-style-type: none"> Central control of port sector 	<ul style="list-style-type: none"> Port ownership with Ministry of Communications; key functions included <ul style="list-style-type: none"> Control of planning and strategy Management of operational activities Definition of infrastructure priorities
Phase II (1984-2004)	<ul style="list-style-type: none"> Decentralised control of ports 	<ul style="list-style-type: none"> Classification of 14 coastal cities as "Open cities" Regulations introduced by State council to promote economic cooperation and terminal interchange with foreign countries; and to speed up development of ports and terminals
Phase III (2004 onwards)	<ul style="list-style-type: none"> Further decentralisation and beginning of corporatisation 	<ul style="list-style-type: none"> "Port Law" introduced in 2003; seen as a signal of high importance attached to port industry by the state Primary ownership with local authorities Central government only plays an oversight role in strategic planning

Source: India Port Sector Policy Review Study, World Bank

Table 4.11
Key Agencies in Shanghai Port

KEY AGENCIES	ROLE
Shanghai Port Authority	<ul style="list-style-type: none"> In 2003 Shanghai's port oversight body underwent a restructure resulting in the Shanghai Port Administration Bureau, which took responsibility for port planning, administration and regulations, and the Shanghai International Port Group (SIPG). The latter was designated port manager and operator and also given responsibility for the operation and management of Yangshan's first five berths Today administration of the Shanghai Port is the charge of the Shanghai Municipal Transport and Port Authority (the "Shanghai Port Authority"), which has the authority to: <ul style="list-style-type: none"> Implement guidelines and policies and enforce laws, rules and regulations Formulate plans and strategies for the Shanghai harbour (including Yangshan); Enforce trade regulations application to the Yangtze River (within the Shanghai municipality); Supervise and manage environmental issues Coordinate research and development Supervise the quality and safety of construction projects Vessel management Tarification Supervise and administer pilotage within the port; Conduct cooperation and technical exchanges between the Shanghai Port and other domestic and foreign ports; and Administer technical and vocational training, including examinations and the issuance of certificates for workers engaging in port activities
Shanghai International Port Group (SIPG)	<ul style="list-style-type: none"> Established in 2003, the SIPG was wholly floated on the Shanghai Stock Exchange in 2006. Its major shareholders are the Shanghai Municipal Council (44 per cent), China Merchants International Terminals (Shanghai) Co Ltd (26 per cent), and Shanghai Tongsheng Investment (Group) Corp (16 per cent). The Shanghai Municipal Council's major stake is consistent with the model of governance adopted throughout China since it began to corporatise and privatise ports from 2001

Source: India Port Sector Policy Review Study, World Bank

Table 4.12
Key Agencies in Singapore Maritime

KEY AGENCIES	ROLE
Maritime and Port Authority of Singapore	The Maritime and Port Authority of Singapore (MPA) regulates and licenses port and marine services and facilities. It also manages vessel traffic in the Singapore port while ensuring safety and security. The port section contains information, guidelines and procedures on matters relating to the port and its operations. The shipping section covers information on how to register a ship under the Singapore flag as well as manning guidelines, procedures and requirements for owners and masters of Singapore-registered ships. MPA also posts circulars and notices to update the port and shipping community. Also important to the communities are information on port, shipping and other MPA tariffs. As an active member of the international maritime community, MPA posts updates on IMO matters.
PSA Singapore Terminals	The Port of Singapore Authority was formed on April 1, 1964 to take over the functions, assets and liabilities of the Singapore Harbour Board. On August 25, 1997, a parliamentary bill was passed to corporatise the Port of Singapore Authority, and PSA Corporation Ltd was created. PSA's staff are represented by the Singapore Port Workers Union and the Port Officers' Union. Both unions enjoy a close relationship with PSA's management.
Singapore Maritime Academy (SMA)	As the country's main maritime training institution, SMA offers a full range of maritime diplomas and specialist diplomas, Certificate of Competency (CoC) courses as well as Standards of Training, Certification and Watchkeeping (STCW) courses.

Source: Agencies' official websites

competitive behaviour in ports or abuse of dominant position by a Port Authority or private operators. Usually a Competition Regulator has the power to issue a tariff order. It might also deal with mergers of port service providers which endanger fair competition in ports. The Competition Regulator could be positioned at different levels: Sub-sector, eg. Sea-ports; Sector, eg. 'transport' or 'infrastructure'; Multi-sector, eg. National Competition Policy; and Maritime Authority, in the event that the Port Authorities are deemed to be too commercially oriented.

INTERNATIONAL EXAMPLES: PORT GOVERNANCE

USA

In the US, the majority of ports are owned and managed by counties and municipalities and operate as landlord ports. The port operations are largely in the hands of private enterprise. Key agencies in the USA and their role are provided in Table 4.5.

CANADA

The main trading ports in Canada are Canada Port Authorities (CPAs) and these fall under federal jurisdiction. Under the Canada Marine Act (CMA), the federal government owns the port lands and infrastructure of six CPA ports in British Columbia, but leaves administration to local authorities. The CMA was introduced to allow ports to be more responsive

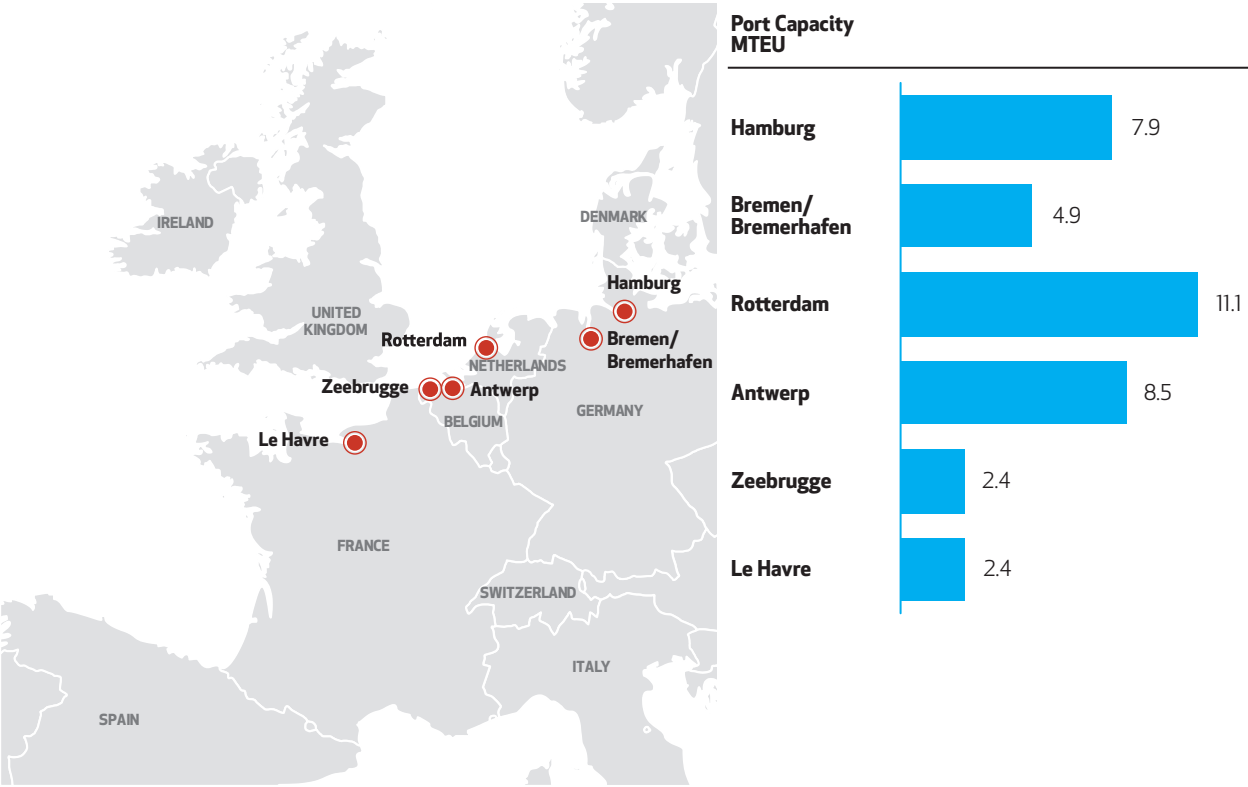
to market opportunities. The Port Authorities provide port infrastructure and lease terminal sites to private operators. Table 4.6 lists the key agencies in Canada and their role.

UK

Most commercial ports' operations have been privatised. Fifteen of the 20 largest ports (by tonnage) in the UK are in private ownership, which accounts for two-thirds of the UK's port traffic. These private ports have no government investment; all their investment must be privately financed on a commercial basis. Many of the smaller ports are trust ports (independent statutory organisations but without shareholders), as well as a few larger ones such as the Port of London Authority. A few ports are also municipal ports belonging to local authorities. Key agencies in UK and their role are provided in Table 4.7.

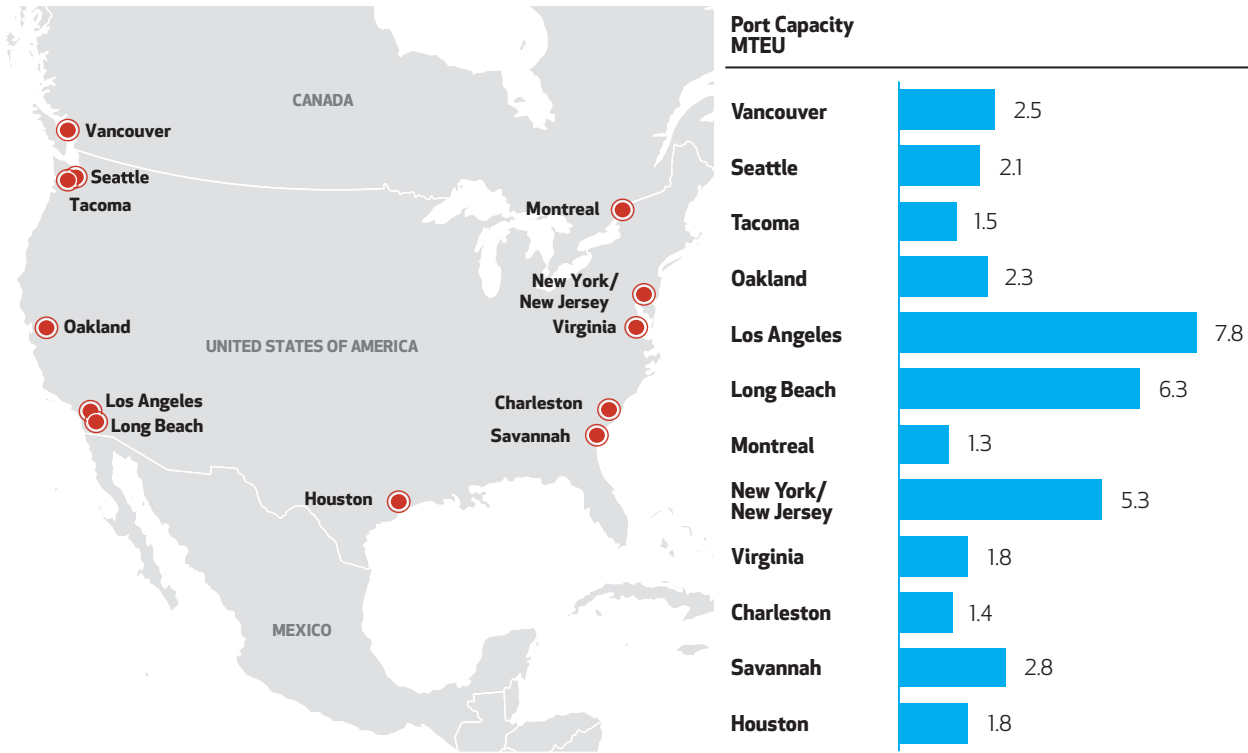
The governance model in the UK is however not representative of the European Union. Port management methods vary considerably from country to country. In some member states, ports are managed by private entities which own port land, or avail themselves of rights similar to those of an owner. Those ports are entirely private business. In other cases a large majority in continental Europe—ports are managed by public entities or undertakings. Table 4.8 shows government level and type of port

Figure 4.33
Main Container Ports in Hamburg-Le Havre Range (NW-Europe)



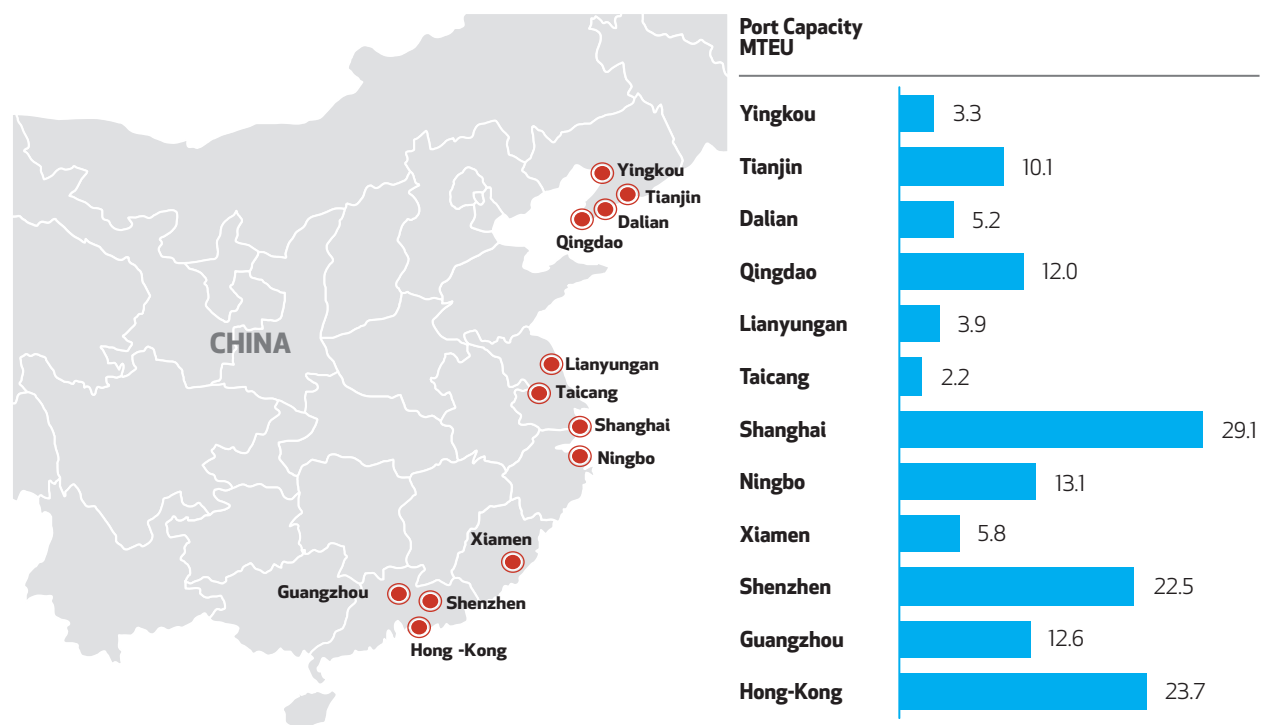
Source: Containerisation International 2010

Figure 4.34
Main Container Ports in USA and Canada



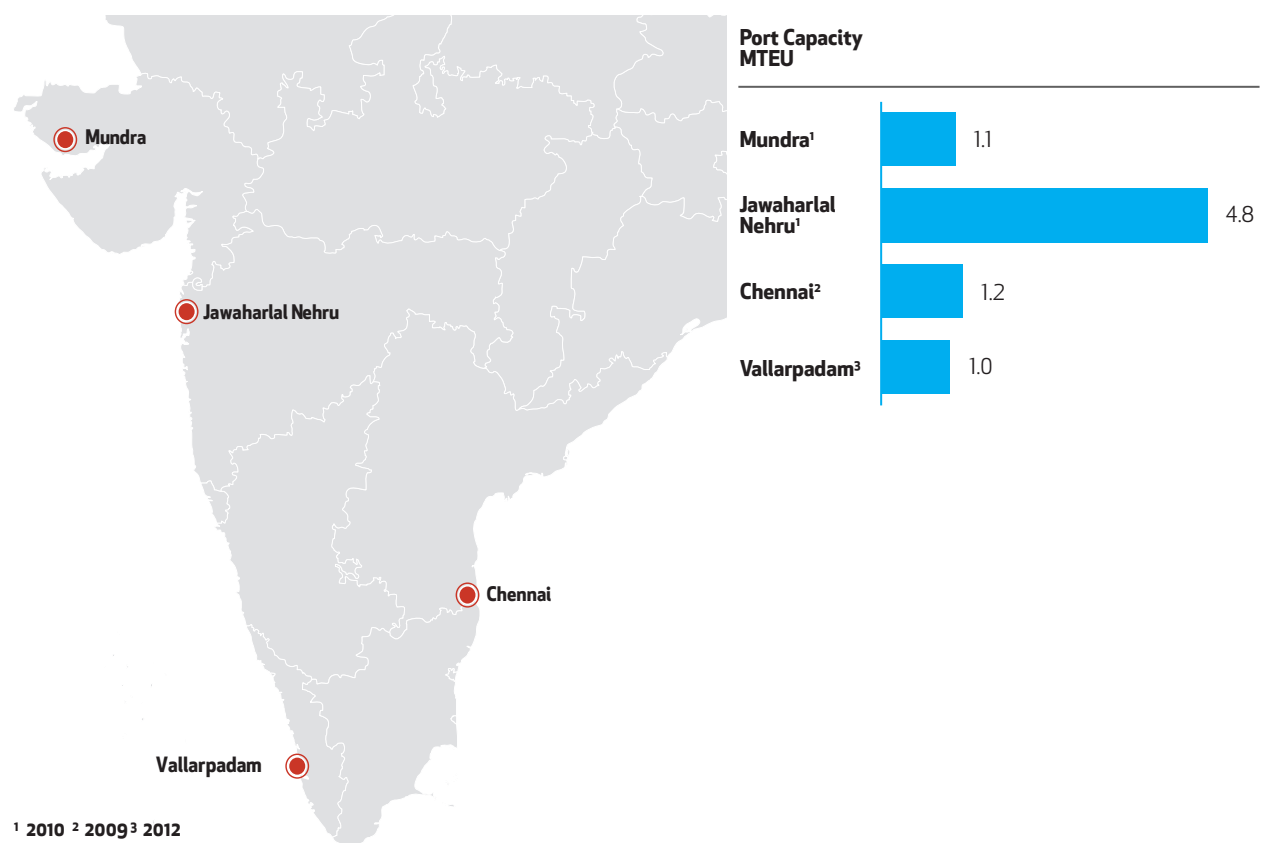
Source: Containerisation International 2010

Figure 4.35
Main Container Ports in China



Source: Containerisation International 2010

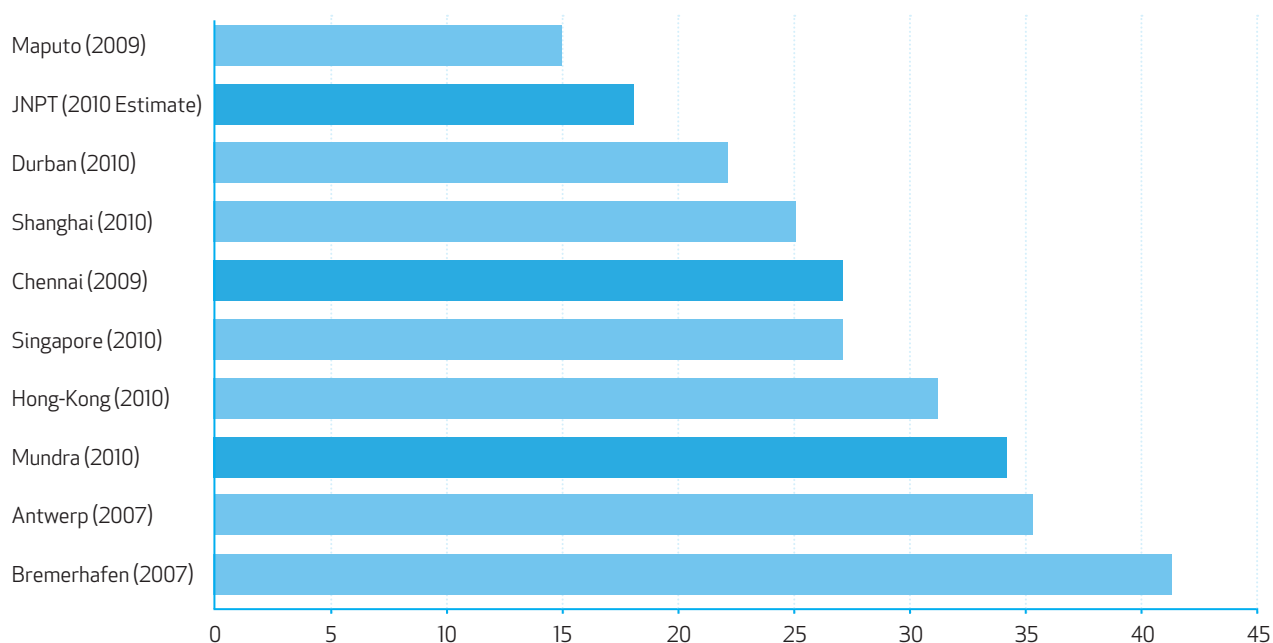
Figure 4.36
Main Container Ports in India



Source: Containerisation International 2010

Figure 4.37
Indian Container Ports in Comparison with Container Ports of Other Countries
 [Container Crane Output]

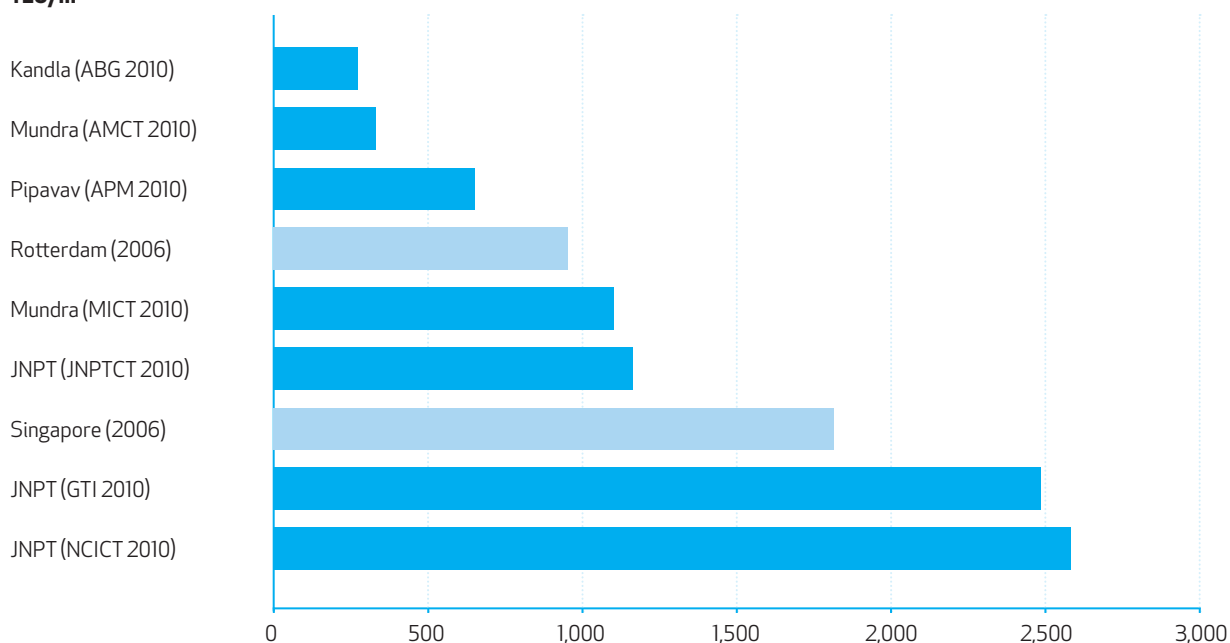
Port Performance
Container Crane Output
Boxes/Hour



Source: Container productivity at New Zealand ports, Ministry of Transport, 2011

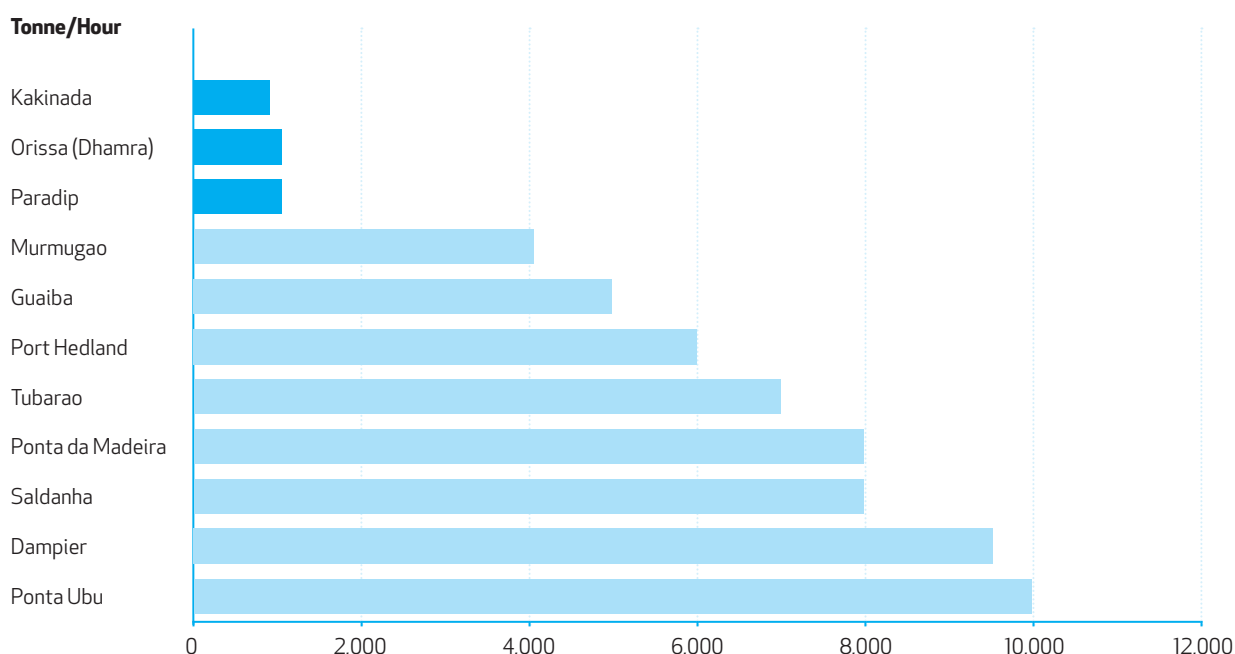
Figure 4.38
Indian Container Ports in Comparison with Container Ports of Other Countries
 [Container Quay Throughput]

Port Performance
Container Quay Throughput
TEU/m



Source: Indian ports: Port efficiency change in container handling terminals: a case of ports in JNPT-Mundra range of ports in India, A. Bhatt & P. Gaur, 2010; Singapore and Rotterdam: Container port Markets in the Middle East and South Asia to 2020, Ocean Shipping Consultants Ltd, 2007

Figure 4.39
Indian Ports in Comparison with Ports of Other Countries
 [Iron Ore Export Terminals Loading Rates]



Source: Global iron ore load ports – information handbook; Wilhelmssen Ships Service, 2008

management—direct government, public entity, private entity—in EU member states.

AUSTRALIA

Australia has three levels of government commonwealth, state and local. The commonwealth has key functions involving the ports, including security, environment and competition policy, and border control. It also finances and owns specific infrastructure assets including certain railways and roads. Port corporations are owned by state governments which also control adjacent land uses, with the exception of South Australia, which was privatised in 2001. Queensland is also currently processing the privatisation of the port of Brisbane. Australian ports are mainly landlords to terminal operators (stevedores) and are primarily only responsible for the management of port infrastructure such as dredged channels and berths. Terminal operating/ stevedoring services are provided by a small number of specialist firms that own the container handling equipment but lease berth space from the relevant port authorities. Key agencies in Australia and their role are provided in Table 4.9.

CHINA

Ports in China generally feature open access, and are managed at the municipal level, with local governments taking a substantial interest in corporatised operations. Port governance in China has undergone significant change since 1979 across three phases of evolution, which are outlined in Table 4.10.

As an example, the key agencies for governance of Shanghai port and their roles are outlined in Table 4.11.

SINGAPORE

Up to 1996, Singapore was one of the few large public service ports in the world. It combined land ownership, regulatory functions and port operations as part of the Government of Singapore. In 1996, the government decided to change the management structure. First, it corporatised the terminal operations of the port under PSA Corporation, which is now one of the largest and most global container terminal operators in the world. Secondly, a new port authority was created as the MPA, Maritime and Port Authority of Singapore, which operates as landlord in the port, developing, promoting, regulating and securing safety. However, the full transitioning towards a landlord will be complete when the port authority divests its shares it has in PSA. As of now, the authority is not yet completely independent from operations. Key agencies in Singapore maritime are provided in Table 4.12.

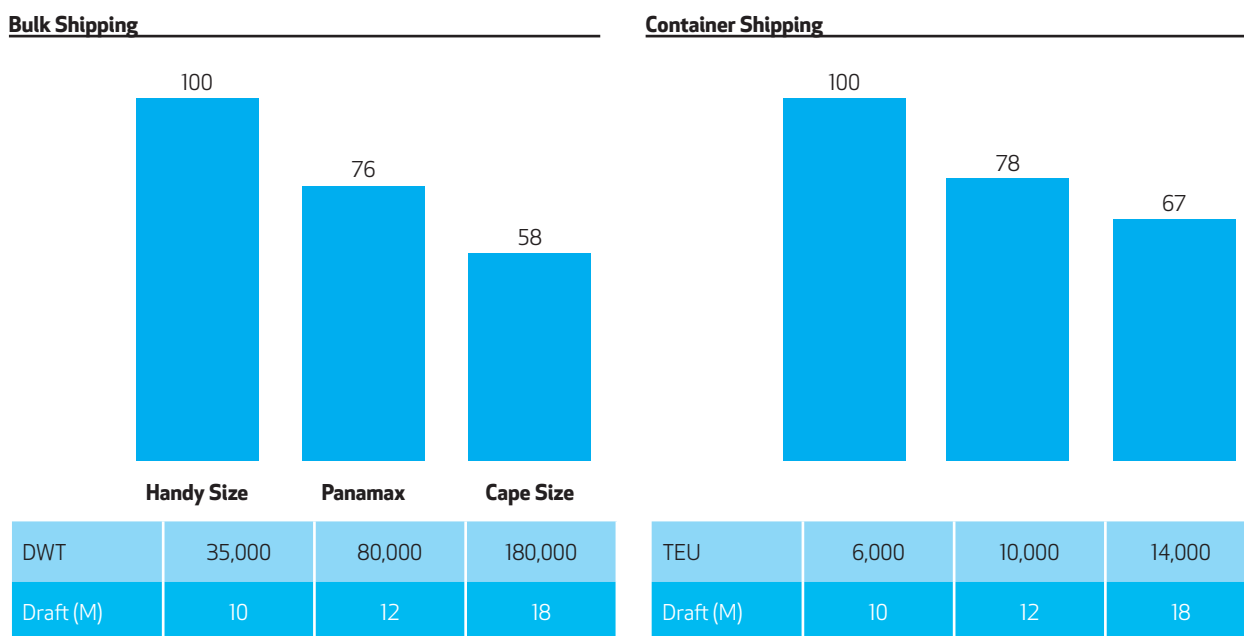
INTERNATIONAL EXAMPLES: PORT EFFICIENCY

CONTAINER PORT CAPACITY

Figures 4.33-4.36 show all container ports of 1 million TEU and over, in Northwest Europe, US/ Canada, China and India respectively (2010 figures).

India has only three such ports compared to six in Europe and 12 each in the US and China. Even if con-

Figure 4.40
Comparison of Ship Sizes and Transport Costs
[Index]



Source: India Port Sector Policy Review Study, World Bank

container volume in ports with less than 1 million TEU is considered, the picture does not change much. Clearly, container penetration in India is not very high. A lot of general cargo is still transported in loose form, which is less efficient than transport in containers.

However, this may change drastically in the coming years or decades. Continuous GDP growth will lead to more (containerised) imports; growth of industrial production will lead to more containerised exports. Moreover, as the Indian economy gets more interconnected with worldwide logistics chains, the container penetration will increase. These two factors combined are expected to result in enormous growth in Indian container volumes. This growth will have to be catered to by a large number of container ports and/or container terminals at existing ports. Careful and strategic selection and development of the best locations for this additional capacity is of utmost importance.

CONTAINER PORT PERFORMANCE

The best port performance will be achieved in a competitive environment for terminal operators. Monopolistic situations tend to result in lower scores on KPIs. And privately operated terminals generally perform better than publicly operated terminals.

Figures 4.37 and 4.38 provide a comparison of Indian container ports with others across the world, for two KPIs commonly used at container terminals: container crane output (boxes per hour), and container quay throughput (TEU per metre of quay per year). The figures show that there is quite some

variation in the scores of Indian ports on these two KPIs, but that the same variation is found in ports throughout the world.

BULK PORT PERFORMANCE




Bulk ports can be compared using loading or unloading rates as a KPI. Figure 4.39 shows the loading rates of a selection of major iron ore export ports throughout the world. These are gross loading rates; net loading rates will be lower due to the time needed to berth and un-berth ships and to position loading equipment. It is clear that loading rates at Indian iron ore exporting ports are lower than those of similar ports worldwide.

It should be noted that the Indian ports generally service smaller ships than the other ports. The maximum draft at Paradip is 13 m, at Marmugao it is 13.7 m, and at Kakinada, 11 m. This means the maximum vessel size at the first three ports is Panamax (70,000 to 80,000 dwt dead weight tonnage, 12 m draft when fully loaded). In Kakinada, handysize bulkers are the largest size that can be fully loaded (about 35,000-45,000 dwt and 10 m draft). The other ports in the overview offer drafts of 19 to 25 m, enough to handle at least capsizes bulkers (180,000 dwt, 18 m when fully loaded).

The question is whether the Indian ports do not handle larger vessels because the required draft is not available or because the markets they serve do not require larger vessels. For major bulk such as coal and iron ore, the rule of thumb is that the larger the bulk ship the better. Economies of scale can greatly reduce transport costs per tonne. Some

Figure 4.41

Comparison of Maximum Drafts at Indian Ports with Other Countries [Metres]

		BULK SHIPPING	CONTAINER SHIPPING
EUROPE 	Hamburg	13	13
	Rotterdam	23	17
	Antwerp	13	13
CHINA 	Shanghai	12	15
	Tianjin	22	18
	Ningbo	21	21
	Qingdao	14	14
	Guangzhou	14	14
INDIA 	Chennai	17	13
	JNPT	13	13
	Paradip	12	12
	Visakhapatnam	17	15

Source: India Port Sector Policy Review Study, World Bank

Indian ports use barges to load larger vessels off-shore. From a logistics point of view however this is suboptimal, as it requires extra cargo handling from barge to ship.

SHIP SIZE ECONOMIES AND PORT DRAFTS

The size of vessels a port can service is determined by:

- Draft limitations in ports and their access channels. For bulk shipping, this means the ports at both ends of the journey; for container shipping, all ports along the route.
- Physical limitations elsewhere along major shipping routes, such as the Suez Canal (maximum draft 20 m), the Panama Canal (maximum draft 12 m, and for the new locks from 2014 onwards, 15.2 m), and to a lesser extent the Strait of Malacca (21 m).

The design vessel of a port the maximum ship size a port can take is always a trade-off between investment costs necessary to create sufficient draft and capacity in the port and the transport cost savings that can be realised by the employment of larger ships.

Figure 4.40 provides a comparison of ships sizes and the transport costs per unit for bulk and container shipping. It shows that:

For bulk shipping, the costs per tonne in a cape size are about 58 per cent of the costs per tonne in a handy size bulker. For instance, the cost of transporting a tonne of coal from Richards Bay, South Africa, to Vishakhapatnam with a cape size vessel is \$10 per tonne less than that for a handy size bulker.

For containers, the costs per TEU on a 14,000 TEU ship (Maersk E-class) are 67 per cent of that on a 6,000 TEU ship. Meanwhile, Maersk has 18,000 TEU ships on order (Maersk triple E class), which the company claims will result in a 25 per cent cost saving per TEU compared to the 14,000 TEU E-class container vessels. And the hull design of the triple E-class is such that the maximum draft is 14.5 m, compared to 15.5 m for an E-class.

It should be noted that the drafts mentioned in the table are design drafts, based on the maximum weight that these vessels can carry. In practice, the draft is often lower as many containers are loaded with relatively light cargo, such as electronics or other consumer goods. It therefore is possible that 14,000 TEU vessels call at ports such as Antwerp or Hamburg, which both have a maximum allowed draft of 13 m. Often, these vessels call at Rotterdam (16.7 m at container terminals) first in order to reduce their draft and then continue to ports that offer less draft.

Figure 4.42
TEN-T Priority Axis 24

Example: TEN-T Priority Axis 24 Railway Axis Lyon/Genoa-Basle-Duisburg- Rotterdam/Antwerp

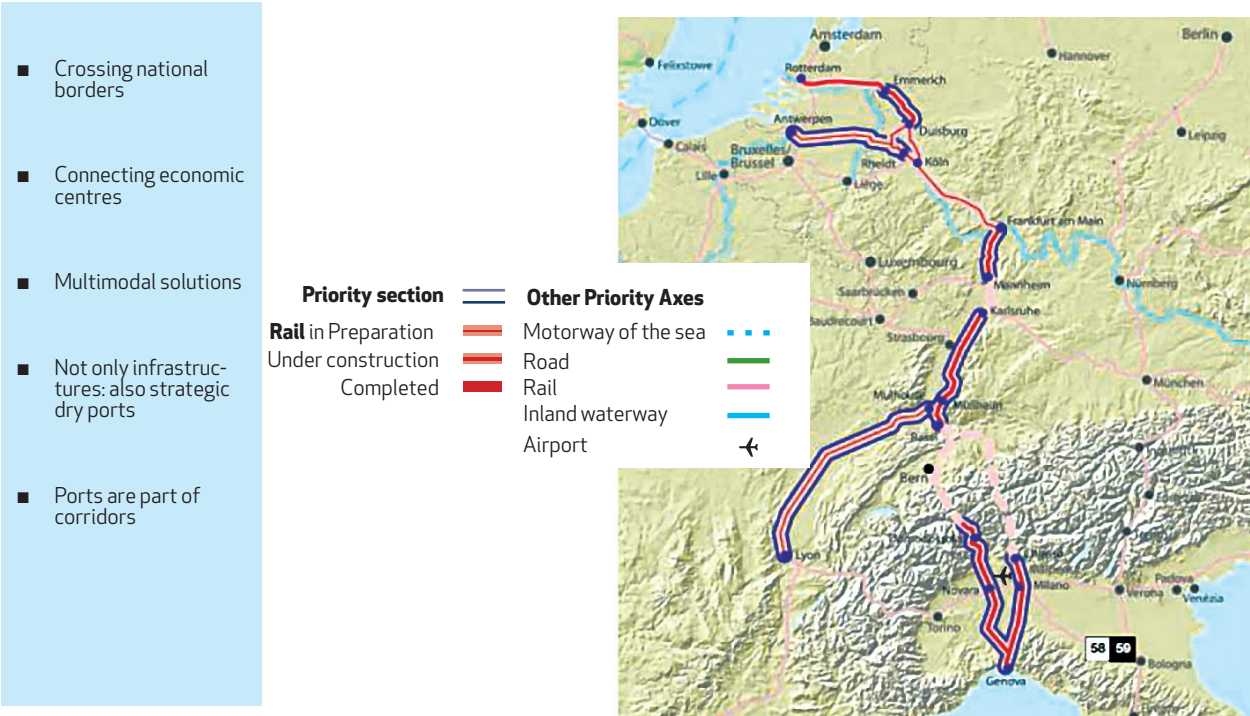
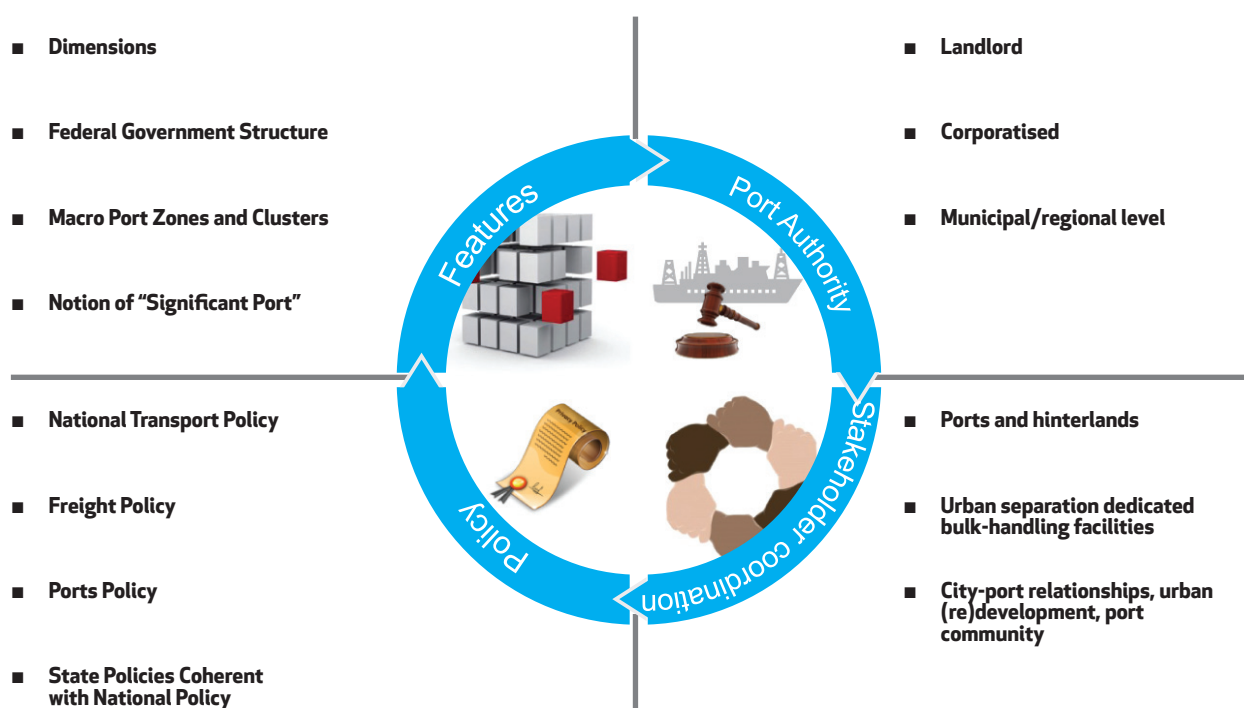


Figure 4.44

Key Characteristics of Australian Ports Policy and Management



Source: India Port Sector Policy Review Study, World Bank

Figure 4.41 compares drafts at various European, Chinese and Indian ports. Drafts at Indian ports generally match those at major European and Chinese ports, particularly for containers. In the bulk sector, European and Chinese ports generally offer more draft.

The drafts available at Indian ports are clearly inadequate to handle higher capacity ships such as the cape size for bulk transport and 14,000 TEU for containers that are increasingly being put to use worldwide. While deeper drafts may be desirable for most Indian ports in general, strategic investments in at least a few special ports will have to be made expeditiously.

INTERNATIONAL EXAMPLES: PORT CONNECTIVITY

The performance of a port is strongly related to its hinterland connections, whose capacity needs to match that of the port. Policy makers increasingly aim at developing transport corridors.

- Transport corridors connect various economic production and consumption centres
- They often cross national borders, which calls for efficient customs procedures that disturb logistic flows as little as possible
- Transport corridors often offer multimodal solutions, combining various transport modes into door-to-door logistics
- They require strategically placed inland terminals sometimes referred to as dry ports. If run in conjunction with maritime ports, these can take up the role of satellite ports, receiving cargo in large efficiently organised trans-

port flows from the maritime port for further distribution in the hinterland

- Ports are important nodes in transport corridors, where maritime transport connects with other transport modes

The European Union regards its ports as nodes in the Trans-European Network for Transport (TEN-T). Figure 4.42 shows the TEN-T Priority Axis 24, a corridor connecting the Italian port of Genoa and the French economic centre around the city of Lyon with the ports of Antwerp and Rotterdam. The river Rhine forms an important part of this corridor, connecting Rotterdam (and Antwerp) with major industrial and population centres in Germany (Rhine-Ruhr area and the region around Mainz and Mannheim) and Switzerland (Basel). Along the Rhine, major road and rail connections complete the corridor. The connections between Basel and Genoa, and Basel and Lyon consist of rail and road links.

The TEN-T priority axis concept is an umbrella for several projects along the corridor network, aimed at upgrading infrastructure. They include

- Construction of dedicated rail freight connections from Rotterdam to the Betuwe rail network in Germany, and from Antwerp to the German Iron Rhine rail network
- Upgrading or expanding existing railway lines
- Upgrading rail systems, such as the introduction of European Rail Traffic Management Services (ERTMS) at rail sections along the

corridor

- Creation of high speed passenger rail connections

Priority Axis 24 is aimed at creating efficient rail connections, as the inland waterways in the corridor are already well developed. But in Central and Eastern Europe, where the road network is partly under-developed, priority axes include motorway development. Figure 4.43 shows Priority Axis 18, aimed at developing an inland waterway connection between the North Sea and the Black Sea, along the rivers Rhine, Meuse, Main and Danube.

INTERNATIONAL EXAMPLES: DREDGING

Currently, most of the Major Ports in India have been financing capital and maintenance dredging from their own internal resources with the exception of Kolkata where maintenance dredging is financed through budgetary resources of the Centre.

Internationally and specially in developed economies, port channels are used as a national asset and dredging projects are funded by local municipalities or the government, and not by the ports themselves.

One of the most comprehensive legislations on cost sharing in dredging is the US Water Resources Development Act, 1987, under which, the Federal Government meets 90 per cent of the dredging costs and 10 per cent is met by the local port authority for a depth upto 20 ft. For a depth up to 45 ft, about 75 per cent of the incremental maintenance dredging costs are met by the Federal Government and 25 per cent by the local port authority. For depth exceeding 45 ft, the incremental cost of dredging is to be borne by the Federal Government and the local port authority on a 50:50 basis. This implies that it is the responsibility of the Federal Government to provide some minimum level of navigational facilities in harbour projects.

The rejection of the concept of full cost recovery from direct users/ beneficiaries seems to have been widely accepted by Canada, Japan and most West European countries. However, there is one important caveat. A study for the US Army Corps of Engineers on the economic benefits in terms of total industrial production from channel dredging and landfill development in the ports of Los Angeles and Long Beach found that the direct benefits were concentrated in the immediate area of the port; the indirect revenues are distributed across the country.

LEARNING FROM GLOBAL BEST PRACTICES

A study of port governance structures and regulatory frameworks worldwide indicate that Landlord Port is the preferred port management model globally. Also, today's Port Authority is usually a corporatised entity with sufficient autonomy to pursue port regulations at the local/ regional level. Port

Authorities have been proven best placed to deal with traditional roles landlord, regulator, operator, and enhanced functions, such as shaping supply chains, planning and financing of port development, port-related industrial development and urban (re) development.

It is also clear that a port policy needs to be embedded in a national integrated inter-modal transport policy, to be defined at the central government level. Countries differ substantially in port management policies, but one, Australia, is outstanding in this, and especially relevant to the Indian situation. Figure 4.44 provides a summary of the key characteristics.

SHIPPING

In several countries or regions, short sea shipping (SSS) is an important logistic solution for cargo flows. The EU for instance actively promotes SSS as an alternative to road transport in order to reduce road congestion and to reduce the environmental footprint of freight transport. Elsewhere in the world, similar policies can be found, such as in the US and Vietnam.

In the EU, about 30 per cent of all maritime shipping is short sea shipping (978 million tonnes out of 3,333 million tonnes), defined as intra-EU and domestic shipping. In practice, the short sea shipping share may be slightly higher, as some of the intercontinental shipping in the EU would also classify as short sea (short distance) shipping, particularly shipping services in the Mediterranean and the Black Sea, where short sea transport takes place between EU member states and neighbouring states.

The main bottlenecks to the use of short sea shipping for cargo movements are:

- Lack of infrastructure specific short sea terminals
- Lack of service levels frequencies and inter-modal connections
- Lack of logistics service providers offering a door-to-door service
- Traditional stance of cargo owners, who perceive it easier to arrange door-to-door road transport than an intermodal transport chain

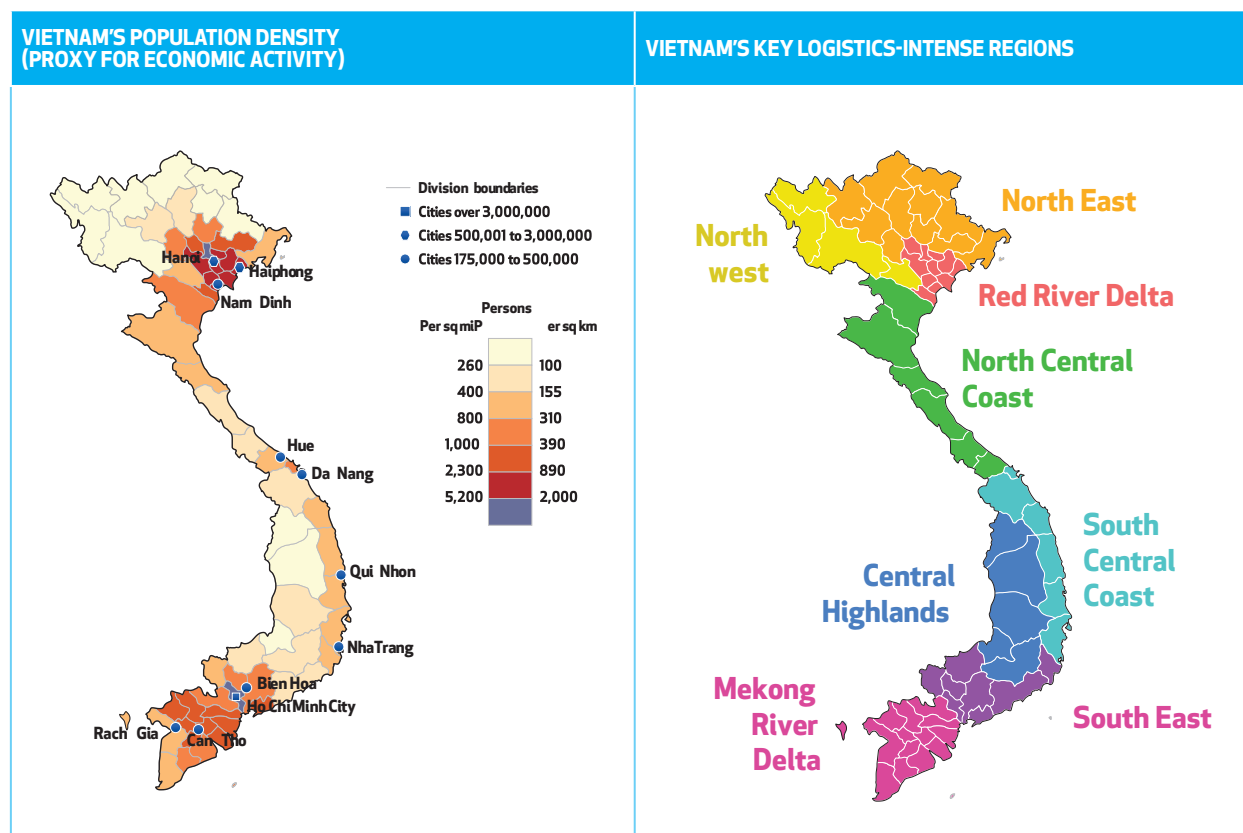
SHORT SEA SHIPPING IN THE EU

The EU has targeted these bottlenecks with a variety of policies and programmes. Short sea shipping is explicitly mentioned in the European White Papers on Transport, both in 2001 and 2011, as a means of reducing road congestion and reducing the environmental footprint of transport. The key developments in EU SSS have been:

Figure 4.45
Coastal Shipping between North and South Vietnam

SHORT SEA SHIPPING AS SOLUTION FOR VIETNAM

90 PER CENT OF TRADE FLOWS BETWEEN NORTH AND SOUTH VIA SHORT SEA SHIPPING: RAPID GROWTH



Source: India Port Sector Policy Review Study, World Bank

Marco Polo In its 2001 white paper, the EU launched the Marco Polo programme as a follow-up of the Pilot Action for Combined Transport programme. Though in principle aimed at promoting modal shift from road to other transport modalities, Marco Polo specifically made efforts to harness the advantages of short sea shipping. The programme financially supported new intermodal services, covering initial losses of services that were expected to be commercially viable in the long term. Marco Polo has, in some cases, been criticised for creating unfair competition and market distortions, as existing intermodal operators claimed they lost tonnage to Marco Polo-supported services. Following this, the criteria for support have been tightened to make sure intermodal services that received support indeed contributed to the objective of removing freight tonnage from the roads. In the 2011 white paper, Marco Polo is no longer mentioned.

Motorways of the Seas (MoS) The concept was introduced in the 2001 white paper. Whereas Marco Polo was aimed at intermodal in particular short sea services, MoS was aimed at the maritime infra-

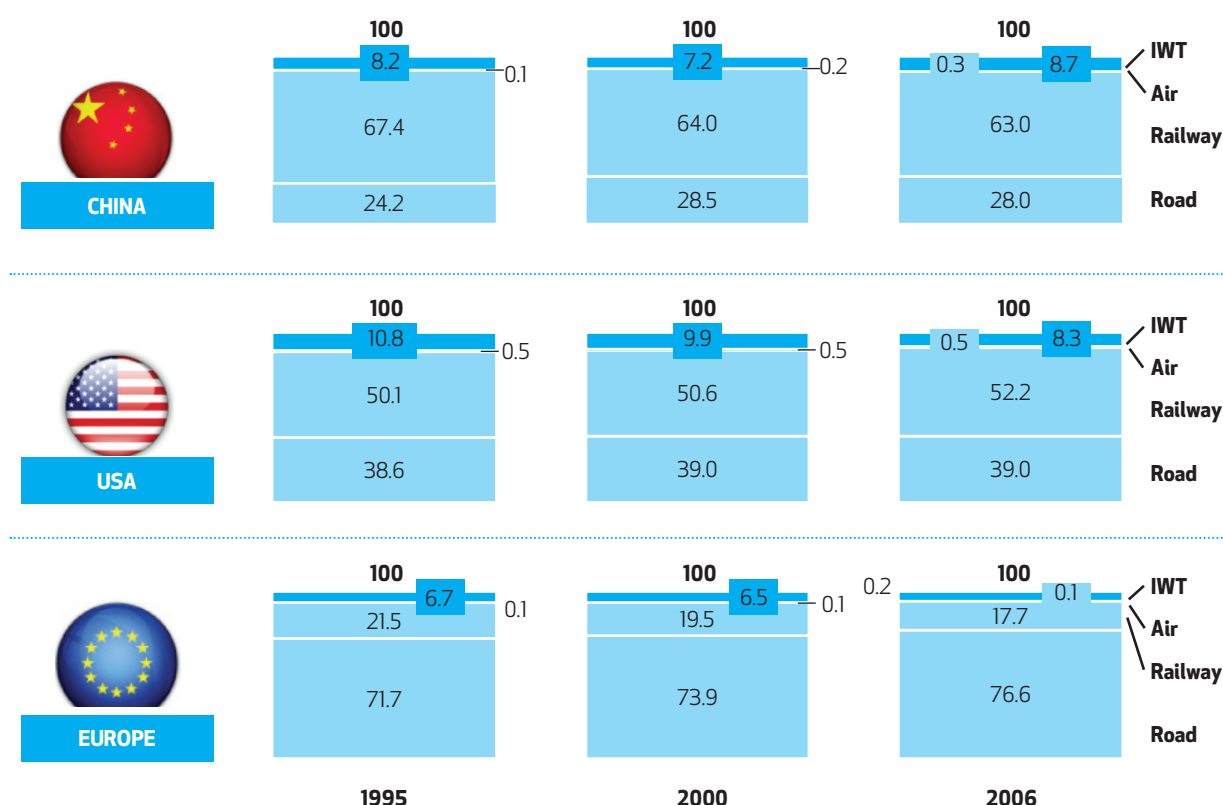
structure needed for the promotion of short sea shipping as an alternative to freight transport on road motorways. The aim was to develop MoS as a real alternative to land transport, thus improving access to markets in Europe and relieving the overstretched European road system. MoS does not exclude rail and inland waterways, but it is primarily aimed at short sea shipping. The EU defined MoS corridors and integrated these into the TEN-T network. Fifty-seven ports have been designated as TEN-T ports.

Short sea network In the late 1990s, several EU countries established shortsea promotion offices. These offices have the advantage of being much 'closer' to the market than the Brussels institutions of the EU, and thus better positioned to actively promote short sea shipping in these countries. Their tasks are to inform cargo owners and transport providers about the possibilities that short sea shipping has to offer, to provide information on national and EU support programmes, to keep an updated inventory of intermodal services and to take away biases against short sea shipping in the transport market. In 2000, the European Shortsea

Figure 4.46

Modal Shares for Modes of Inland Transport in China, US and EU

[Per cent]



Source: India Port Sector Policy Review Study, World Bank

Network (ESN) was established to provide coordination and support to the national organisations.

SHORT SEA SHIPPING IN VIETNAM

Due to its shape a long and narrow country with a long coastline, Vietnam is very suitable for developing coastal shipping. Its main economic centres in the north (Red River Delta/ Hanoi) and south (Mekong Delta/ Ho Chi Minh City) are connected by a highway and a railway line, but these cannot cope with the increasing traffic. Freight transport via coastal shipping therefore experienced rapid growth; currently it accounts for over 90 per cent of all freight transport between the north and the south. Figure 4.45 provides an overview.

LEARNING FROM GLOBAL BEST PRACTICES

Domestic shipping has been regarded by most maritime countries big and small across the world as an effective tool to reduce increasing land congestion, particularly on roads. It is also five times as energy efficient as road transport.

Europe is regarded as a world model, for the way it long developed its short sea transport to its advantage, and today hauls as high as about 40 per cent of its domestic goods by way of its coastal seas. However, far more than just promoting domestic shipping

itself, the reason that led to European success was the vision with which the short sea transport was made a part of an integrated transport network. Further, the continuous evolution of supportive policies and programmes such as the Marco Polo scheme and Motorways of the Seas have ensured that bottlenecks are addressed and provided the momentum to generate returns to scale.

The US, which currently undertakes limited coastal shipping, is also gearing up to expand short sea shipping in domestic waters to accommodate the anticipated increase in domestic freight movements, especially containerised goods. Coastal sea lanes are increasingly being referred to as Marine Highways.

Most maritime nations like USA, China and Indonesia practice an absolute cabotage restricting movement of coastal cargo only under their own flag vessels. Beijing has, effective January 2013, issued new regulations that further underscore the ban on foreign-flagged ships on Chinese waters. Such an approach, however, might be premature in the case of countries like India which have a long way to go before becoming self-reliant in supporting the needs of coastal sea transport. It may be worthwhile only after this is achieved to consider imposing absolute cabotage.

At present, there is no comprehensive and coherent strategy for the location of ports in the country or indeed for the overall investment programme in these ports

Landside congestion and infrastructure decay are both costly to fix, and coastal shipping is considered to provide a relatively inexpensive alternative. However, without it being suitably embedded in the overall transport plan that allows for efficient inter-modal access on both sides of the sea leg, any expectation for potential gains to the economy might be unfounded.

INLAND WATER TRANSPORT

In most countries where development of IWT has been given due importance, it has contributed significantly to the economy.

USA

The US inland navigation system is nearly 12,000 miles of commercially navigable inland and coastal waterways. More than 630 MT cargo moves annually on the inland waterway system.

Inland navigation operates much like the highway system. Main stem waterways, the Mississippi, Ohio, Illinois, and Tennessee rivers and the Gulf Intra-coastal Waterway, are like interstate highways, and these routes carry most of the traffic. By building a series of barrages and navigation locks, these waterways have been developed with assured 9 feet depth all round the year, making inland navigation highly commercially viable. Smaller tributary waterways act as secondary roads or neighbourhood streets, allowing commerce on and off the main routes and providing access to communities not located on the main waterways. These tributary waterways carry less traffic than the main stem waterways, but, like neighbourhood streets, they play a vital role in linking communities to the system as a whole.

The trip on the tributaries is usually only a small part of the full journey between producer and consumer, but very important, as it connects origin and destination. They allow shippers and consumers on tributary waterways to take advantage of the huge economies of scale offered by large barge tows on the main stem, resulting in lower transportation costs. They also allow millions of tonnes of cargo to stay in barges until much closer to a final destination, rather than moving longer distances by highway or rail and adding to congestion.

CHINA

China, with an inland waterway system of 119,000 km of navigable length, has the most developed IWT sector in the region. The majority of the country's total length of navigable waterways is located within the courses of the Yangtze, Pearl, Huaihe, Helongjiang rivers and the Grand Canal. The Yangtze, with

its tributaries, alone has a navigable length of 58,000 km, of which 3,000 km is suitable for navigation by vessels of 1,000 dwt or more. There are about 2,000 inland ports, including 85 leading ports capable of accommodating vessels of up to 10,000 dwt. Seven of these ports each have an annual cargo throughput of at least 10 MT. The network has some 900 navigational structures such as ship locks and ship lifts. China is concentrating its IWT development thrust on five specific areas: the Yangtze, the Pearl, the Beijing-Hangzhou Grand Canal, and the Yangtze and Pearl river deltas. Shanghai, the world's largest container port, is linked with the Yangtze, which moves 80 per cent of the country's IWT traffic, thus enhancing cargo evacuation capacity of the port.

The fleet of vessels plying the inland waterways now numbers 231,000 with a total deadweight tonnage of 20.67 million. The average vessel size is growing; it increased by 36 per cent between 1995 and 1999. In 2000, the cargo volume carried on the inland waterways of China reached 690 MMT and the total cargo task, measured in tonne-km, touched 155 billion, which is an average trip distance of 212 km.

Since 1990, the growth of container traffic has dominated overall traffic growth on the inland waterway system. The volume of containers carried to or from major river ports grew by 38.6 per cent per annum, from 100,000 TEU in 1990 to 1.88 million TEU in 1999.

THE NETHERLANDS

The Netherlands have a dense inland waterway network, due to the estuaries of the rivers Rhine/ Wall, Meuse and Scheldt. The total length of the Dutch waterways amounts to 5,200 km.

The Dutch waterways provide seamless hinterland connectivity to the ports of Rotterdam and Amsterdam, not only for cargo destined for the Netherlands but also for countries like Germany, Belgium, France, Switzerland and Austria. The waterways account for about 40 per cent of international freight movements in the Netherlands and 20 per cent of domestic freight.

The waterways are an integration of canal and river networks with well-defined classification based on the barge configurations that can ply on a stretch. Intermodal terminals ensure last mile connectivity.

GERMANY

The German waterway system is 7,300 km long comprising of 2,540 km of free flowing rivers, 3,030 km of rivers with flood control, and 1,730 km of canals.

Since 1990, container traffic has dominated overall traffic growth on the inland waterway system. The volume of containers carried to or from major river ports grew by 38.6 per cent per annum, from 100,000 TEU in 1990 to 1.88 million TEU in 1999.

The waterways provide direct connectivity to two major sea ports of Hamburg the world's ninth largest container port and Bremen, and transport both domestic and exim cargo. They are largely being used for traffic like container, mineral oil and bulk cargo like ore and coal. The share of waterways with regard to the entire goods transport is 12 per cent, which is comparable to haulage of the German railway. Fifty-six of the 74 German metropolitan regions are directly connected to the waterway system. Most of the over 100 inland ports are developed on a tri-modal logistic platform, so that cargo is directly connected with the waterways, the railway network and the most important trunk roads.

Duisport, located at the crossroads of European transportation routes and cargo flows, is one of the largest inland ports, delivering cargo up to Moscow. Waterways, railroad lines and highways turn over upwards of 100 MMT of cargo at Duisburg, while connecting it with other European countries and other continents. Approximately 20,000 ships and 16,000 trains move goods through the port; over 350 rail connections to 80 European destinations originate from the combined traffic hub. More than 300 globally active transport and logistics providers are active on site.

MODAL SHARES IN CHINA, EU AND US

The share of the IWT in 2006 is similar in China (8.7 per cent) and the US (8.3 per cent), but lower in the EU (5.6 per cent). However, the modal share of IWT has declined significantly in the US and the EU over the last 10 years. In China, the declined between 1995 and 2000, but has since rebounded by about a fifth. Figure 4.46 gives the data.

It is important to note that while the percentage figures are small compared to the dominant modes, these are significant numbers both in absolute terms and in comparison to share of IWT in other countries, including India.

It is also important not to confuse mode share across large regions with market share. IWT can only 'share' or compete for markets in any particular transport corridor where it actually exists. In all three regions, most transport corridors do not offer a realistic IWT option. Market shares in IWT corridors in all three regions are therefore much higher than regional averages. For example, though the overall mode share of IWT in the EU is quite low, in the Netherlands, which has many excellent waterway routes, IWT carries more tonne-km than any other mode.

LEARNING FROM GLOBAL BEST PRACTICES

An analysis of IWT development indicates three important lessons for India.

INTEGRATION WITH OTHER TRANSPORT MODES

World over, bimodal and tri-modal inland terminals have become an intrinsic part of the transport system. Most gateway ports are linked with all the three modes of transportation—road, rail and IWT—that provide alternatives for both inbound and outbound cargo. This in turn provides smooth evacuation from the gateway port that in turn reduces the chance of congestion within the port and enhances productivity.

PUBLIC INVESTMENT IN IWT

Waterways in the EU and USA have reached the state of mature asset with massive public investment over a century. The Chinese IWT infrastructure is also a state contribution. At this belated stage of IWT development in India, there needs to be a push from the State for funding of infrastructure, though other models like PPP and viability gap funding could be considered in cases which are commercially viable.

An efficiently run IWT system has clear environmental and social benefits over other modes of freight transport. It helps minimise loss of agricultural land, reduce congestion on roads and road accident costs, and of course, can contribute significantly to shrinking the carbon footprint. These are powerful reasons to try and enhance the role and scale of IWT within national transport strategies. They also provide a stronger case for state funding of IWT infrastructure projects.

STANDARDISATION OF WATERWAYS

Complete standardisation of waterway exists in the EU, US and China to ensure depth and width, which in turn enables fixation of barge specification and configuration.

RECOMMENDATIONS

PORTS

There are positive signs of progress in India's ports sector and the potential for growth and development is enormous.

Exports and imports for India, bulk of which takes place through the seaports, have demonstrated unprecedented growth during the last decade. While exports grew at a CAGR of about 21 per cent, imports witnessed a 25 per cent growth. The pace of trade growth is likely to continue in the coming years. Thus, from a long-term transport policy perspective,

Current investment trends may lead to significant waste and inefficiencies in the building of transport links that connect with the burgeoning Non-Major Ports. While physical infrastructure grew rather arbitrarily, there has also been little progress towards the generally accepted and successful landlord model of port governance

An expert group should be set up to undertake detailed studies to identify potential location and modalities for creation of Mega Ports, preferably two to three on each coast. The expert group shall have to take due cognizance of developing and planned high-density freight corridors, as they analyse potential locations for such Mega Ports

it is extremely important to review current limitations to ensure that the facilitating environment, comprising both physical infrastructure and government policy, evolves in the desired manner.

At present, there is no comprehensive and coherent strategy for the location of ports in the country or indeed for the overall investment programme in these ports. Till now, investment in both Major and Non-Major Ports has been done in a somewhat haphazard piecemeal fashion, resulting in sub-optimal hinterland connectivity, inadequate infrastructure and drafts, and low levels of containerisation, all these in turn having a bearing on port congestion, cargo evacuation and higher transaction costs. One clear manifestation of the inadequacy is that at present, a good proportion of India's maritime trade is transhipped in Colombo or Singapore because of lack of capable ports on the Indian coastline to handle larger container ships. In particular, in order for major ports to accommodate larger mother vessels going forward, the draft at major ports needs to be increased to at least 17 metres, by the first half of 13th Plan. The associated incremental capital dredging at most of the ports would require continued Govt. support.

Current investment trends may lead to significant waste and inefficiencies in the building of transport links that connect with the burgeoning Non-Major Ports. While physical infrastructure grew rather arbitrarily, there has also been little progress towards the generally accepted and successful landlord model of port governance. The ports in India, essentially the Major Ports, widely follow a hybrid format of the long obsolete service port model and the preferred landlord model. This has resulted in a conflict of interest between the port trusts and the private sector, with the former acting both as port regulators and providers of commercial services in many instances.

INVESTMENT IN KEY MEGA PORTS

A key government priority should be to invest in four to six Mega Ports over the next 20 years, with two to three on each coast. These Mega Ports can be established either by transforming some of the existing Major (or Non-Major) ports into Mega Ports, by combining some major and minor ports, or by setting up totally new Mega Ports. As opposed to other large

economies, each of which have a few Mega Ports (such as Shanghai, Shenzhen in China; Los Angeles, New York in US; Hamburg, Bremen in Germany, and so on), India has none.

Planning for Mega Ports would involve identifying the port locations, projecting the cargo requirements for 2030, identifying the capacities and investment required to handle larger ships, container traffic and varieties of cargo, planning and designing the ports and the inland connectivity. As ports are nodes in the overall logistics chain, adequate hinterland connectivity through multiple transport modes assumes great significance. Typically, provision of sufficient rail/ road connectivity is primarily a result of concerted public investment. But since public investment is limited, it may not be possible to provide superior multi-modal hinterland connectivity to all ports. For maximum impact of the investment, it is logical to identify ports with large proportion of country's capacity as Mega Ports that can then be connected with a multi-modal transport system. An effective implementation of such a decision would invariably call for close coordination with the maritime states. This strategy should also take note of the transport requirements of key commodities such as coal, petroleum and iron ore.

There are several critical benefits of developing Mega Ports:

Economies of scale: Average costs of handling are reduced when more volumes are put through a port. First of all, larger (Mega) ports facilitate larger vessels to call due to higher drafts, which create cost advantages on the seaside of the supply chain. Secondly, the fixed costs of land, infrastructure and facilities in the port are distributed over a larger number of units, decreasing average costs. The hinterland transportation leg can also benefit from the larger volumes concentrated in the Mega Ports by having economies of scale in transport by rail, road and possibly inland waterways.

Economies of scope: Larger ports, in most cases, are able to handle a larger variety of goods than smaller ports. Therefore, the assets necessary to handle one type of goods can also be used without additional fixed costs for other types of goods. In large ports, for instance, the access canal, port infrastructure, rail connections and pilotage and tug services can be used by containers, bulk shipments, industrial products and many others because these services and facilities need to be present anyhow. Accordingly, specialised terminals for POL/coal/containers and so on can be built on adjacent sites within the port.

Agglomeration economies: Related to economies of scope are benefits from clustering of activities and services. Larger ports can host many different types of companies, suppliers, industrial complexes

and logistic companies. Being clustered together in one port, they benefit from the presence of each other in terms of synergies and shared infrastructure. Companies can even be located in a large port close to some of their suppliers and customers, and all can benefit from reduced transport costs.

Economic: Multiplier large ports are stimulators for the national economy. They create jobs, facilitate trade and attract companies.

Intra-port competition: Larger ports may host multiple competing companies—for instance, terminal operators, creating a competitive environment within their field of operation in the port. This might benefit the consumers by lower handling charges.

Transshipment hub: A large port with the capability to handle larger mother vessels and having large container yards could be a transshipment hub. As such, the port can attract additional cargo volumes which have to be feedered out to smaller ports in the vicinity. For the port itself, this means more income, because transshipment cargo is handled twice on the seaside incoming and outgoing and therefore also paid for twice.

Mega Ports and smaller ports can act very well together. Especially in the container segment, when a hub-and-spoke system serves India and coastal shipping is stimulated, the hub ports capture all major global maritime flows and feed the smaller ports with their specific markets behind them. Thus, both types of ports operate optimally within their own boundaries and opportunities.

DECISION CRITERIA FOR MEGA PORTS

Mega Ports are proposed with a view to provide strategic direction to otherwise piecemeal investments so as to result in ports with superior infrastructure, more specifically in terms of capital intensive multi-modal hinterland connectivity and deeper drafts, among others. The decision to channel greater investments, therefore, should be based on scrupulous identification of potential port locations. A port needs to be identified as a possible future Mega Port when certain conditions are met in a port and its environment.

EXPERT GROUP

An expert group should be expeditiously set up, to undertake detailed studies to identify potential location and modalities for creation of Mega Ports, preferably two to three on each coast. The expert group shall have to take due cognizance of developing and planned high-density freight corridors, as they analyse potential locations for such Mega Ports, so that there is planned and efficient integration of these ports with the transport corridors. If Mega Ports are to be commissioned, decisions to do so must be taken

A crucial reason for having a Mega Port on the east coast is to tap the immense potential that ASEAN has to offer. While ASEAN is becoming one of the most important regions of the world, the trade relationship between ASEAN and India is still limited. The major obstacle cited is the high cost of moving goods across the borders, reflecting insufficient infrastructure for physical connectivity

speedily. This is so that initiating studies and other actions for port construction are in concert with plans for other transport infrastructure.

The following conditions should serve to define whether a port has the potential to develop into a Mega Port and when the government should focus its policies to accommodate this growth:

Physical conditions Ports need to meet the physical and technical conditions to be or have the potential to become a Mega Port. It should have or be suitable for creating sufficient draft to accommodate larger vessels, enough berthing and terminal capacity, and the necessary equipment, space and superstructure to handle large volumes.

Volumes and market size: Large ports can only be developed when there is sufficient market potential to attract high volumes. Market potentials could be export and import markets in their hinterland or being in the close vicinity of major world shipping routes to become a transshipment port. For instance, Rotterdam functions both as gateway and as transshipment port.

Hinterland connections: In case of a gateway port, the hinterland connections should facilitate distribution of high volumes handled in the port into the specific hinterland. There should be enough potential to develop these connections into safe, efficient and high-capacity corridors. The presence of rail, road and possibly inland waterway operators and infrastructure, as well as distribution centres and inland terminals are required.

Feeder connections: If a Major Port tends to develop as a transshipment port, feeder connections to smaller ports are necessary.

Management capabilities: A large port should be equipped with the sufficient management capabilities to manage and administer the land in the port and relations with private concessionaires in case of a landlord structure.

POTENTIAL LOCATIONS FOR THE PROPOSED MEGAPORTS

The studies will help establish potential locations for Mega Ports based on a more detailed technical analysis. However, a limited commercial analysis under-

The existence of two fundamentally different systems for governance of Major and Non-Major Ports creates hurdles to achieving balanced growth. The necessary integration between these two systems cannot be done without the cooperation of maritime states

taken by the Committee (see chapter on Transport of Energy Commodities) does indicate a few potential locations, with Gujarat as the prime area, based on expected highest port traffic from POL and coal over the next two decades. A port on the southern end of the Maharashtra coast that could also be used to serve Goa and Karnataka. Odisha, Andhra Pradesh and Tamil Nadu are potential candidate states for Mega

other commodities needs to be included in the analysis. Second, detailed data are required on the cost of development of candidate ports, and then detailed modelling is required to examine the costs and benefits of various alternative selections from a short list of potential sites.

IMPROVING HINTERLAND CONNECTIVITY

Identification of ports as Mega Ports and planning for capacity expansion is only the first step towards a well-developed port system. Concerted efforts need to be made to ensure adequate, preferably multi-modal, hinterland connectivity for these Mega Ports. **Roads:** The committee endorses the recommendations made by the Committee of Secretaries (CoS) set up under the chairmanship of Member Secretary, Planning Commission, on the minimum levels of surface transport infrastructure that needs to be provided to and from the Major Ports. The CoS had recommended that each Major Port should preferably have minimum four-lane road and double-line rail connectivity and this should be established within a fixed timeframe. This should be taken up for speedy implementation. At the same time, the location of the proposed Mega Ports should be harmonised with NHDP plans.

Dedicated Freight Corridors (DFC): The Ministry of Railways has undertaken the construction of a dedicated DFC between Delhi and Mumbai. It will be a high-speed rail corridor with multiple linkages with feeder lines. It stretches over 1,483 km in length, covering six states. The DFC will help alleviate congestion on the Delhi-Mumbai corridor considerably. It is critical to the hinterland connectivity of the Mumbai and Gujarat port clusters that handle a large share of India's port traffic. The focus is also to ensure high-impact development within 150 km on either side of the DFC. The first DFC should be completed at the earliest, preferably by the end of 12th Plan and should extend up to JNPT. The second DFC, between Ludhiana and Dankuni, is expected to provide connectivity mainly for the traffic stream of coal to power houses, although later on, connectivity to Kolkata port is also a possibility. There are four more DFCs planned: Kolkata-Mumbai, Chennai-Kolkata, Delhi-Chennai and Goa-Chennai. The need to integrate the development of the proposed Mega Ports with the planned DFCs and possible new freight corridors that come along in due course cannot be overemphasised.

Inland waterways: connectivity for select ports

The Ganga-Bhagirathi-Hooghly river system (NW-1) and the Brahmaputra (NW-2) are linked by the Indo-Bangladesh protocol route via Sunderbans and Meghna (total 2,258 km) and provide hinterland connectivity to the Major Ports of Kolkata and Haldia. Similarly, the East Coast Canal and Hijili Tidal Canal, along with the Brahmani river (NH-5) provides 588 km hinterland connectivity to the ports of Kakinada, Krishnapatnam and Ennore. The 205-km

Ports on the east coast.

A crucial reason for having a Mega Port on the east coast is to tap the immense potential that ASEAN has to offer. While ASEAN is becoming one of the most important regions of the world, the trade relationship between ASEAN and India is still limited. The major obstacle cited is the high cost of moving goods across the borders, reflecting insufficient infrastructure for physical connectivity. Greater connectivity will help both sides achieve rebalancing strategies and provide more opportunities for less developed areas such as Northeast India. ASEAN-India trade was historically carried out through maritime routes while land transport connected major urban centres. In the modern world, an integrated transport system at the regional level is essential and the Comprehensive Asia Development Plan (CADP) recommends a strategy based on a multi-modal, multi-functional and multi-tier approach to enhance ASEAN-India connectivity (See chapter on International Connectivity). The two principal proposed routes to enhance ASEAN-India connectivity are:

- Sea route along the Mekong-India Economic Corridor (MIEC), the most important part of which is the development of Dawei port, Myanmar
- Land routes, with various options, along the Trilateral Highway (TH)/ Asian Highway (AH)-1 connecting Thailand, Myanmar and India.

A strategic Mega Port on the Indian east coast along the MIEC needs specific consideration to benefit from the emerging world's largest free trade areas. Some of the existing ports that have deeper drafts, an important feature that makes them suitable candidate for development as Mega Ports are Mundra (Gujarat), Gangavaram (Andhra), Dhamra (Odisha), and Ennore (Tamil Nadu).

However, selection of sites for locating Mega Ports will require extensive modelling and analysis. First, all types of port traffic including containers and

West Coast Canal System (NW-3) connects the Major Port of Kochi and also Neendakara, Kayamkulam and Munambam. The Mandovi and Zuari rivers, along with the Cumberjua canal (122 km) are connected with the Major Port of Mormugao and the port of Panjim. The backwater system of Mumbai-Thane-Ulhas waterway (142 km) provides hinterland connectivity to Mumbai and JNPT. Thus, a vast network of waterways has the potential to provide viable IWT connectivity at many ports.

Given the near saturation of rail/ road connectivity to Major Ports in particular, it is imperative to explore and augment connectivity through inland water mode wherever feasible. IWAI is setting up intermodal terminals at major cargo centres on all national waterways. Terminals have been built at Patna and Pandu, and similar terminals are planned or under construction at Kolkata, Varanasi, Allahabad on NW-1, Dhubri and Jogighkopa on NW-2, eight terminals on NW-3, 16 on NW-4 and seven on NW-5. Likewise, terminals are being set up on Goa and Mumbai waterways by the respective state governments. All IWT terminals need to be linked with the nearest NH by road, for which appropriate junctions with NWs are to be provided by NHAI. Further, permission for use of service roads as link loads, or use of NH land for construction of link roads needs to be granted for proper linkages with NHs.

STRATEGIC INSTITUTIONAL SHIFT: LANDLORD PORT MODEL

The current governance structure of Major Ports the public service port model lacks potential to attract private capital and therefore competitiveness. While it was appropriate for a period when centralised economic planning was the norm, the need today is to move towards a landlord model.

The existence of two fundamentally different systems for governance of Major and Non-Major Ports creates hurdles to achieving balanced growth while rendering it difficult to draw on the experiences of either of the two for any meaningful comparison. The necessary integration between these two systems cannot be done without the cooperation of maritime states. Moreover, given that Non-Major Ports under the management of maritime states have enjoyed more success as compared to Major Ports, any progressive regulatory shift should attempt to bring in the cooperation and participation of maritime states.

GOVERNANCE MODEL

The governance structure of Major Ports needs significant change. Incremental improvements, while retaining the essence of the current centralised structure, will not yield the desired benefits. The path recommended for Major Ports is of corporatisation and decentralisation.

Management should shift from the current centralised form to a decentralised one where the port authorities are given autonomous powers within the policy frameworks of the central and state governments

While the term 'privatisation' has often been used in the context of port reform processes, it actually refers to the introduction of private sector into the public domain by privatising terminal services under a landlord port regime. To implement the shift, a three-step approach is recommended.

1. Transform the current port trusts into statutory landlord port authorities. The ownership of these port authorities should be public. They would own the land and only when they become landlords would they function as the neutral regulatory authority for the terminal operators.
2. Subsequently, unbundle all Major Ports and corporatise terminal operations of port trusts as public sector corporations.
3. The corporatised public sector terminal operators could potentially be disinvested, listed, and possibly privatised at a later stage.

The port authorities could be corporatised as a statutory authority by a separate Incorporation Act under its own articles of incorporation, supported through the application of an umbrella legislation. Corporatisation in this manner—as opposed to corporatisation under the Companies Act, 1956—provides considerably more room for socio-political objectives rather than just maximisation of value for shareholders.

Corporatisation of port authorities would allow them to have the freedom to manage capital investment programmes essential for capacity augmentation. The corporatised authorities could borrow from capital markets without the constraint of government spending limits. Thus, investments can be made in accordance to the needs of the port without having to contend for funding with other entities in the public sector.

Corporatised port authorities as well as terminal operators would also be exposed to the rigour and discipline of financial markets, pushing them to be more efficient.

The management should shift from the current centralised form to a decentralised one where the port authorities are given autonomous powers within the policy frameworks of the central and state governments. The objective should be to support efficient functioning within a commercial setting and do

Table 4.13
Functions of Port Authority

PUBLIC FUNCTIONS	COMMERCIAL FUNCTIONS
<ul style="list-style-type: none"> ■ Planning and administration of port land and waters ■ Issuance of public licenses ■ Regulation of port and terminal activities by issuing bye-laws within the framework of applicable law ■ Construction and maintenance of basic port infrastructure and common areas ■ Ensuring public order and safety in port area ■ Protection of the port environment ■ Representing the entire port community 	<ul style="list-style-type: none"> ■ Establishment of contractual (concession, lease) and other conditions (Public license) for private operator to provide marine or terminal services; application of transparent and open public tender procedures with clear and objective selection criteria ■ Construction and maintenance of terminal infrastructure, across roads/rail and port basins ■ Re-development of existing port areas which have lost their port function, in conjunction with local and regional authorities

Table 4.14
Functions of Ministry In Charge of the Port Sector

PLANNING	LEGISLATIVE FUNCTIONS
<ul style="list-style-type: none"> ■ Planning and development of a basic maritime and port infrastructure comprising of coastline defenses (shore protection), port entrances, lighthouses and Aids to navigation, navigable sea routes and canals ■ Planning and regulating port development (location, function, type of management) ■ Planning and development of port hinterland connections (roads, railways, IWT, pipelines) 	<ul style="list-style-type: none"> ■ Drafting and implementation of transport and port laws, national regulations and decrees ■ Inclusion of international conventions (SOLAS, MARPOL etc.) into the national legislation
INTERNATIONAL RELATIONS	FINANCIAL AND ECONOMIC AFFAIRS
<ul style="list-style-type: none"> ■ Developing and executing national policies for furthering international transport capability of the country 	<ul style="list-style-type: none"> ■ Planning, financing and budget preparation of national plans and projects ■ Evaluating socio-economic/financial feasibility of projects in relation to national policies in various sectors

away with unnecessary reliance on central authorities, including the Ministry of Shipping.

Currently, maritime states do not have any stake in the development and functioning of the Major Ports. This needs to change. The direct participation of the relevant maritime states needs to be done through corporatisation, thereby opening up opportunities for acquisition of shares in the port authorities of Major Ports. State governments should be encouraged to have substantial shareholding to ensure their participation in development and expansion of these ports. This will be mutually beneficial, as the state governments would in turn benefit from the development of infrastructure and hinterland connectivity in the state.

At the same time, it is important to ensure that the corporatised port authority is professionally run, insulated as much as possible from government intervention. The Board of Directors should largely comprise professionals with sufficient expertise in technical, finance, strategy, marketing and other relevant disciplines. Depending on equity contribution, a few seats could be fixed for the central and state government.

The Committee is not recommending complete privatisation of port authorities. Under the landlord model, ownership of port land is not transferred to a private party, even temporarily, such as under the BOOT system.

There is pressing need to expedite the adoption and implementation of the landlord port model for Major Ports. On the other hand, given the relative success of Non-Major Ports, it is recommended that their governance structure should be retained and the management of these ports should continue to be performed by the maritime states.

UNBUNDLING

Currently, a majority of the Major Port trusts in India carry out terminal operations as well. Unbundling of the terminal operations of the port trusts and corporatising them as public sector corporations shall accordingly be the next logical step under the landlord port model. Involvement of the port authority in terminal operations leads to a conflict of interest and works against objectivity. The neutrality of the landlord port authority is a basic requirement for fair competition between port service providers, specifically the port terminal operators.

Even if some indirect involvement is required in the form of strategic investments by a port authority for overall development of the port area, it should be limited. The port terminals including infrastructure should be leased out to private terminal operators who will:

- Provide and maintain their own superstructure, including buildings offices, warehouses, container freight stations, workshops and often also terminal infrastructure such as quay walls
- Install their own equipment in the terminal such as quay cranes, transtainers, conveyor belts
- Employ stevedores port and dock labour with the exception of some ports where labour is provided through a pool system

Eventually, both private and corporatised public sector terminal operators would compete under the aegis of the landlord port authority. The landlord port authority would carry out all public sector services and operations such as administration of port land and waters, development of common infrastructure, dredging, award of bids for containers and other terminals. The main objective of unbundling is to eliminate direct control of the government or port authority over the terminal operator and make it more responsive to market forces. It must also be ensured that the board and management of the corporatised entity should be free of political and bureaucratic interference. This can only be the first step towards full privatisation and should be treated as that. At the end of a reasonable period, the corporatised public sector terminal operators could potentially be disinvested, listed, and possibly privatised.

Unbundling could be a complicated task for older ports, and the transition process needs to be customised for each Major Port. During the changeover phase when terminal services such as stevedoring activities are still being provided by the port trusts, there needs to be a clear demarcation between each of the terminal service activities and other activities. This, in turn, requires that the internal accounts for each of the activities are kept separate, and all costs and revenues are correctly allocated on the basis of consistent and justifiable accounting principles, which need to be clearly identified and stated.

SEPARATION OF RESPONSIBILITIES

There should be clear separation of responsibilities between the Ministry of Shipping and the port authorities. The Ministry should avoid micro-management of day-to-day operations of the port. It should rather play an enabler role. Tables 4.59 and 4.60 provide the functional areas of the port authorities and the Ministry respectively.

ROLE OF REGULATORY AUTHORITY

There should be clear separation of responsibilities between the Ministry of Shipping and the port authorities. The Ministry should avoid micro-management of day-to-day operations of the port. It should rather play an enabler role

As observed already, given the relative success of Non-Major Ports, their governance structure should be retained and the management of these ports should continue to be performed by the maritime states. The existing regulatory mechanism for the Major Ports, on the other hand, will have to be suitably revamped to make it more responsive to the needs of capacity augmentation and market demand.

The three-pronged approach to reform tariff regulation (short, medium and long-term) suggested by the B.K. Chaturvedi Committee has already been discussed. The report recommends moving away from tariff regulation, leaving its determination to market forces as competition sets in. As mentioned before. The Australian landlord port model is certainly one that India could adopt.

Drawing on the above and keeping in mind the key priority of Indian ports sector to add capacity quickly through private participation, the role of regulatory body is recommended to undergo an enabling structural change:

- In principle, tariff setting or other price controls should not be exercised under the landlord model but left to the market. Rather, economic regulation pertains to establishing conditions for fair competition on a level playing field.
- To this end, TAMP should soon start delegating tariff determination and setting to corporatised terminal operators, where efficient price discovery should be market-driven rather than being regulated. All terminals and cargo handling facilities at ports should be encouraged to operate at higher levels of efficiency using the best available technologies. This can only be achieved through competition and not through a tariff setting process.
- Only in cases of inadequate competition between terminals in a port or among ports, or serious market imperfections, may some pricing control be required. Accordingly, TAMP, set up under the Major Ports Trust Act, should be restructured under a new Major Ports Authority Act (needed to transform port trusts into port authorities) and allowed to regulate tariff setting on a normative basis till such time that it is found essential or in specific cases where competition is inadequate. TAMP could also act as the Appellate

Tribunal for all tariff related matters where tariff is determined by service providers.

- A new regulatory authority, Maritime Authority for Ports (MAP), should be constituted under a modernised Indian Ports Act 1908, suitably empowered to regulate competition and port conservancy across all ports in the country. The proposed MAP should essentially have two main functional divisions:

Conservancy division This should set standards for conservancy, safety and environment as a unified code applicable to all ports, and carry out periodic audits to see if the required functions are satisfactorily carried out and to decide on the qualification of the conservator.

Port conservancy management has been relatively less discussed in India. At the same time, all the conservancy powers in ports and all other regulatory functions are vested in the port trusts. Conservancy needs to be regarded as a national issue and any form of regulation should facilitate establishing a common conservancy code for Indian ports. This can perhaps be better monitored and enforced by the proposed Maritime Authority for Ports (MAP). For this, India needs to draw on experiences of certain international port regulating bodies that have created substantive frameworks to address port conservation. One such successful model is that of the Maritime and Port Authority (MPA) of Singapore which is responsible for ensuring port safety and conservancy in addition to promoting, regulating and licensing of port and marine services and facilities.

Competition Division The proposed MAP should be parallelly vested with powers pertaining to competition regulation on the lines of other sectoral regulators such as the Central Electricity Regulatory Commission (CERC). This might create overlapping jurisdiction between MAP and CCI. This is not unusual and exists in all infrastructure and utility sectors that have a specific regulator. Since the sector regulator is likely to better deal with specific regulatory and competition issues that call for sector/ domain expertise, it is best to empower the proposed regulatory authority to address complaints concerning alleged anti-competitive practices or abuse of a dominant position. In addition, it should also be charged with merger approvals and review of draft concession agreements to advise the port authority on

whether any provisions may be incompatible with the promotion of competition. The sector regulator is likely to have the best information about the sector to monitor it. For example, competition issues arising from imperfect price and non-price conditions of access to unbundled elements in landlord ports, or cross-subsidy problems would be best understood and addressed by sector regulator. In essence, the sector regulator and CCI can have a concurrent role with matters being referred or interventions made depending on who is best equipped to deal with a particular issue. This would clearly call for establishing a mechanism for close coordination and consultation between the sector regulator and the CCI.

It may not be possible to shift from the current statetariff regulation to the proposed one competition regulation immediately. The 2013 draft guidelines for tariff setting in Major Ports proposed by the Ministry that allow market-driven tariff can be considered a step forward in support of the recommended shift to tariff deregulation under a landlord model of port governance. However, going forward, these guidelines will have to be reviewed, given that they still retain the concept of tariff regulation.

Under tariff regulation, the final issue to be dealt with pertains to vessel-related activities. Currently, the tariff setting is done on a cost plus basis which does not incentivise efficiency. However, the shift to a normative approach is a complex task because of the lack of standardisation across different situations. An expert panel should be set up to recommend a normative approach for tariff setting in vessel-related services.

In addition, regulatory approvals need to be granted in a time-bound manner and towards this end, the regulatory process should be streamlined including adequately strengthening administrative and statutory aspects of regulatory organisations.

PORT LEGISLATION

It is recommended that the two Acts governing the Indian ports - the Indian Ports Act, 1908, and the Major Port Trusts Act, 1963 - be kept separate but modernised. A review of port legislation should be undertaken to have one unified law relating to conservancy and competition and a new law to transform the port trusts to landlord port authorities with functional and financial autonomy. The following approach to reform of port regulation is recommended:

- The Major Port Trusts Act (MPTA) should be replaced by a new Major Port Authority Act (MPAA) that allows port trusts to become

Figure 4.47

In Line with Global Norms, QCBA Approach should be Used to Select Consultants





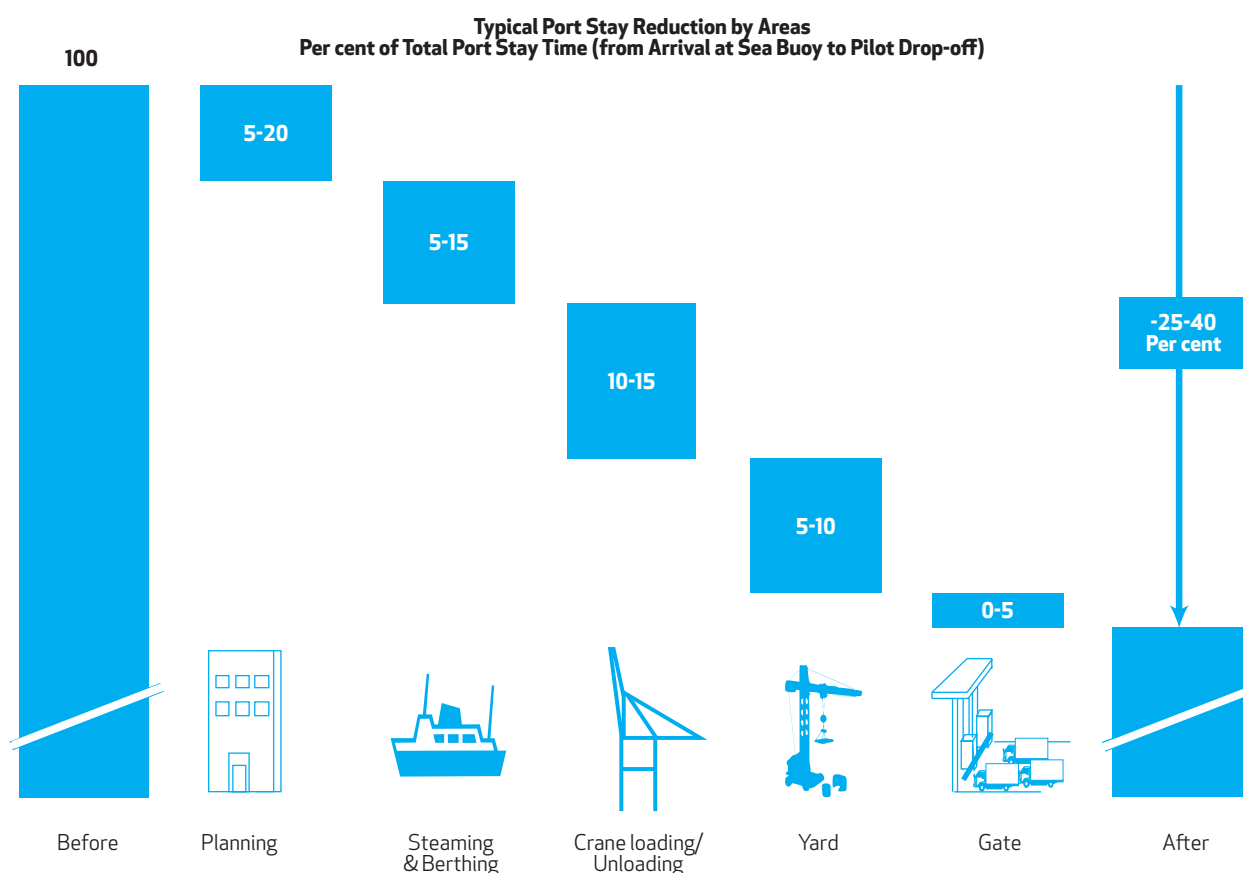
CRITERIA FOR QUALITY ASSESSMENT			COST OVER-RUNS [PER CENT]
<ul style="list-style-type: none"> ■ Technical rating (80 per cent weightage) includes <ul style="list-style-type: none"> – Performance rating (50 per cent weightage), based on appraisals over the last 3 years – Health rating (30 per cent weightage), based on – cash position; project portfolio. ■ Bid price (20 per cent weightage) 	Canada (Ontario Ministry of Transportation)		5
<ul style="list-style-type: none"> ■ Technical rating includes <ul style="list-style-type: none"> – Performance on previous projects – Health rating, based on sector experience of the firm; quality of staff; education and experience of personnel ■ Ratio of technical score-to-price quote is used to determine the winner 	USA (FHWA, State DOTs)		9
<ul style="list-style-type: none"> ■ Technical rating includes <ul style="list-style-type: none"> – Quality of bidder's technical suggestions on the project (value engineering) – Health rating 	China (Highways agency)		12
<ul style="list-style-type: none"> ■ Technical rating includes <ul style="list-style-type: none"> – Experience of similar work – Suggested approach and methodology – Staffing, resume of key personnel 	India		22
<ul style="list-style-type: none"> ■ Technical rating, wherever used at final tendering stage, delivers better results ■ Factoring the consultant's past performance in his technical rating makes the pre-qualification very robust 			

Figure 4.48

Total Port Stay Can be Cut by 25-40 Per Cent Across 5 Main Levers



A Port Community System (PCS), a single technology based platform which brings together all stakeholders and shares information is essential. An 'e-custom' solution could also be developed later. While implementation of PCS has been already initiated, its rollout has not been very successful

landlord port authorities and enable them to function on the basis of commercial principles, subject to the rigour and discipline of financial and capital markets.

- The Indian Ports Act, 1908 that already deals with the safety of ports (both major and non-major) can be modernised to introduce setting up of a new Maritime Authority of Ports vested with power to regulate intra-port and inter-port competition as well as port conservancy across all the ports in India.
- TAMP should ideally cease to exist with time as port operations become competitive and tariff regulation is no more required.

STRENGTHENING PROJECT IMPLEMENTATION

The route to the much-needed capacity addition to India's ports is through effective implementation of PPP projects. Three initiatives have been identified to facilitate this.

HIGH-POWER GROUP FOR PORT PROJECTS

Such a group can add transparency and force decisions to strengthen weak project implementation and enable progress. Its scope should cover a small number of larger projects. The group can be headed by a minister or a secretary and carry out functions on the lines of the Cabinet Committee on Investment. It can bring in other ministries as necessary. The group should

- Identify key projects that need to be implemented on a time-bound basis, involving investments above Rs 5 billion and upto Rs10 billion, or any other project identified as critical by the Committee
- Prescribe time limits for issue of requisite approvals and clearances by the ministries/ departments concerned in respect of identified projects
- Monitor project portfolio and port performance on at least three key metrics: on-time award; actual construction progress against planned milestones; and within-budget completion, including time taken to obtain approvals
- Involve providers of identified projects to understand bottlenecks and collaborate on solutions for delays and over-runs
- Remove inter-ministerial bottlenecks that are impeding important projects pre- or post-tendering to relevant authorities, and push for

decisions. For instance, the group can selectively convene ministers and bureaucrats from concerned areas, creating an empowered group to expedite the resolution of bottlenecks

- Take decisions regarding grant/ refusal of approval or clearance of specific projects that have been unduly delayed, if deemed necessary

CAPACITY BUILDING

The skill set of public sector port managers in structuring PPP projects is limited. This affects timely implementation of projects due to frequent delays in the pre-tendering phase itself. There is a strong need to build capacity of port officials to structure and manage private investments, as well as officials in the ports/ shipping ministries and departments at the Centre and in the maritime states.

CONSULTANT SELECTION ON QUALITY-CUM-COST BASIS

Paid consultants help to prepare most DPRs and can impact the time and cost of project execution. It is important to select technical consultants using a quality-cum-cost-based assessment (QCBA), instead of the traditional L1-lowest cost—approach. Figure 4.47 lists some of the criteria used for quality assessment in Canada, the US and China along with the consequent impact on cost overruns. The quality score should count for 50 to 80 per cent of overall assessment, as in Canada and the US. Evaluators can rate the consultant through feedback from the respective port trusts about his or her performance on previous and ongoing projects. The port trusts in turn can assess performance in a standard manner across projects using a set of standard guidelines with objective scoring parameters. For instance, evaluators can look at the magnitude of design changes during project execution and the reasons for the same.

OPERATIONAL PERFORMANCE OF PORTS

Optimising the vessel handling process end-to-end can reduce the port stay time of a vessel by up to 40 per cent (Figure 4.48). In this context, five typical stages of a vessel's port stay need close attention.

Planning Better planning, coordination and communication ahead of the vessel's arrival in a port can help save 5 to 20 per cent on total port stay time

Steaming Optimising berthing and steaming process for container ships can save 5 to 15 per cent of total port stay time

Handling Efficient crane loading and unloading can cut port stay times by 10 to 15 per cent

Yard operations Better yard layout and production process storage and retrieval of boxes can save 5 to 10 per cent on existing timelines

Gate operations This might not result in direct savings for shipping lines or terminal operators, but it reduces the dwell time of the cargo for the shipper and limits the duration for which shippers need to hire the truck driver. There can be a maximum of 5 per cent savings if the port focuses on avoiding non-value-added activities at the gate, and arranging better arrival/ departure pattern of incoming and outgoing trucks and containers to smooth peak loads.

Prudent use of information and communication technologies (ICT) can substantially help to address the operational constraints with Ports in India. While a discussion on ICT intervention for the Ports sector is undertaken in greater detail in Chapter 9, a broad introduction on the proposed framework for ICT in ports is placed hereunder:

FRAMEWORK FOR IMPLEMENTATION OF ICTS IN PORTS

Most significantly, all major ports would need an extensive IT infrastructure to manage their day to day operations. To create an interconnected network of ports and ensure consistency in ICT policies, it is required that the Ministry of Shipping lay down the ICT policy and roadmap for the Indian maritime sector. An important requirement will be of interoperability between IT systems owned by various entities and provision for Electronic Data Interchange (EDI). It will help them share latest information, analyse data, monitor progress and support quick decision making.

All of this should facilitate movement to a Single Window system. This would involve looking at various processes and documentation requirements from a trader's point of view and weeding out redundancies, improve transparency and reduce process lead times, thereby improving India's competitiveness in trade.

Smart cargo is the next step in automation of maritime operations. Recent developments in Radio Frequency Identification (RFID) and Global Positioning Systems (GPS) seek to make the cargo intelligent. It will help reduce handling time, and eliminate risks associated with container security and missing consignments.

ICT TECHNOLOGIES FOR PORTS

There is no clear view of yard storage space to plan movement of cargo which leads to sub optimal utilisation of a port's storage and loss of revenue. **Geographic Information System (GIS)** solutions could be used to get a real time view of the storage area. It can lead to better yard operations thereby increasing yard throughput and enhance customer satisfaction.

Another application is **Radio Frequency Identification (RFID)** technology for monitoring container movement in yards. It can be used for container identification, information related to cargo origin-destination, and can also help check cases of seal tampering.

Traffic congestion at port gates is another critical problem with currently little or no automation. The entry and exit of vehicles and drivers through the gates of container terminal can be automated. The **Optical Character Recognition (OCR)** system can be installed at the terminal gates and driver's **biometric identity** and his authentication documents could be stored in a **smart card** which he can flash at the counter to gain entry.

It would also be useful to implement **Enterprise Resource Planning (ERP)** solutions which are driven by an integrated suite of software that supports the basic internal business process of any organisation. Importantly, a **Port Community System (PCS)**, a single technology based platform which brings together all stakeholders and shares information is essential. An "e-custom" solution could also be developed later. While implementation of PCS has been already initiated, its rollout has not been very successful. Thus, before embarking on such plans, focus should be on building the foundation and developing stakeholder capabilities.

INSTITUTION AND CAPACITY BUILDING

A well-coordinated and integrated approach will require a strong institutional framework. In that context, the Committee recommends the establishment of an organisation, the Indian Institute of Maritime Research & Planning (IIMRP). Its functions can include supporting government in policy formulation, planning, carrying out high-end research, improving operational efficiency and developing standards and protocol for ICT solutions etc. It should be controlled by an advisory board and should have participation by both government and private sector.

A review of various ports in India suggests that a "one size fits all" strategy cannot be adopted. Separate studies need to be undertaken to assess IT maturity of individual ports and identify specific action items for each of them in line with the overall ICT enablement roadmap.

ICT IMPLEMENTATION ROADMAP

For effective implementation of ICT applications, considerable groundwork is required. The first phase, Foundation Building, should focus on developing the ecosystem, capacity building and creating necessary institutions. The next phase should be capacity building, focusing on setting up ICT systems at port and provide assistance with technology implementation to various stakeholders. In the third phase, Integrated Traffic management system, focus should be on integrating business processes and IT systems of

While it may be desirable to exercise absolute cabotage, given the current inadequacy of the Indian coastal fleet and the need to introduce competition and growth in containerisation, a certain degree of cautious relaxation in cabotage policy might be needed for next couple of years till coastal shipping grows sufficiently

various stakeholders. Some of the initiatives could be Single Window concept, RFID tagging etc.

A review of various ports in India suggests that a “one size fits all” strategy cannot be adopted. Separate studies need to be undertaken to assess IT maturity of individual ports and identify specific action items for each of them in line with the overall ICT enablement roadmap.

INVOLVING ALL STAKEHOLDERS

The four main stakeholders in the port productivity improvement process are the government either directly or through the port authority; the shipping lines; the terminal operators; and the cargo owners or shippers. Each stakeholder has a specific and critical role in accelerating performance.

- Government and/ or port authorities have to make sufficient pilots/ tugs available to bring vessels to their berths with minimal delay. They must also ensure clearance of cargo in the ports to limit the dwell time of these goods inside the port.
- Shipping lines need to clearly align and communicate with terminal operators around their port arrival planning and preferred handling process. This enables terminal operators to turn their vessels around in the fastest possible time.
- Terminal operators need to ensure transparent communications, apply leaner operations in berthing, loading/ unloading and yard operations processes, and facilitate faster exit/ entry at the terminal gate.
- Shippers need to limit the dwell time of the cargo inside the port.

A programme that brings in the right organisational structure, clear processes, required skills and appropriate tools is critical to improve operational performance of Indian ports. Such a programme usually consists of four steps; determine the base line; do a diagnostic on improvement potential; generate ideas; and implement. The process might take months to complete, and its success requires a strong focus on the following key factors:

- Commitment from management: target setting and responsibility
- Clear transformation plan driven by the pro-

gramme management office

- Incentives and disincentives based on performance

A sustained focus on all three key performance indicators can drive high operational efficiency at ports. All four major stakeholders must collaborate to ensure optimum utilisation of existing capacity. This can help our ports effectively manage ever-increasing freight traffic.

SHIPPING

Indian tonnage must be increased and made more competitive. Most importantly, multiple policy changes are necessary to ensure that coastal shipping becomes a critical part of our overall logistics infrastructure.

INCREASING NATIONAL TONNAGE

Increasing Indian tonnage will help spawn associated shore-based services, such as stevedoring, ship repairs, logistics, manning and cargo movement. It will provide higher employment opportunities for Indian seafarers: India has about 30,000 officers and 230,000 ratings. Having more ships under the Indian flag will also provide bigger opportunities for training of Indian seafarers. Higher tonnage will help alleviate national security concerns: national tonnage maintains the supply line for essential cargoes in emergency situations. For example, 100 per cent of the total crude imports from the Middle East during the Iraq war came on Indian ships.

Apart from direct acquisition of new tonnage with emphasis on adequate tonnage towards fulfilling energy security needs over a medium term, domestic tonnage can be augmented in the interim and short run through a combination of policies.

CARGO ASSURANCE THROUGH LONG TERM CHARTERS

Need for long-term charters by public sector enterprises for critical energy cargoes of crude oil, petroleum products and gas could be explored exclusively with Indian ship owners for Indian flag vessels, which will ensure a dedicated fleet of vessels at competitive rates on a long-term basis and will ultimately result in a win-win situation for charterers, ship owners and the economy at large, providing stability in freight costs and lowering input costs. For instance, Japan and Korea have developed strong LNG fleets on the basis of long-term contracts.

MANAGERIAL AND ADMINISTRATIVE CAPACITY

While technical personnel like marine engineers and master mariners are formally trained for their job; administrative personnel are brought in to the

Directorate for three to five years from other services. The sector loses their valuable experience and expertise when they are repatriated. It may be useful to identify ways to build and retain expertise within the system, such as building a subordinate cadre. At the same time, in order to build internal administrative capacity, introduction of an Indian Maritime Services (IMS) merits consideration.

NEED FOR A LEVEL PLAYING FIELD

It is important that the Indian shipping industry be provided a level playing field for it to grow and compete globally with vessels under other flags. This will require rationalisation of restrictive policies, particularly related to imposition of a variety of direct/indirect taxes.

INCENTIVES FOR COASTAL SHIPPING

The following steps merit consideration:

- According priority to coastal ships by setting up coastal terminals at the Major Ports and identifying and developing five or six Non-Major Ports on the east and west coasts as designated coastal ports
- Providing adequate road and rail connectivity to these coastal terminals and designated Non-Major coastal ports.
- Ensure that certain minimum service levels are provided for the coastal fleet in new container terminals as part of the concession agreement to get parity treatment with international vessels. This will help avoid long waiting times for coastal vessels due to preference given by terminals for international cargo given that they pay 30-40 per cent more on a per container basis
- Allow coastal ships to import bunker fuel as well as spare parts with the same concessions availed of by ocean going vessels. The diesel subsidy available to land transport—road and rail—should be completely phased out to even out the current price distortion and provide a level playing field across transport modes
- Providing fiscal incentives to consignors who shift cargo from road and rail to coastal shipping on the lines of the incentives provided by the EU under the Marco Polo scheme.
- Develop separate wings in development financial institutions to fund coastal shipping
- Suitably amend the Merchant Shipping Act or enact separate legislation for coastal shipping to provide different specifications and lower manning scales.
- Have absolute cabotage for import and export of crude, critical energy cargoes and defence equipment/ parts. Relax cabotage to allow foreign vessels to carry bulk/ general cargo and transhipped exim containers, including empty containers on Indian waters. This would

Each river basin should be developed with total integration of multiple uses like irrigation, flood control, navigation, hydro-power, industrial/ domestic water use, fishing, tourism, and ecology, instead of viewing the river use independently from each user point of view by different agencies

help meet the principal objective of enhancing domestic mobility for Indian cargo while also contributing to reduce the strangulating stress on road transport.

A few countries practice an absolute cabotage law while others practice a tailored one. China introduced absolute cabotage beginning January 2013. While it may be desirable to exercise absolute cabotage, given the current inadequacy of the Indian coastal fleet and the need to introduce competition and growth in containerisation, a certain degree of cautious relaxation in cabotage policy might be needed for next couple of years till coastal shipping grows sufficiently. Absolute cabotage might be imposed beyond a certain growth in national tonnage and achievement of desired outcomes.

Reforming the coastal shipping sector will enable India to leverage its coastal lines for logistics three to four times more, reduce dependence on imported fuel by 5-10 per cent, apart from reducing overall cost of cargo movement by over 25 per cent and carbon emissions by more than 50 per cent.

INLAND WATER TRANSPORT

The key issues to be addressed in the IWT sector have already been outlined. However, it must be noted that IWT sector is unique in the sense that water is largely a state subject, though inter-state rivers could be brought under the control of the Union, as are the National Waterways. Success can only be achieved if multiple stakeholders come together and work towards a common objective.

NAVIGATIONAL INFRASTRUCTURE

Development of adequate depth (LAD) Efforts should be made to develop deeper stretches of the rivers (at least 2.5 m, preferably 3 m LAD round the year). Several rivers in India meander, which results in increase in distance to be travelled on waterways as compared to road or rail. Technical feasibility of reducing the IWT route length by straightening the waterway, wherever feasible, to avoid bends, should be studied. While the problem of siltation would be overcome to some extent by adequate LAD, the longer term measure is river basin development:

The Indian ports and shipping sector suffers from poor incentives, lack of clarity in the regulatory structure coupled with overlapping jurisdiction of institutions charged with sector oversight and a debilitating prevalence of ad hoc and piecemeal decision making

Each river basin should be developed with total integration of multiple uses like irrigation, flood control, navigation, hydro-power, industrial/ domestic water use, fishing, tourism, and ecology, instead of viewing the river use independently from each user point of view by different agencies

Central legislation of River Basin Authorities under the control of the Ministry of Water Resources will help total development of river basins instead of isolated interest shown by each organisation and each state government. This system is in line with that followed in several developed countries. Navigation authorities (IWAI and state IWT departments) should be well represented in this forum.

Such River Basin Authorities can plan storage of flood waters in the upper catchment area and release it during the lean season while generating hydro-power. This will control floods during the monsoon and save vast areas of land from erosion and prevent siltation at the downstream end of the river. The augmented lean season flow will help irrigation, navigation, industrial/ domestic use, fishing, tourism and ecology.

Finally, it will lead to integration of river basins with one another and a total network of rivers and waterways, resulting in water balance in the entire region

Adequate air draft Funding may be made available through specific budget provisioning for raising the bridges to at least 5 m above high flood level (HFL) to make these canal systems navigable for commercial cargo carriers.

Augmentation of cargo terminals and IWT vessels There is a case for provision of support at concessional terms for setting up cargo handling facilities and for the acquisition of vessels. Formation of a Special Purpose Vehicle—Inland Vessel Leasing Company—may be looked into, that can procure and lease out the IWT vessel based on market demand to lower entry barriers to IWT operators.

Focus on North-East Given that the available draft in the waterways is low, the appropriate strategy would be to focus on the waterways in the North East. Terminals and cargo handling facilities should be set up at strategic locations and adequate connectivity to road and rail provided.

Development of night navigation infrastructure IWAI should develop this in all National Waterways with a clear plan and timelines. IWAI also needs to provide differential global positioning systems (DGPS), light buoys, river information services (RIS) and other advanced technology for night navigation on some stretches of waterways and subsequently to be extended to cover all NWs.

Development of MRO facilities Private sector participation needs to be explored for development of MRO facilities in North Eastern states and other National Waterway corridors. In Goa, there is already interest from the private sector to develop repair yards, if the state government provides land. Finally, vessel repair facility could be considered for infrastructure status.

POLICY PARITY

Inland vessels could also be considered for inclusion in the tonnage tax regime. Fiscal incentives could be provided to consignors using inland water transport

MODAL INTEGRATION

IWT terminals need to have sufficient connectivity with road and preferably with rail for last mile connectivity.

Identification of potential multimodal corridors This requires detailed mapping of waterways and industrial clusters and analysis of origin and destination cargo. Existing NWs need to be extended to their tributaries to connect important cargo hubs to enable connectivity at optimum cost.

Develop IWT feeder routes There is a need to create feeder routes under the jurisdiction of states to NWs so that the entire channel can be developed on the 'fish bone structure'. This would involve development of feeder routes in the North East such as Subansiri, Dhansiri and Dibang, as well as major tributaries of Ganga such as Yamuna, Gandak, Kosi and Ghagra. Successful operations of these feeders will pave the way for development of barrages/weirs with navigational locks to ensure round-the-year operations.

In many stretches, IWT and coastal shipping operations could be integrated to accommodate hinterland, coastal and international traffic. Both modes are by nature inter-modal. At many places, these two modes provide seamless connectivity to the hinterland, for example, the region adjoining Kolkata and Paradip port; the Goa region, the Cochin port-West Coast Canal region, the proposed NW-4 and NW-5 linking East Coast Canal and Eluru. By combining inland terminals with an automated Roll on–Roll off (Ro-Ro) system, the cost of transshipment can be minimised to a great extent since ro-ro vessels offer an

excellent alternative to road haulage on certain corridors/ stretches. Also, such vessels will be able to reach certain inland locations via inland waterways; this could take some of the traffic load off the road network and bring about a better balance among various modes.

PUBLIC INVESTMENT

A choice was posed earlier about the relative priority of IWT against other transport modes, given the limited public investment available for the transport sector. That is the foremost question that needs to be answered before any avenues for development of IWT can be considered.

In case IWT is considered a priority, there ought to be a quantum jump in funding in the 12th Plan and beyond. In addition, the possibility of private sector participation in the development, maintenance and regulation of some stretches of rivers may be also looked into. Following pre-conditions need to be in place to encourage private participation:

- There is long-term cargo commitment from the user on both ways. In the initial years, when business volumes are lower, policy intervention is required to mitigate demand uncertainty. Such an intervention in identified routes may be similar to awarding concession for seaport/ airport
- Freight through IWT is sufficient so that the private operator is able to recover his investment
- Freight subsidy is given on par with road and rail

WATER TRANSPORT STATISTICS

Improving quality of water transport statistics to monitor trends and performance of the sector key to enabling the development of the sector.

These statistics include data about ports, shipping, ship building and ship repair, and inland water transport. Transport Research Wing (TRW), Ministry of Road Transport and Highways is the nodal agency for collection, compilation, dissemination and analysis of water transport statistics.

The following data gaps exist in port statistics in India:

- Data on country-wise break-up of origin and destination of cargo is frequently asked for by researchers. Shipping lines/ companies generally provide information on the port of country from where the cargo is loaded or where the cargo is to be discharged, and not the actual country from where the cargo originated or is destined to.
- Container cargo is the fastest growing form of traffic at Major Ports. However, the commodity-wise data handled in containers is not

being maintained.

Data on the shipping sector, disseminated through two annual publications—Indian Shipping Statistics and Statistics of India's Ship- Building & Ship Repairing Industry, was found to have the following gaps by the National Statistical Commission:

- Financial performance indicators of private shipping companies.
- Operational indicators voyages, cargo, capacity or space utilisation
- Freight rates for selected Indian import and export commodities for all shipping companies
- Safety statistics
- Environment pollution caused by shipping industry

Apart from the non-availability of timely data on inland water statistics, particularly from states, there are significant data gaps on IWT. IWAI provides cargo statistics for vessels which are registered and availing IWAI facilities on NWs. But numerous unregistered vessels/ boats carry cargo and do not avail IWAI infrastructure facilities. This traffic is not being captured at all. Periodic surveys need to be carried out—perhaps once in five years—to assess the cargo carried by such vessels on NWs. Many state governments are unable to maintain the data/ information on IWT due to lack of scheduled/ systematic records on freight/ passenger operations. Consequently, the data on IWT at the all-India level lacks full coverage.

IMPROVING QUALITY OF STATISTICS

- Periodic review of water transport statistics is required to assess the system and identify the possible changes required for meeting user needs. Such reviews should be undertaken once every five years
- At present, no system for training and sharing of experiences on water transport statistics exists. Training programmes/workshops for officials/staff involved in compiling statistics, particularly port statistics may be organised. The workshops should cover statistical concepts, definitions and issues of compilation, processing and Total Quality Management
- The annual publication should be out in the year following end of the calendar/ financial year, and the bi-annual publication within the three months i.e. in June for the period ending March and December for the period ending September
- TRW may provide the metadata for water transport statistics in the form of a manual on the Ministry of Shipping website
- All regular publications of TRW on ports, shipping and IWT should be available online
- Concurrent audit of statistical activities is necessary for early detection of errors and mistakes during the progress of

work, and their rectification in time is essentially an internal activity of the primary data compiling agency. It is suggested that assessment of quality of the data produced by the primary source agencies may be carried out through statistical audit by officers authorised by the Ministry of Shipping.

THE ROAD AHEAD

The section below summarises the traffic projections and related investments in infrastructure for the ports and shipping sector for around next 20 years. Given the unusually long term assessment of the traffic and associated investments, it is only reasonable to suggest that these projections be reviewed and rationalised at specific intervals to factor in the socio-economic changes as they emerge overtime. The section concludes with a summary of key recommendations for the sector discussed in detail earlier. An indicative time plan, bucketed into short-term, medium-term and long-term targets, has been drawn at the end to guide decisions through the next 20 years.

TRAFFIC PROJECTIONS

PORTS

The cargo traffic at ports is expected to grow at a CAGR of more than 6 per cent to reach **3,068 MT** by the end of the 15th Plan (2031-32) from the current levels of 914 MT. Higher annual growth rates of around 7-8 per cent are expected to be seen in case of coal, containers and general cargo. To meet this growth in cargo traffic, a capacity requirement of about **4,000 MT** including the major and non-major ports, is projected by 2031-32.

SHIPPING

The growth in Indian shipping has been projected in terms of the desirable growth of Indian tonnage as percentage of the world tonnage, by end of the 12th Plan. This growth has been looked at from a business-as-usual perspective, i.e. if the Indian tonnage remains the same percentage of global tonnage. In addition, two rather aggressive growth scenarios, one with Indian tonnage reaching 2.5 per cent and other at 5 per cent of the world tonnage by 2016-17, have also been assumed. The tonnage projections are placed below:

GROWTH SCENARIOS	TONNAGE (GT) - PROJECTED (BY END OF 12 TH PLAN)
Business as Usual (same percentage of world tonnage)	12.4M
Indian tonnage expands to 2.5 per cent of world tonnage	26.6M
Indian tonnage expands to 5 per cent of world tonnage	53.3M

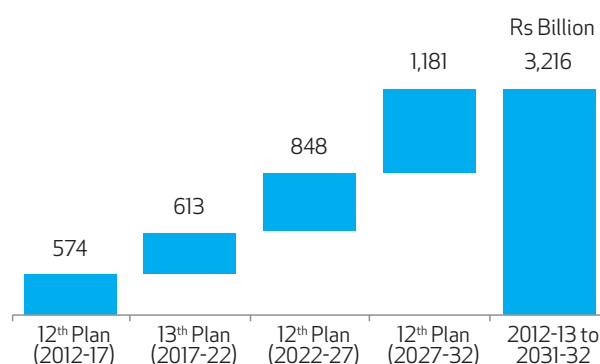
INLAND WATER TRANSPORT (IWT)

Provided that the IWT infrastructure develops sufficiently, the cargo potential on the existing five national waterways is projected to increase to about 47 MMT by 2019-20 and to 92 MMT by 2031-32. The composition of projected cargo is expected to be similar to the current structure comprising of coal, agriculture & forest products and others with coal forming the bulk of the volume.

INVESTMENTS

PORTS

An estimated cumulative investment of over Rs 3 trillion shall have to be made to create the projected port capacities of about 4,000 MT by 2031-32. The Plan-wise break-up of projected investments (in Rs billion) in building port capacities including that for dredging, is shown in the figure below.



SHIPPING

The projected investment towards Indian tonnage growth, basis the three scenarios considered, are placed hereunder. Even for a business as usual case, India will have to make an investment to the tune of Rs 25 billion during the 12th Plan on creating Indian tonnage which is consistent with its present share in the world tonnage.

GROWTH SCENARIOS	TONNAGE (GT) - PROJECTED (BY END OF 12 TH PLAN)	ESTIMATED EXPENDITURE (RS BILLION)
Business as usual (same percentage of world tonnage)	12.1M	25
Indian tonnage expands to 2.5 per cent of world tonnage	26.6M	320
Indian tonnage expands to 5 per cent of world tonnage	53.3M	800

Source: INSA

INLAND WATER TRANSPORT (IWT)

The volume of cargo moved through inland water transport remains very low, confined largely to the movement of iron ore in Goa and fertiliser raw material in the West Coast region. Development of inland water transport with adequate intermodal connectivity can help to reduce the congestion on roads and

7. Of the total sectoral investment projected, shipping investments have been projected only upto the end of the 12th plan (i.e. 2016-17)

rail and reduce CO₂ emissions. In order to support the cargo growth expected by the end of the 15th Plan, an investment of about Rs 640 billion is projected for development of IWT, with about Rs 300 billion contributed by the government and the rest by the private sector.

A total investment of about Rs 4,000 billion⁷ is projected for desired development of the ports and shipping sector till the end of the 15th Plan.

KEY RECOMMENDATIONS

The Indian ports and shipping sector suffers from poor incentives, lack of clarity in the regulatory structure coupled with overlapping jurisdiction of institutions charged with sector oversight and a debilitating prevalence of ad hoc and piecemeal decision making. Neither the regulatory structure nor capacity has kept pace with the enormous growth in traffic witnessed in the last decade due to India's increased integration with the global economy. Coastal shipping as well as Inland water transport has grown far less optimally than what would have been ideally desirable, given the low unit transportation cost and environmental impact.

The Committee is making the recommendations with the intent to provide a long term direction to the future development and governance of Indian ports while aiming to incentivise and integrate water based transport for it to play an increasing role in the national transport network. Needless to say, most of these recommendations shall bear fruit when their implementation results from well co-ordinated and planned integration between agencies at various levels so that the maritime capacities created complement one another in an integrated national network. Placed below is a summary of recommendations made, which are then followed by an indicative time plan mapped against the key recommendations.

PORTS

There is a strong need to put in place an overarching long-term theme for national port development that prioritises and guides investments while also paving way for regulatory reforms and suitable governance structure.

STRATEGIC VIEW ON PORT INVESTMENT

Indian ports will have to be adequately invested, efficient and cost effective to be globally competitive, particularly in terms of superior multi-modal hinterland connectivity and higher drafts of at least 17 metres at the major ports. One of the key government priorities should be to invest in four to six Mega ports over the next 20 years, with two to three on each coast to substantially cater to our foreign trade and the estimated requirement of raw material imports and exports by 2030.

Based on the assessed levels of competition between ports and between similar cargo handling terminals in a region, tariff determination should be left to market forces. Only in cases of inadequate competition, or serious market imperfections, may some pricing control be required

These mega ports can be established either by transforming some of the existing major (or non major) ports into mega ports, if feasible, by combining some major and minor ports, or by setting up totally new mega ports. This would call for close coordination with the maritime states. Contingent on such a decision, the location of these ports should be harmonised with plans for the NHDP and the upcoming dedicated freight corridors as well as those that are planned in future, so that there is efficient multi-modal connectivity.

An expert group needs to be expeditiously set-up to study and identify potential locations for development of these mega ports while give special consideration to the immense trade potential with the east.

a) Strategic Institutional shift – Landlord model of port governance

The ports in India, essentially the major-ports, widely follow a hybrid format of the long obsolete service port model and the preferred landlord model. The hybrid approach has resulted in a conflict of interest between the port trusts and the private sector, with the former acting both as port regulators and providers of commercial services in many instances.

Whereas there has been consensus within the various echelons of the Government for moving to landlord model of port governance and corporatisation of major port trusts, there has been little progress towards its implementation. There is immediate need to make appropriate legislative and policy changes to expedite the move to the landlord model and to transform the port trusts to statutory landlord port authorities through specific legislation. All the terminal operations of port trusts would need to be corporatised as public sector corporations. Then, both private- and corporatised public-sector terminal operators would compete under the aegis of the landlord port authority. The corporatised public sector terminal operators could potentially be disinvested, listed, and possibly privatised at a later stage. The landlord port authority would carry out all public sector services and operations such as the award of bids for containers and other terminals, dredging etc.

Moreover, given that non-major ports under the management of maritime states have enjoyed more

success as compared to major ports, any progressive regulatory shift should attempt to bring in the cooperation and participation of maritime states.

• **Role of TAMP**

Based on the assessed levels of competition between ports and between similar cargo handling terminals in a region, tariff determination should be left to market forces. Only in cases of inadequate competition, or serious market imperfections, may some pricing control be required. Accordingly, TAMP should be restructured under a new Major Ports Authority Act and allowed to regulate tariff setting on a normative basis till such time that it is found essential for lack of competition. TAMP could also act as the Appellate Tribunal for all tariff-related matters where tariff is determined by service providers. TAMP should naturally cease to exist with time as port operations become competitive and tariff regulation is no more required.

A new regulatory authority, Maritime Authority for Ports (MAP), should be constituted under a modernised Indian Ports Act, suitably empowered to regulate competition and port conservancy across all the major and non-major ports in the country.

The combination of strategic decisions on investment in Mega Ports and movement to a landlord port system would do much to accelerate the investment in and modernisation of Indian ports.

b) Strengthening Project Implementation

The route to much-needed capacity addition to India's ports is through effective implementation of PPP port projects. Three initiatives have been identified for the government, regulators and nodal agencies to facilitate the implementation of PPP port projects in India.

• **High-power group for port projects**

Such a group can add transparency and force decisions to strengthen weak project implementation and enable progress. Its scope should cover a small number of larger projects. The group would essentially identify key projects required to be implemented on a time-bound basis, involving investments above Rs 5 billion and upto Rs10 billion, or any other project identified to be critical by the Committee. It would escalate inter-ministerial bottlenecks that are impeding important projects (pre or post-tendering) to relevant authorities, and push for decisions.

• **Capacity Building**

The capacity of port managers as well as officials at the ministry should be developed in structuring of PPP projects and managing private investments. This would help address delays in pre-tendering phase that ultimately affects project implementation schedule.

• **Consultant selection on quality-cum-cost basis**

Paid consultants help to prepare most DPRs and can impact the time and cost of project execution. It is important to select technical consultants using a quality-cum-cost based assessment (QCBA) instead of the traditional L1 based (lowest cost) approach. While QCBA is being increasingly adopted in India, the quality is typically ensured through quantum of past experience and not necessarily by the quality of that experience. For instance, evaluators can look at the magnitude of design changes during project execution and the reasons for the same.

SHIPPING

a) Increasing national tonnage

• **Cargo assurance through long term charters**

Need for long term charters by PSUs for critical energy cargoes of crude oil, petroleum products and gas could be explored exclusively with Indian ship-owners for Indian flag vessels, which will ensure a dedicated fleet of vessels at competitive rates on a long term basis.

• **A level playing field**

It is important that the Indian shipping industry be provided a level playing field for it to grow and compete globally with vessels under other flags. This shall require rationalisation of restrictive policies, particularly related to imposition of variety of direct/indirect taxes.

b) Managerial and Administrative Capacity

While technical personnel like marine engineers, master mariners etc. are formally trained for their job; administrative personnel are brought in to the Directorate for three to five years from other services. The sector loses their valuable experience and expertise as they are repatriated. In this context, it may be useful to identify ways to build and retain expertise within the system, such as building a sub-ordinate cadre. At the same time, in order to build internal administrative capacity, introduction of Indian Maritime Services (IMS) merits consideration.

c) Incentives for Coastal Shipping

Multiple policy changes can help increase penetration of coastal shipping leading to a cleaner, cost effective and sustainable alternative to rail and road. The following steps merit consideration:

- According priority to coastal ships by setting up coastal terminals at the major ports and identifying and developing five or six non-major ports on the east and west coasts as designated coastal ports.
- Providing adequate road and rail connectivity to these coastal terminals and designated non-major coastal ports.
- Allowing coastal ships to import bunker fuel

as well as spare parts with the same concessions availed of by ocean going vessels

- Providing fiscal incentives to consignors who shift cargo from road and rail to coastal shipping on the lines of the incentives provided by the EU under the Marco Polo scheme.
- Develop separate wings in development financial institutions to fund coastal shipping
- Manning scales and vehicle specifications for coastal ships should conform to near ocean-going vessels, which are currently related to ocean going vessels.
- Cabotage - While it may be desirable to exercise absolute cabotage in India, given the current inadequacy of Indian coastal fleet and the need to introduce competition and growth in containerisation, certain degree of cautious relaxation in Cabotage policy might be needed for next couple of years till coastal shipping grows sufficiently. To clarify, the more desirable absolute cabotage might be imposed beyond a certain growth in national tonnage and achievement of desired outcomes. Accordingly, the following is suggested:
 - Absolute cabotage for import and export of crude, critical energy cargoes and defence equipment/parts
 - Relax cabotage to allow foreign vessels to carry bulk / general cargo and transhipped EXIM containers, including empty containers on Indian waters. This would help meet the principal objective of enhancing domestic mobility for Indian cargo while also inducing competition led efficiency and reduced load on road transport.

INLAND WATER TRANSPORT

- Development of adequate depth (LAD): Efforts should be made to develop deeper stretches of the rivers for IWT/ navigational purposes (at

least 2.5 m, preferably 3.0 m LAD for round the year navigation).

- Focus North-East: Given that the available draft in the waterways is low, the appropriate strategy would be to focus on the waterways in the North East Region (NER). Set up terminals and cargo handling facilities at strategic locations in the north-east and provide adequate connectivity to road and rail.
- Provide support at concessional terms for setting up cargo Handling facilities and for the acquisition of vessels
- Provide fiscal incentives to consignors using inland water transport
- Modal integration - IWT terminals need to have sufficient connectivity with road and preferably with rail for last mile connectivity, on lines of bi-modal and tri-modal concept of developed waterways of other countries. Following are proposed:
 - Identification of potential Multimodal corridors: This requires detailed mapping of waterways and industrial clusters and analysis of origin and destination cargo to undertake development of suitable waterways as well as multimodal transport hubs in IWT Corridors.
- Develop IWT feeder routes: There is need to develop the feeder routes on the water under jurisdiction of State, to National waterways so that the entire channel can be developed on the “fish bone structure”.
- In many stretches, IWT and coastal shipping operations could be integrated to accommodate hinterland, coastal and international traffic.

WATER TRANSPORT STATISTICS

Currently, substantial gaps exist in these statistics. Improving quality of Water Transport statistics to monitor trends and performance of the water trans-

(Contd...)

RECOMMENDATION	OBJECTIVE	SHORT-TERM 1-5 YEARS	MEDIUM-TERM 5-10 YEARS	LONG-TERM 10-20 YEARS	EXPECTED GAINS
PORTS					
Drafts at Major Ports	Accommodating larger mother vessels	Draft at major ports needs to be increased to at least 17 metres , by the first half of 13 th Plan			Economies of scale - Increased cost competitiveness
Develop 4-6 Mega-ports	Strategic and efficient Investments for superior multi-modal hinterland connectivity, substantial improvement in available drafts and port capacity	Initiate technical studies			<ul style="list-style-type: none"> - Economies of Scale - Economies of Scope - Growth in Containerisation - Growth in Coastal Shipping - Strategic gateway to the emerging East
		Identify potential locations			
		Harmonise with planned and future Highways/Rail Freight Corridors	Harmonise with planned and future Highways / Rail Freight Corridors	Harmonise with planned and future Highways / Rail Freight Corridors	
			Develop 2-3 Mega Ports		
Shift to Landlord Model of Port Governance for Major Ports	Adoption of suitable port governance model that encourages private investments and efficiency through competition		(Consider Port for connectivity to ASEAN)	Develop 2-3 Mega Ports	<ul style="list-style-type: none"> - Private Investments - Competition - Operational Efficiency - Government disengagement from operations
		Corporatise Landlord Port Authorities			
		Unbundle Terminal Operations and Corporatise			
		Induce Competition			
		With competition, deregulate tariff and restructure TAMP			
			Competition Regulation		
SHIPPING					
Cargo Assurance	Increasing National Tonnage	Possibility of long term charter contracts with PSUs for critical energy cargoes could be explored			<ul style="list-style-type: none"> - National Fleet - Alleviate National Security concerns - Create jobs - Stable freight cost
Coastal Terminals and dedicated Ports	Promote Coastal Shipping	Set-up Coastal terminals at Major ports			<ul style="list-style-type: none"> - Reduced congestion on roads and railways - Reduced CO₂ emissions
		Identifying 5-6 Non-Major ports on east and west coasts as designated coastal ports			
		Develop 2-3 of such ports	Develop 2-3 of such ports		
		Provide Rail / Road Connectivity to Terminals and ports			
Cabotage	Improve mobility while protecting coastal shipping	Absolute cabotage for EXIM crude, critical energy cargo and defence related			<ul style="list-style-type: none"> - Competition led efficiency - Reduced cost
		Relax cabotage for Bulk/General cargo and trans-shipped EXIM containers (including empty containers)			
				Absolute Cabotage	
Inland Water Transport					

RECOMMENDATION	OBJECTIVE	SHORT-TERM	MEDIUM-TERM	LONG-TERM	EXPECTED GAINS
		1-5 YEARS	5-10 YEARS	10-20 YEARS	
Develop Adequate Depth	Improve Navigational Infrastructure	Initiate technical studies for optimal route length			<ul style="list-style-type: none"> - Improved carrying capacity - Reduced land congestions
		Develop deeper stretches of the rivers (at least 2.5 m, preferably 3.0 m LAD)			
Focus on North East	Address low draft available in the waterways	Set up terminals and cargo handling facilities at strategic locations in the North-East			<ul style="list-style-type: none"> - Exploit the natural draft at NER - Strengthen opportunities for Strategic linkages for the region
Incentivise Vessel Acquisition and Cargo Handling Facilities	Encourage investments in IWT infrastructure	Consider Inland vessels in the Tonnage tax regime			<ul style="list-style-type: none"> - Increase private participation - Improved infrastructure
		Provide concessions for setting up cargo handling facilities			
Multi-modal Integration	Provide last mile connectivity	Initiate studies for mapping of waterways and industrial clusters	Develop suitable waterways and multi-modal transport hubs in IWT Corridors		<ul style="list-style-type: none"> - Efficient inland movement of cargo - Economies of scale
			Develop IWT Feeder routes (Fish-bone structure)		<ul style="list-style-type: none"> - Integration with coastal operations
OTHERS					
Improve water Statistics	Address current gaps in data	Periodic review of Water Transport statistics (once every 5 yrs)			Improved monitoring of trends and performance of the water transport sector for effective decision making
		Training of officials			
		Concurrent audit of statistical activities			

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Annex 4.1

Draft Available at Major Ports

PORT	LENGTH OF ENTRANCE CHANNEL (KM)	DRAFT (METRES)	DRAFT AVAILABLE AT BERTHS (METRES)	
			MIN.	MAX.
Kolkata	232	7.2	7.2	13.7
Haldia	115	7.2 13	Subject to tidal variations	
Paradip	500	(17 m by June, 2012)	11.0	21.0 (SPM)
Visakhapatnam	IH-2.0 OH-3.1	IH-11.0 OH-20.0	8.0	17.0
Ennore	3.775	16.0	15.0	15.0
Chennai	6.7	IH-18.6 OH-19.2	8.5	17.4
V.O. Chidambaranar	4.0	12.8	5.85	12.8
Cochin	10.5	14.5	9.14	22.5(SPM)
New Mangalore	14.0	14.0	7.0	12.5
Mormugao	4.6	14.4	12.0	14.1
Mumbai	9.6	10.7	7.0	12.0
JNPT	10.0	11.0	5.0	13.5
Kandla	25.0 OOT-8.0	11.6 OOT-23.5	9.1	30 (SBM)

5. **URBAN TRANSPORT**





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5. URBAN TRANSPORT

India's cities have expanded rapidly over the last few decades and are likely to grow faster in the future. Urban India is expected to contribute 70 per cent of India's GDP by 2030¹

These are centres of wealth—the per capita income in the largest cities is much higher than the average per capita income of the country as a whole and, in some cases more than double the national average—but they are also intertwined with the national and rural economy through consumption patterns, remittances, and other links.

URBANISATION AND FUTURE URBANISATION PROJECTIONS

According to Census 2001, 27.8 per cent of Indians, i.e. 286 million people or 55 million households lived in urban areas. The provisional data from Census 2011, showed that urban population had gone up to 377 million, which represents 31.2 percent of the population of India. Estimates of urban population growth in India range from 550 to nearly 600 million people by 2030.²

'Urban India' will be varied. The total urban population living in cities and towns in any particular class has increased consistently due to the stable and balanced pattern of urbanisation throughout the last century. This balanced urban growth pattern has led to increasingly larger proportions of population living in Class I towns. As seen from Table 5.1, over two-thirds of the total urban population now lives in cities that have populations over 100,000 (Class I towns). The continuing increase in the number of large cities, million-plus cities, half-million-plus cities, and 100,000-plus cities does have implications for strategies for urban transport management.

In 2001, there were 5,161 towns in India which increased to 7,935 towns by 2011 (Table 5.2). The total number of Urban Agglomerations, which constitutes

the urban frame, is 6166 in the country. Nearly 50 per cent of the urban population lives in small cities (<.5 million), whereas 15 per cent lives in mega cities.

The fastest growth in the last decade has been of cities with population between 100,000 and 1 million, e.g. Surat, Nashik and Faridabad. Mumbai, Delhi, Kolkata, Chennai, Hyderabad and Bangalore have grown at a slower rate than the others during the past three decades. The faster growing big metros like Hyderabad and Bangalore have experienced peripheral expansion with smaller municipalities and large villages surrounding the core city becoming part of the larger metropolitan area. This trend is also beginning to emerge in smaller metros like Pune, Indore and Surat.

Although the share of population in cities with more than a million population is high, more than 60 per cent of the urban population is still be living in cities of smaller size (Table 5.3). As will be brought out in the following sections, these cities have not received any support on urban transport either from their respective states or the national government. There is a huge responsibility of addressing urban transport needs responsibly in these towns and cities too.

Even by 2031, about 30-40 per cent of the urban population will be living in small and medium towns. This will be a significant population for which mobility services need to be thought through. The demand for urban transport in newly growing areas and now-smaller cities also will need significant attention so that urban transport in these locations don't reach crisis proportions before they are addressed. The approach to small and medium towns and large rural

¹ India's Urban Awakening, McKinsey, 2009

² UN Population division; the High Powered Expert Committee for Estimating the Investment Requirements for Urban Infrastructure Services set up by the Ministry of Urban Development, Government of India which submitted its final report entitled 'Report on Indian Urban Infrastructure and Services' in March 2011 and the McKinsey Global Institute's Report entitled 'India's Urban Awakening : Building Inclusive Cities, Sustaining Economic Growth', April 2010.

Table 5.1
Composition of Class I Cities as per Population Size (Census 2011)

CITIES AS PER POPULATION	NO. OF CITIES
More than 10 million	3
5 - 10 million	5
2 - 5 million	10
1 - 2 million	35
Total Million Plus Cities	53
0.5 million to 1 million	43
100,000 to 500,000	372
Total Class - I Cities	468

Source : Census 2011

Table 5.2
Category of Urban Agglomerations as per Census 2001 and 2011

CATEGORY	NUMBER OF UAs AS PER CENSUS	
	2001	2011
Class I (more than 100,000)	441	468
Class II (50,000 to 100,000)	496	
Class III (20,000 to 50,000)	1388	
Class IV (10,000 to 20,000)	1563	
Class V (5,000 to 10,000)	1041	
Class VI (below 5,000)	232	
	5161	7935

Source : Census 2011

areas cannot be the same as for metropolitan cities and while their demands and problems are also significant urban planners should not look at them with the peculiar lens out of their understanding of mega cities alone.

URBAN TRANSPORT IS UNLIKE OTHER TRANSPORT SECTORS

Urban transport (UT) is a broad name for a sector that covers a variety of modes of intra-city transport for people and goods, including walking, bicycling, non-motorised transport such as rickshaws etc, private personal transport, i.e. cars and motorbikes; public transport which could be rail or bus based;

private-public transport such as taxis and para-transit modes among others.

NTDPC's scope has been spread across a range of issues related to development of comprehensive and sustainable policy for meeting the transport requirements of the country through various modes of transport. While looking at the changing nature of demand for transport and the particularities of each mode of transport, UT cannot be neglected since more often than not, it accounts for the last mile in any other inter-city transport trip. In fact it is, cumulatively, a significant percentage of the overall transportation trips in the country. It is often productive, but also contributes significantly to congestion,

Table 5.3
Distribution of Urban Population, 2001 and 2011

CITY SIZE	POPULATION RANGE	NUMBER OF TOWNS		POPULATION IN TOWNS (IN MILLION)		PER CENT OF URBAN POPULATION,	
		2001	2011	2001	2011	2001	2011
Class I	> 100,000	441	468	178	265	62.3	70.2
Class II	50,000 -100,000	496	7,467	344	112	12.0	29.8
Class III	20,000 -50,000	1,388		421		14.7	
Class IV	10,000 -20,000	1,563		23		7.9	
Class V	5,000 -10,000	1,041		8		2.8	
Class VI	< 5,000	232		0.8		0.3	
ALL	Total	5,161	7,935	286	377	100	100

Source: Census of India, 2001 and 2011

environmental pollution, energy dependence and other social concerns.

One of the key differentiating factors between UT and other transport sectors like, railways, roads and inland water ways is the complexity of the system given the variety of modes prevalent here. UT solutions not only have to look at the efficiency in terms of time and cost and convenience of each mode but also the inter dependency of one mode on the other. As an example, a highly efficient mass transit system could be made ineffective if links to other parts of transit systems are weak and inefficient.

Unlike other transportation sectors, UT is primarily guided by the nature and future nature of urbanisation. UT system choice decisions are rarely taken on the basis of technology or system performance alone; they also incorporate economic geography, industrial development, distributional, environmental and other goals. Wider urban social, economic and governance issues such as the crime and safety, public sector regulation and management capacity,

also play a strong role in determining the mode of transport adopted by a city.

UT could be a facilitator or could pose a burden on the urban contribution to city productivity and the national economy. The defining trait of urban transportation is the ability to support higher densities in urban areas and efficiently, affordably move people and goods through and in the city. Agglomeration economies rely on provision of basic urban infrastructure services in general and UT infrastructure in particular. UT helps connect people and residential areas to education and employment locations, expanding opportunities and choices for people to access alternate education and employment. The efficiency and effectiveness of the UT system also has an important impact on the health and safety of the commuters in specific and urban residents in general. Safety from traffic-related accidents as well as safety from crime, is also related to the way the city and the transport system is planned and managed. In terms of the health-related impacts of transport in urban areas, vehicular pollution has emerged

In the absence of adequate provision of UT infrastructure including public transport, congestion diseconomies can outweigh the benefits of agglomeration. Well-planned and implemented UT can augment the agglomeration advantages of cities and minimise their congestion diseconomies

as the top contributor to air pollution. These issues are discussed more at length in other chapters of this report.

In the absence of appropriate infrastructure, diseconomies could set in from traffic congestion, environmental degradation, deterioration in civic services, fatalities and injuries due to road traffic crashes, and air and water pollution. In order for cities to perform their role as engines of economic growth and innovation, while providing an improved quality of life to its residents it is very important to integrate the competing demands of transport, housing, and commercial real estate in their development. In the absence of adequate provision of UT infrastructure including public transport, congestion diseconomies can outweigh the benefits of agglomeration. Well-planned and implemented UT can augment the agglomeration advantages of cities and minimise their congestion diseconomies.

URBAN TRANSPORT IN INDIA TODAY

URBAN TRANSPORT MODAL SHARE ACROSS INDIAN CITIES

Urban transportation enables movement of goods and people from one location to another within an urban area. UT modes related to the transportation of goods in Indian cities commonly include a variety of modes including non-motorised modes such as manual push carts and bicycle carts, and motorised modes such as small and large trucks, pick up vans etc. UT modes related to the transportation of people, for work, education, social activities and shopping include walking, non - motorised transport-bicycling, cycle rickshaws, etc; alternative mode of flexible passenger transportation commonly termed para-transit modes—such as minibuses and share taxis, that do not follow fixed routes or schedules, public transport such as on call taxis, chartered taxis and buses; organised bus systems; bus rapid transit systems; trams and electric buses; underground and over-ground rail based mass transit systems; and private motorised modes such as cars and two wheelers. The distribution of travel among these modes varies significantly across cities. At present, there is inadequate understanding of, and inconclusive data on, the modal share distribution between these various transport modes, across city types and sizes in India.

The variations in reported modal share from a few studies are reflected in Table 5.4. It is clear that there is no consensus among transport planners about the true modal split of trips in any city. Particularly lacking is information and data on urban freight movement, which is commonly believed to be up to 15 per cent of the traffic.

The different results are due to a range of factors that include, differences in types and the methodologies of the surveys. Most transport studies, have been conducted by consultants who have designed their methodologies and surveys to measure viability of specific projects such as a new road or flyovers or even integrated public transport systems. Project based methodologies are now also used in wider surveys including a study conducted for Ministry of Urban Development (MoUD) in 2008 leading to the report titled 'Study on Traffic and Transportation Policies and strategies in Urban Areas in India.' These kinds of traffic surveys, however, give an incomplete and often biased picture of modal share as they are most often conducted on points/places on roads (such as at petrol pumps, traffic junctions or midway on roads, etc) that are unrepresentative of broader traffic patterns. Surveys based on household interviews can also miss many trips taken by those not present when the interview was taken, or those not considered as 'trips' by the respondent.

Comprehensive traffic diary surveys are a superior instrument for policy level discussion and decision making, but are not available in India. Accurate comprehensive traffic diary surveys should be undertaken at the start of each Comprehensive Mobility Plan (CMP) revision process. As discussed in Chapter 5, Volume II on Institutions for Transport System Governance, there also is a strong requirement for developing an institutionalised system that would be responsible for conducting its own national travel and urban transportation surveys on a periodic basis and maintain data banks for data generated by other organisations associated with transportation too.

PUBLIC TRANSPORT MODES ACROSS CITIES

Internationally and historically the choice of the mode of public transport has closely followed the developments in transportation technology as well as the city form and the needs of the city's economy. Many large European and many large American cities that have extensive rail based public transport, were constructed during the 1850 -1920s, period before the diesel engine, good pneumatic tyres (essential for large buses) and availability of mass produced road vehicles took hold. These cities have important large Central Business Districts (CBD) which were fed by rail/metro systems. Cities like Tokyo, New York, Paris and London provided exceedingly large CBDs with large number of jobs each³. In today's developing

Table 5.4
Mode Share in Various Indian Cities

CONSOLIDATED FIGURES FROM VARIOUS REPORTS ON MODAL SPLIT IN INDIAN CITIES										
CITY SIZE CATEGORY (MILLION POPULATION)	CITY NAME	POPULATION IN THE CITY (MILL)	WALK	NMT		IPT		PUBLIC TRANSPORT	MOTORISED PERSONAL TRANSPORT	
				CYCLE	RICKSHAW	AUTO RICKSHAW	OTHERS		CARS	2 WHEELERS
>8.0 ****	-	-	22	8		7		44	10	9
>5.0 *	-	-	29	8	1	1		47	4	10
	Mumbai**	-	12	10		-		60		18
	Mumbai***	16.4	28	5		9		44	9	5
	Mumbai****	17.7	27	6		7		45	8	7
	Kolkata**	-	12	4		-		77		5
	Kolkata***	13.2	18	12		3		57	7	3
	Kolkata****	14.7	19	11		4		54	8	4
	Delhi **	-	35	5		-		40		20
	Delhi ***	12.9	20	12		6		43	14	5
	Delhi ****	13.8	21	12		6		43	14	5
	Chennai**	-	32	16		-		42		10
	Chennai***	6.56	22	6		9		32	9	22
	Chennai ****	7	22	8		8		31	10	20
	Bangalore**	-	46	10	-	-		36		8
	Bangalore***	5.7	28	5	18	18		26	16	7
	Bangalore ****	8.6	26	7	7	7		35	8	17
	Hyderabad**	-	21	28	-	-		35		16
	Hyderabad***	6.34	22	6	7	7		49	8	8
	Hyderabad ****	6.3	22	9	7	7		35	9	9
	Ahmedabad**		48	14	-	-		28		10
	Ahmedabad***	5.41	22	14	5	5		15	20	24
	Ahmedabad ****	5.9	22	14	6	6		16	17	25
'4-8 ****	-	-	25	11	7	7		21	10	26
'2-5 *	-	-	29	13	2	7		33	1	21
	Pune**	-	28	10	-	2		38		24
	Pune***	3.78	24	8	8	-		12	10	38

CONSOLIDATED FIGURES FROM VARIOUS REPORTS ON MODAL SPLIT IN INDIAN CITIES										
CITY SIZE CATEGORY (MILLION POPULATION)	CITY NAME	POPULATION IN THE CITY (MILL)	WALK	NMT		IPT		PUBLIC TRANSPORT	MOTORISED PERSONAL TRANSPORT	
				CYCLE	RICKSHAW	AUTO RICKSHAW	OTHERS		CARS	2 WHEELERS
	Pune ****	4.2	22	11		7		12	12	35
	Kanpur **	-	72	21		-		5	2	
	Kanpur ***	2.72	30	18		7		6	7	32
	Kanpur ****	-	29	19		7		9	16	21
	Lucknow**	-	36	36		-		0	28	
	Lucknow***	2.24	38	26		8		0	4	24
'2-4 ****	-	-	25	18		6		10	12	29
'1-2 *	-	-	30	8	5	2		24	1	30
'1-2 ****	-	-	24	19		8		13	1	24
'0.5-1 *	-	-	32	10	9	3		21	2	23
'0.5-1 ****	-	-	32	20		3		9	12	24
< 0.5 (category 1a) ****	-	-	34	3		5		5	27	26
< 0.5 (category 1b for hilly towns) ****	-	-	57	1		0		8	28	6
'0.1-0.5 *	-	-	38	15	12	3		13	1	18
'0.05-0.1 *	-	-	38	17	13	4		11	1	16

Source: * Geetam Tiwari, 2011; ** Pendakur 2002 and World Bank 2002; *** Various CDPs from <http://www.JNNURM.nic.in/>; **** WSA, Study on Traffic and Transportation Policies and Strategies in Urban Areas in India, Ministry of Urban Development, Government of India, 2008.

world, there are very few cities that have such large CBDs with such high employment densities. India's cities often have several concentrated business districts corresponding to city centres in particular eras.

Very few Indian cities currently, have organised, registered and regulated public transport systems. The coverage of local commuter rail services are available only in the seven metropolitan cities in India Mumbai, Delhi, Chennai, Kolkata, Bangalore, Hyderabad and Pune. Organised city bus services operate now in about 65 cities, an increase from only 20 cities in 2006. Intermediate public transport modes like three-wheeled auto rickshaws, tempos and cycle rickshaws also provide public transport services. Today, while the share of city buses is very small compared to para-transit modes (registered transport and personalised motorised vehicles (two-wheelers and cars), it must be kept in mind that in most cities, a large number of contract buses also ply especially catering to trip demands for work and for children to go to school. City wise vehicle registration data when compared to

the fleet strength of the formal public transport agency reveal interesting insights on how important other vehicles, contract buses and para transit vehicles must be in those cities for urban transport (Table 5.5).

A general decline in public transport trips is noticeable in cities of all sizes when a RITES study of 1994 is compared to the WSA, Study on Traffic and Transportation Policies and Strategies in Urban Areas in India (Table 5.6). Another analysis of data on vehicles registered in India, presented in Table 5.7, reveals that the share of buses has declined to 1.1 per cent of all registered vehicle in India from 11.1 per cent in 1951, indicating that while cars and two wheelers have seen rapid growth, governments have not invested significantly to increase the quality and availability of public transport, especially through buses, over the decades. However, the rapid growth in personal two-wheelers specifically, and in cars to some extent, is still much less than comparative economies globally as discussed in a later section.

3 Mohan, D. 2008. Mythologies, Metro Rail Systems and Future Urban Transport. Economic and Political Weekly, 43, 41-53.

Table 5.5
Pattern of Public Transport in Selected Indian Cities
 (All figures in numbers)

CITY	MUMBAI	DELHI	CHENNAI	BANGALORE	KOLKATA	PUNE
	BEST	DTC	MTTC	BMTTC	CALCUTTA STC	PUNE MPML
Public Transport Buses operated by SRTU	4,652	5,771	3,414	6,111	956	1,549
Other Buses (Reg buses excluding SRTU buses)	8,189	39,986	33,791	22,150	3,293	13,459
Paratransit-registered commercial transport vehicles incl. taxis and three to six seater passenger vehicles	159,629	253,532	174,314	162,431	49,648	78,778

Source: Adapted from Transport Research Wing, Ministry of Road Transport and Highways, Government of India, New Delhi, Road Transport Yearbook (2009-10 & 2010-11), July 2012 and Physical Performance of SRTU's for the year 2010-11 (Source IJTM April-June 11, published by Central Institute for Road Transport, Pune India)

Table 5.6
Composition of India's Vehicle Population

YEAR END (MARCH)	TWO WHEELERS	CARS, JEEPS & TAXIS ETC.	BUSES	GOODS VEHICLES	OTHERS VEHICLES	TOTAL
	(as percentage of total vehicle population)					(Million)
1951	8.8	52	11.1	26.8	1.3	0.3
1961	13.2	46.6	8.6	25.3	6.3	0.6
1971	30.9	36.6	5.0	18.4	9.1	1.8
1981	48.6	21.5	3.0	10.3	16.6	5.4
1991	66.4	13.8	1.5	6.3	11.9	21.4
2001	70.1	12.8	1.2	5.4	10.5	55.0
2011	71.8	13.6	1.1	5.0	8.5	141.8

Source: Transport Research Wing, Ministry of Road Transport and Highways, Government of India, New Delhi, Road Transport Yearbook (2009-10 & 2010-11), July 2012

While these figures do provide a macro picture of the rapid increase in registration of personal modes of transport, especially two wheelers, a significant caveat is that public transport vehicle numbers are likely to be more accurate than those of personal vehicles. This is due to annual or bi-annual verification of public transport vehicles in all states. The number for personal vehicles registered is likely to be much higher than those being used and those on the road due to the fact that very few of them are

de-registered. They pay a one time road tax at the time of registration and annual monitoring of the registration is not in place. Therefore the number of personal vehicles registered presented in the table reflects a cumulative number of all vehicles registered over many decades. The personal vehicles on the road are only a small percentage of these. A survey conducted in Delhi to support the Auto Policy, demonstrated that only around 60-70 percent of the personal registered vehicles were in use.⁴

4 Expert Committee on Auto Fuel Policy 2002. Urban road traffic and air pollution in major cities: Volume 1. New Delhi: Government of India.

Table 5.7
Public Transport Share Comparison, 1994 and 2007

CITY CATEGORY	CITY POPULATION (RANGE IN MILLIONS)	WSA, 2007 (PER CENT)	UTES, 1994 (PER CENT)
1	< 0.5	0 – 15.6	– 22.7
2	0.5–1	0 – 22.5	22.7 – 29.1
3	1.09 – 2	– 50.8	28.1 – 5.6
4	2 – 4	– 22.2	35.6 – 45.8
5	4 – 8	32.1	45.8 – 59.7
6	Above 8	35.2 – 54.0	59.7 – 78.7

Source: Urban Transport Working Group, 2012

URBAN TRANSPORT TRIPS AND TRIP LENGTHS

It is generally believed that the demand for transport increases with increasing incomes. The point to be noted however is that work and education trips, which are essential in nature, remain constant even with increasing incomes. All the other trip types (such as shopping, social, personal business, etc) are flexible and are smaller in number than work trips.

As described in the Box 5.1, the total number of trips does not increase dramatically with rising incomes or increasing population, but the number of motorised trips can and the motorised essentially replace walk or non motorised trips. Also as a city grows motorised trips per corridor may increase.

Indian cities have traditionally been developed on mixed land use models that allow neighbourhoods to provide for residences, workplaces, shopping, social and educational facilities. This has resulted in minimising of trip lengths irrespective of city size as the mixed land use prevalent in the cities due to either planned or unplanned market interventions ensure that living and work spaces are as close to each other as possible and the dependence on motorised urban transport is minimised separately by all households. Fig 5.1 below shows that 80 per cent of the trips are less than 10 km in length and 70 per cent of the trips are less than 5 km even in big cities like Mumbai and Hyderabad. In cities like Pune 97 per cent of the trips are less than 10 km and 80 per cent are shorter than 5 km. The average trip length in medium and small size cities is less than 5 km, which makes non motorised transport an attractive option for commuting.

Another associated phenomenon is that in large cities such as in Mumbai, Delhi, Hyderabad and Pune, as documented in the Census of 2011, about 41.3 per cent, 16.2 per cent, 32.9 per cent and 20.7 per cent of the urban households, respectively, live in slums.

The residents of slums are essentially from lower income groups. They typically find it difficult to afford either motorised private or motorised public transport and hence are primarily dependent on Non Motorised Transport (NMT) even for long distance trips. As documented by Tiwari, (2002), only a small percentage of people living in slums use public transport for commuting. Development projects or housing projects for the poor displace communities from slums closer to the city to far off locations. This displacement of poor people from areas close to their work, while raising each poor families own transport costs, also pose significant challenges to their mobility, thereby increasing their economic vulnerability.

Whereas in most cities of the world, the majority of trip distances are less than 10 km, in India, they are still less than 5 km as in Mumbai.⁵ Other cities most likely have shorter average trip lengths. These characteristics of Indian cities are a huge positive, i.e. smaller trip lengths and travel time, for providing sustainable and affordable travel options in the future too. New city development strategies and plans including UT plans need to recognise and strengthen these characteristics to ensure modern, efficient, sustainable UT service provision.

RESIDENTIAL DENSITY AND MIXED LAND USE OF INDIAN CITIES

Population density is a key determinant of the spatial spread of a city and therefore the intensity of travel demand. At the city-wide 'net density'⁶ level Bangalore has a density of 5889 persons/sq. km, Hyderabad has 6265 persons/sq. km and Ahmedabad has 15574 persons/sq. km.⁷

As presented in the Urban Transport Working Group report (UTWG, NTDP, 2012) and other literature, Indian cities are often described to have low densities that need to be made more dense. This may be misleading. 'Residential urban density' measures how many people live in relative

5 Baker, J. et al (2004) Urban Poverty and Transport: The Case of Mumbai. The World Bank.

6 Total population of the city divided by the total area of the city

7 Urban Transport Working Group Report, NTDP 2011.

Box 5.1

The Limit to Mobility Needs: Each Trip Has a Purpose

‘With increasing motorisation mobility increases. The number of trips a person makes a day increases with number of cars per inhabitants. More cars mean more mobility’. This has been the conventional wisdom propagated through the 20th century and has been the traditional definition of mobility. As explained by H. Knoflacher each trip is related to a purpose. This purpose is to compensate the existence of local deficits (i.e., non-availability of services and goods) of the origin at the destination.

In low-density cities like Houston and Melbourne, which are car-dominated and have abundant road space, car owners travel long distances relatively fast, but still have high travel times. It is difficult to establish efficient public transport systems in such low-density cities. In such cities, those who do not have cars, cannot get to work easily and can be excluded from economic activities. On the other hand, cities that have a dense settlement pattern, such as Hong Kong, Singapore and Tokyo, tend to be more public transport friendly and more citizens use non-motorised forms of transport. These world-wide experiences tell us that access needs despite varied mobility patterns, remain similar across cities of different sizes, populations and contexts.

Mobility can therefore only improve if local deficits, such as facilities available in the vicinity/neighbourhood are expanded which are often lacking due to poor urban planning, poor logistics, poor management. Deficits have to be compensated by physical mobility. But the number of purposes for accessing which mobility is needed in society have not changed during increased motorisation. Mobility therefore has nothing to do with car ownership since it is purpose-related. Each trip with the car replaces a trip of another mode.

Increasing car mobility means decreasing mobility for pedestrians, cyclists or public transport. There is no or marginal growth of mobility in the transport system as a whole, when the population is constant. The number of trips remains constant. Knoflacher shows from an example from an Austrian city, that the trend of increasing motorisation was broken by changing the physical structures and land uses around 1990. Since then car traffic has declined; pedestrian, cycling and public transport has increased. These changes did not result in trip numbers changing.

Source : Adapted from H. Knoflacher, 'Success and failures in urban transport planning in Europe—understanding the transport system', printed in *Sadhana*, Vol. 32, Part 4, August 2007, pp. 293–307. And Dinesh Mohan, *Public Transportation Systems for Urban Areas A Brief Review*, Transportation Research and Injury Prevention Programme Indian Institute of Technology, 2006

proximity in cities, expressed as the number of people living in each square kilometre of a 100 x 100 kilometres urban region.⁸ A mapping of ‘residential urban density, as in Fig 5.2, shows how Hong Kong, Mumbai, Istanbul and Shanghai have more effective ‘residential urban density’ than New York, Mexico City, Sao Paulo, Johannesburg and London. Residential density is largely driven by topographical constraints, the location of public transport and other infrastructure, but also by each city’s inherited traditions of urban culture and development.

Globally, residential density differs widely. Figure 5.2 shows how topographical constraints drive densities that rise to ‘spikes’ in Manhattan and parts of the Bronx, Brooklyn and Queens in New York, and in Hong Kong Island and Kowloon in Hong Kong, and Mumbai. São Paulo is multi-centred and similar in its overall density pattern to Mexico City, yet São

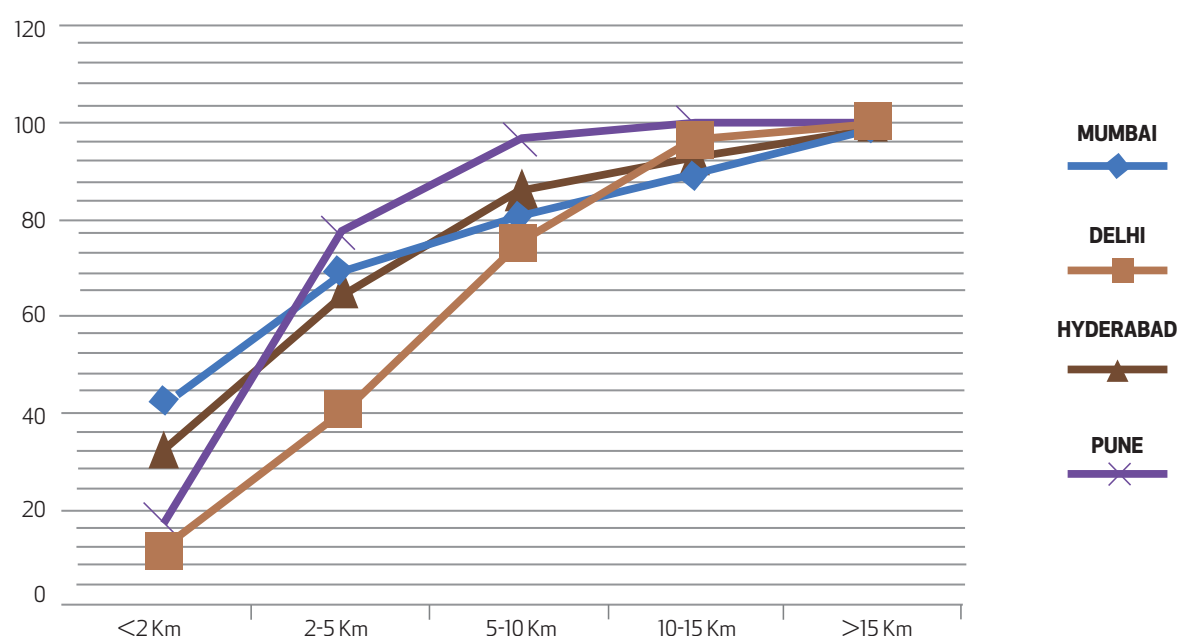
Paulo’s skyline is dominated by high-rise apartment blocks, while Mexico City’s is consistently low-rise, demonstrating that high-density can be achieved with different types of built form.

Indian cities, in most instances, have high proportions of mixed land use, which result in high residential densities and ensure smaller trip lengths and maximise non-motorised transport modes for commuting. London and Paris also demonstrate that even with lower density cities can have very good and effective public transport systems. Over the next 20 years, while per capita income in India will increase significantly, it will still be low, and so most areas in most cities will have significantly high densities, other than a few pockets for some very high-income citizens.

The need for effective UT increases with density. With respect to public transport in urban areas it

⁸ <http://lsecities.net/media/objects/articles/urban-age-cities-compared>

Figure 5.1
Trip Lengths in Selected Indian Cities



Source : Key mobility challenges in India, ITF, Dr G Tiwari, 2011

should be noted that cities such as London, Paris, Zurich etc have much lower built up densities than most Indian cities (Table 5.8) yet have very good public transport systems. Angel et al also conclude that ‘average densities in developing-country cities are high enough....to sustain public transport’. Several studies compiled by Holtzclaw (1974), for example, suggest that average densities of 30 persons per hectare can sustain local bus service and densities of 50 persons per hectare can sustain high-frequency bus service. Many planners recently have been calling for cities, especially developing country cities, to be made denser, for better benefits from energy savings and the reduced levels of greenhouse gases associated with public transport, but this strategy is not without costs.

RAPID GROWTH OF PERSONAL TRANSPORT – AND ITS IMPACT

According to the Motor Transport Statistics⁹, the annual rate of growth of motor vehicles in India over the last decade was very high close to 9.9 percent. In 1981 there were only 5.4 million vehicles registered in the country. The figure was 21.4 million in 1991, 54.9 million in 2001 and 141 million in 2011 (Table 5.6 earlier).

Notwithstanding this rapid growth of motor vehicles in the last three decades, international comparison of vehicle per 1000 population rates across countries, shows that India has low penetration (Table 5.9), but which is consistent with its level of per capita income. The figure is likely to be even lower

since registered but unused vehicles figure in the data. International comparison in Figure 5.3 shows the trends in car ownership in countries with per capita incomes less than \$40,000 and with increasing car ownership trends. While it shows that increasing trends in car ownership can be witnessed as a phenomenon even in countries with much higher per capita incomes, it also reveals how countries with similar per capita incomes have different car ownership ratios, establishing that while a rapid increase in motorised vehicles can be expected in India, policy can affect car ownership to some extent and car usage to a large extent.

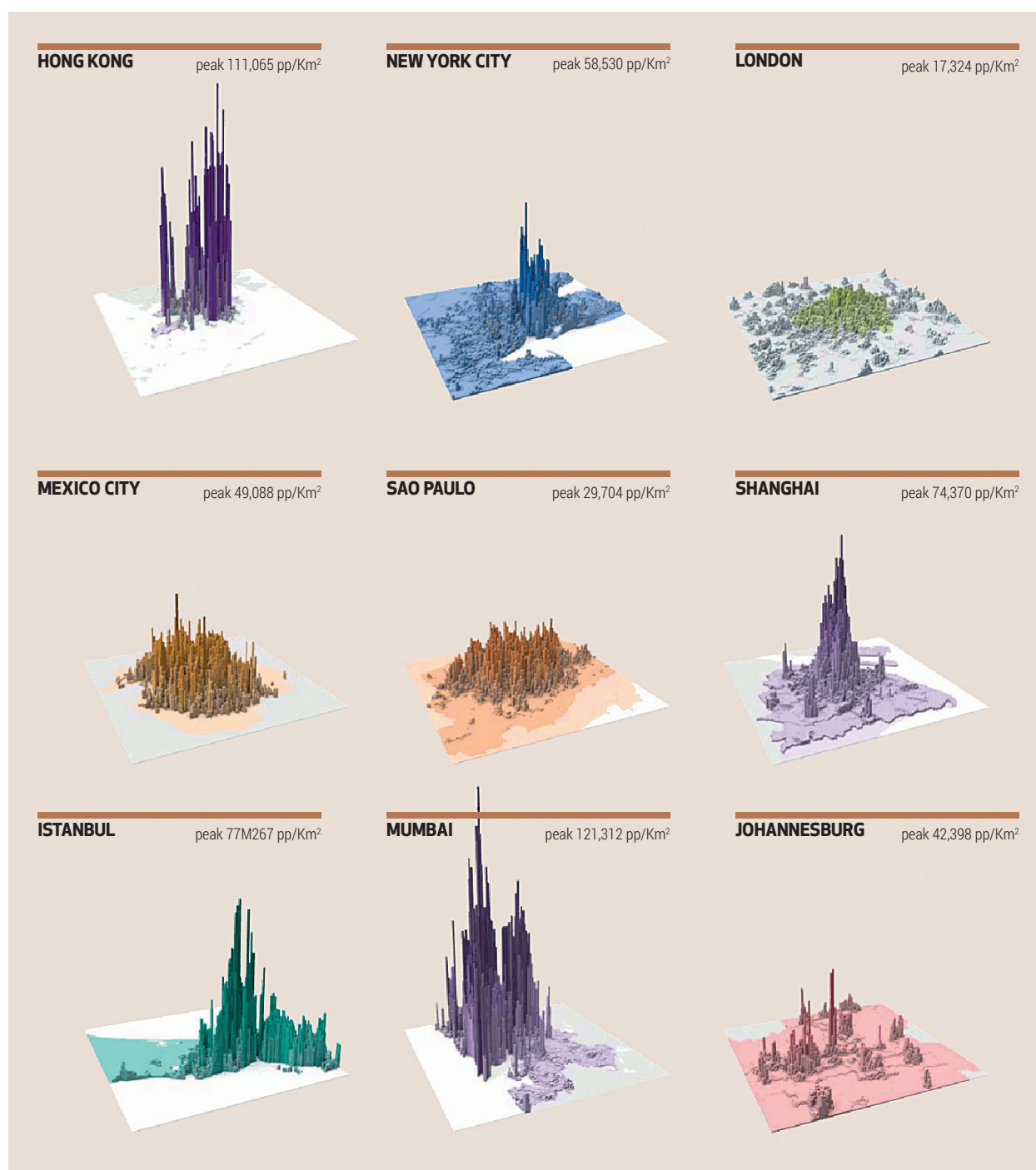
India’s most acute UT problems are not because of the number of vehicles but the high concentration of private vehicles in a few selected cities. About 32 per cent of motor vehicles are in metropolitan cities alone, which constitute just around 11 per cent of the total population (Road Transport Yearbook (2009-10 & 2010-11).

Delhi, with around 1.4 per cent of the Indian population, accounts for more than 7 per cent of all motor vehicles in the country. As of March 31st 2011, there were more than 7.23 million registered motor vehicles in Delhi compared to a population of 16.7 million residents and about 600 additional vehicles are being registered every day, even though there has been a downward trend in this over the last couple of years. However, a recent report suggests that the actual number of vehicles in Delhi may be about half this number.¹⁰ This therefore indicates that the

9 Motor Transport Statistics of India. Various Issues, Transport Research Wing, Ministry of Surface Transport, Government of India, New Delhi.

10 Mohan, D. 2013. Moving around in Indian cities. Transportation Research and Injury Prevention Programme, Indian Institute of Technology Delhi.

Figure 5.2
Residential Density of International Cities



Source: The Urban Age, London School of Economics, University of London, <http://lsecities.net/media/objects/articles/urban-age-cities-compared>

issues related to cars and private transport need special focus in our metropolitan cities.

The huge increase in the population of two wheelers in India is a unique. From being 8.8 percent of registered vehicles in 1951, it has crossed the 70 per cent mark. India now has the second highest concentration of two wheelers in the world only after Malaysia and ahead of China.

Personal vehicle demand is going up in an environment where there is the absence of adequate and

efficient public transport systems. At the same time rising incomes makes cars and motorcycle ownership increasingly affordable. Cars are available from Rs 1,50,000 to Rs 3,00,000 upwards and motorcycles requiring an outlay of around Rs 50,000-60,000 plus are the two major choices for private vehicle ownership and serve two different sections of the market. Level of service (comfort) and travel time are the principal priorities for those in the high income population group, while initial capital investment and operating costs are the major deciding factors for those in the middle income class. Thus,

Table 5.8
Built Up Area, Urbanised Area and City Footprint Densities in Selected Cities

CITY	COUNTRY	BUILT-UP AREA DENSITY (HECTARES)*		URBANISED AREA DENSITY (HECTARES)**		CITY FOOTPRINT DENSITY (HECTARES)***	
		1990	2000	1990	2000	1990	2000
Beijing	China	164.7	162.7	144.9	138.4	84.1	71.4
Shanghai	China	162.9	125.2	141.4	102.9	78.3	59.5
Hong Kong	China	629.5	543	532.7	462.9	399.7	346.8
Bandung	Indonesia	278.3	241.8	219.1	188.9	134.7	127
Kuala Lumpur	Malaysia	76.4	68	60.2	52.7	40.4	37.6
Manila	Philippines	347.6	284.1	264.4	230.9	154.9	146.4
Singapore	Singapore	170.9	174.8	128.6	130.3	78.7	87.3
Bangkok	Thailand	139.4	100.3	107.5	77.1	47.9	44.4
Hyderabad	India	276.4	189.6	228.7	155.8	128.5	95
Jaipur	India	347.9	200.4	282.8	158.6	179.5	127.2
Kanpur	India	159.2	151.7	132.5	128.5	78.4	73.7
Kolkata	India	386.9	276.7	321.4	226.4	172.6	110.4
Mumbai	India	474.5	440.3	407.3	384.5	310.7	286.3
Pune	India	466.9	201.6	362.9	158.1	181	124.3
Vijayawada	India	246.9	181.5	199.7	157.2	133.3	98.3
Istanbul	Turkey	190.7	165.9	144.6	129.5	107.1	94
Cairo	Egypt	259.7	231.1	221.3	198.2	167.7	143.1
Addis ababa	Ethiopia	204.6	211.3	157.7	164.5	110.8	111.8
Sao Paulo	Brazil	101.7	99.6	87.9	88.1	72.1	71.5
Moscow	Russia	139.1	95.5	109.4	76.9	62.3	47.4
Philadelphia	United States	35	34.3	28.3	28.4	24	24.5
Chicago	United States	24.7	20.4	19	16.4	12	10.4
Paris	France	70.2	64.4	55.7	53.1	40.8	39.5
Tokyo	Japan	117.6	115.7	91.5	93	80.1	81.7
Madrid	Spain	147.1	124.5	119.7	98.9	74.4	63.7
London	United Kingdom	62.2	54.1	48.6	43.6	35.5	30.8

* is the ratio of the total population in the smallest administrative districts containing the city and the total area of the built up pixels within these districts.

** is the ratio of the total population to the total urbanised area

*** is the ratio of the total population and the total city footprint area (sum of the urban and suburban built up areas).

Source :- Shlomo Angel, Jason Parent, Daniel L. Civco, and Alejandro M. Blei, The Persistent Decline in Urban Densities: Global and Historical Evidence of 'Sprawl' , Lincoln Institute of Land Policy Working Paper, 2010

Table 5.9
Vehicular Penetration in Select Developed and Developing Countries

COUNTRY	GNI PER CAPITA 2009 (US \$)	PER 1000 PERSON		
DEVELOPED		PASSENGER CARS	TOTAL VEHICLES**	TWO WHEELERS
USA.	46,360	439	828	26
UK	41,370	460	544	21
Japan	38,080	617	617	28
Germany	42,620	510	610	46
Australia	40,240	550	717	28
France	42,620	496	654	56
DEVELOPING				
Mexico	8,960	191	288	11
Malaysia	7,350	313	675	325
South Africa	5,760	110	170	7
Brazil (*)	8,070	165	275	68
China	3,650	34	119	72
Korea, Rep	19,830	267	393	37
India (##)	1,220	13	117	76

** India Vehicle include passenger cars, buses + coaches, vans + lorries and Two wheelers
(*): Data relates to 2008, ##: Data relates to 2011

Source: 1 World Road Statistics 2011 International Road Federation Geners
2. calculated on the basis of data received from offices of State Transport Commissioners / UT Adms.

Source: Transport Research Wing, Ministry of Road Transport and Highways, Government of India, New Delhi, Road Transport Yearbook (2009-10 & 2010-11), 2012.

cars and two wheelers address different markets and, in general, they are not competitors. Recent industry trends also indicate that a significant segment of the market is moving out of the small entry level car segment and is buying larger cars. This could have increased negative impact on city mobility indicators.

One of the most direct impacts of increase in personal motorised transport has been on parking requirements. As most residential or work facilities were not developed with such high private transport ownership in mind personal motorised transport parking often overflows and occupies public land such as road carriageways, footpaths or parks etc. posing other problems of mobility. Simultaneously parking space for public transport and non-motorised transport is not given any priority. It is now well recognised that parking demand is insatiable, in an environment of rapid increase in private vehicles in larger cities. Conventional policies encourage more parking supply.

However it must be noted that despite the high and increasing percentage of cars and two wheeler ownership in relationship to over all vehicles these personalised vehicles still constitute a small portion of overall passenger trips in each city. As in the case of Delhi¹¹ (Figure 5.5), and in various city level comprehensive mobility plans in cities where the penetration of personal motorised transport is high, car ownership still constitutes at the most, less than 25 percent. Personal motorised transport use has had severe negative impacts and the pace of increase of personalised motor vehicles has emerged as the key urban transport and mobility challenge for the country.

EXTERNALITIES, ENERGY ISSUES, ENVIRONMENTAL IMPACT AND SAFETY PERFORMANCE

ENERGY ISSUES

Energy efficiency of UT is important for two reasons. First, energy costs form a significant proportion of transport costs for all modes in urban India,

¹¹ As per the RITES report entitled 'Transport Demand Forecast and development of a Public transport network' for Delhi, the business as usual scenario will have cars based trips increasing from 19.3 percent to 23.4 percent by 2021 and two wheeler trips from 21.7 to 21.9 percentage of trips by then.

Table 5.10
Registered Motor Vehicles per 1,000 Population in Million-Plus Indian Cities

CITY	MVS/'000 POPULATION
Agra	366
Bangalore	434
Bhopal	401
Chennai	388
Coimbatore	577
Delhi	332
Greater Mumbai	90
Gwalior	408
Hyderabad	391
Indore	560
Jaipur	551
Jodhpur	559
Kanpur	343
Kochi	193
Kolkata**	30
Lucknow	417
Madurai	412
Pune	415
Visakhapatnam	356
Average of 35 Million + cities	293

Source: Transport Research Wing, Ministry of Road Transport and Highways, Government of India, New Delhi, Road Transport Yearbook (2009-10 & 2010-11), 2012

so that efficiency in energy use is a central issue in sector efficiency. Second, consumption of energy, particularly that of hydrocarbons, is a critical factor in determining the impact of the UT sector on both the local and the global environment. Figure 5.6 shows the estimated fuel consumption in 23 largest cities which is close to 8-10 percent of the petroleum used in the country.

Another TERI study¹², indicates that

- There will be an 18 per cent reduction in motor fuel demand, if buses meet 70 per cent of the total passenger travel demand in 2030.
- If fuel efficiency of vehicles can be improved by 5 per cent and 20 per cent in 2015 and 2030, respectively, for the vehicles registered after 2010, a reduction of about 17 per cent is achievable in motor fuel consumption by 2030 as against the BAU scenario
- Integrated land-use and transport planning

can also reduce transport energy demand by 20 per cent by 2030

These numbers indicate the impact of different interventions. If these interventions are taken together, the reduction in energy use and CO₂ emissions could be very significant.

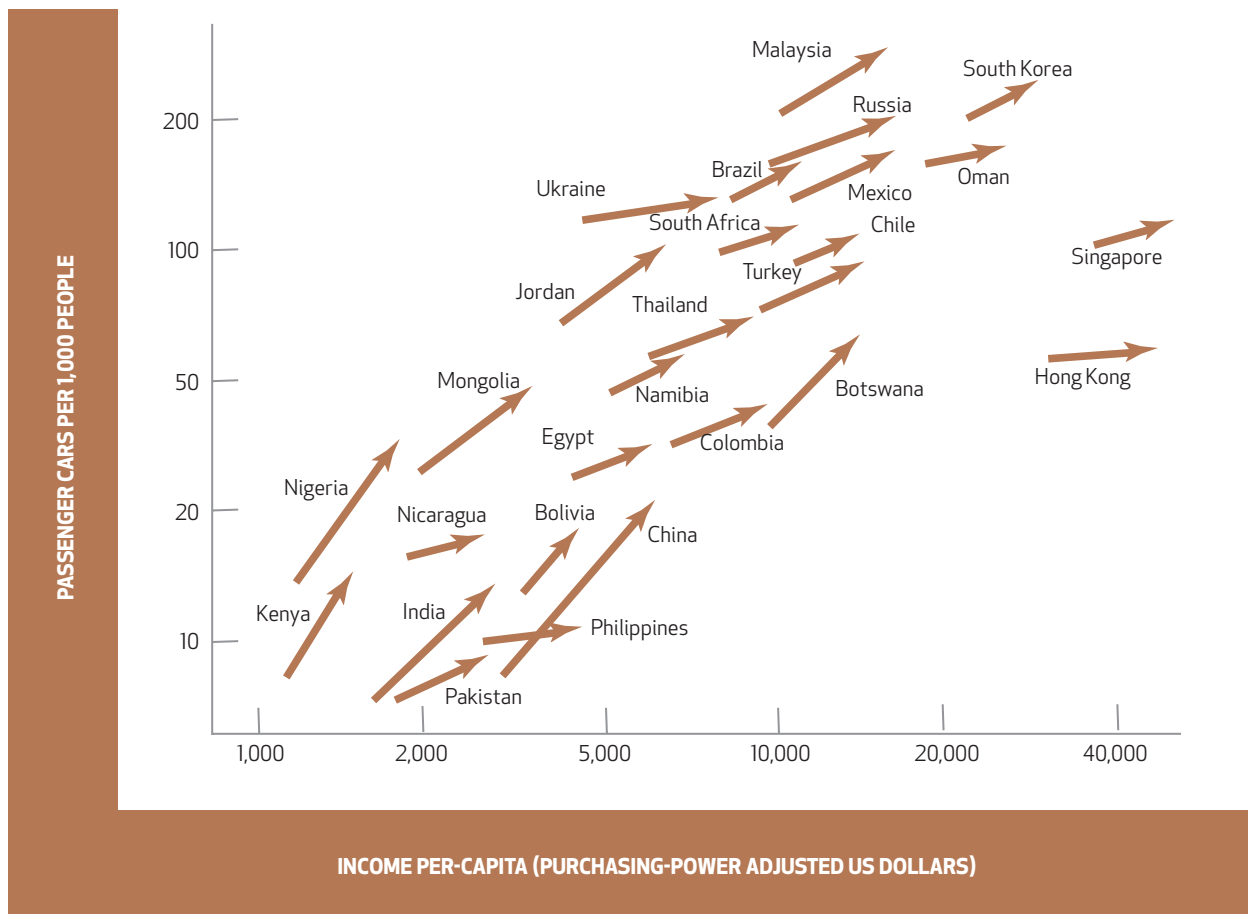
The National Mission on Sustainable Habitat of the National Action Plan on Climate Change (NAPCC) also focuses on reducing energy use in UT by emphasising the strengthening of public transport systems through various promotional, regulatory and fiscal measures. The key actions proposed, related to UT are:

- Promoting modal shift towards public transport and better urban planning for reducing the need to travel and to shorten travel distances
- Introducing appropriate transport pricing measures to influence purchase and use of

12 TERI (2007)

Figure 5.3

Projected Growth in Passenger Cars Per 1000 People, Various Countries



Source: Mark Kutzbach, Megacities and Megatraffic in Access No 37, 2010.

vehicles with higher fuel efficiency and alternate fuels

- Tightening regulatory standards such as enforcing fuel economy standards for automobile manufacturers
- Establishing mechanisms to promote investments in development of high capacity public transport systems
- Abandoning of old vehicles to be made illegal and responsibility for handing over the end-of-life vehicle to collection centres fixed on the last owner of the vehicle
- Setting up of a demonstration unit to take up recycling of vehicles, especially two wheelers, which require new techniques
- Setting up a Combustion Research Institute to facilitate R&D in advanced engine design
- Providing tax benefits and investment support for recovery of materials from scrap vehicles

ENVIRONMENT EXTERNALITIES AND PUBLIC HEALTH

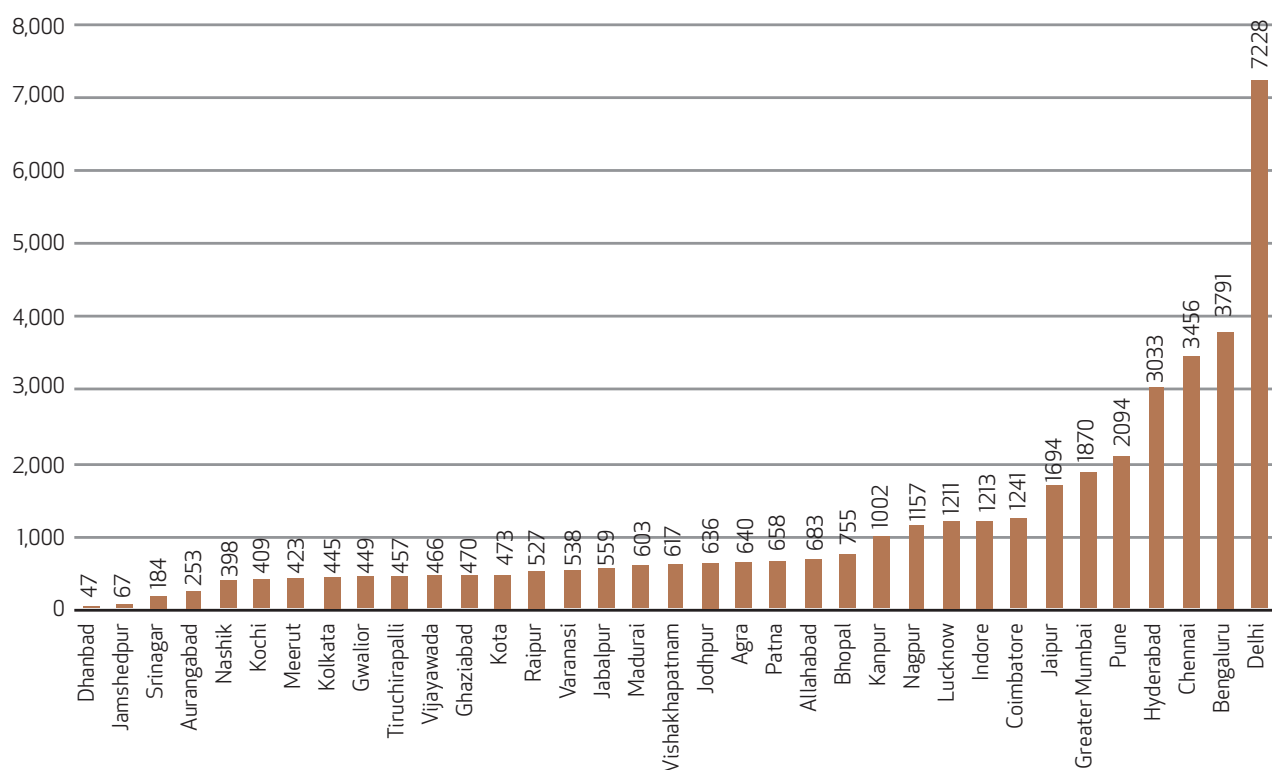
On one side, urban transportation activities support increasing mobility demands for passengers and freight, and on the other side, they have resulted

in growing levels of motorisation and congestion. This results in the UT sector becoming an increasingly significant contributor to environmental problems. In urban areas the key manifestation has been air pollution and its health effects, which have been discussed in detail in the Chapter 7, Volume II on Energy and Environment. Some anecdotal data which outlines the externalities and environmental impacts of the urban transport sector in India are discussed below to stress the urgent requirement to focus on the need to focus on measure to control the same.

UT externalities are closely linked to environmental pollution and public health outcomes. In India it is clearly evident that increasing vehicular emissions leading to poor air quality are having significant negative impacts on public health. Traffic-related air pollution, especially PM and NO_x, has been shown to lead to premature morbidity and mortality. The World Health Organisation (WHO) estimates that over 700,000 people die each year in South Asia as a result of ambient particulate matter pollution¹³. In 2008, the CPCB identified around 70 cities, represent-

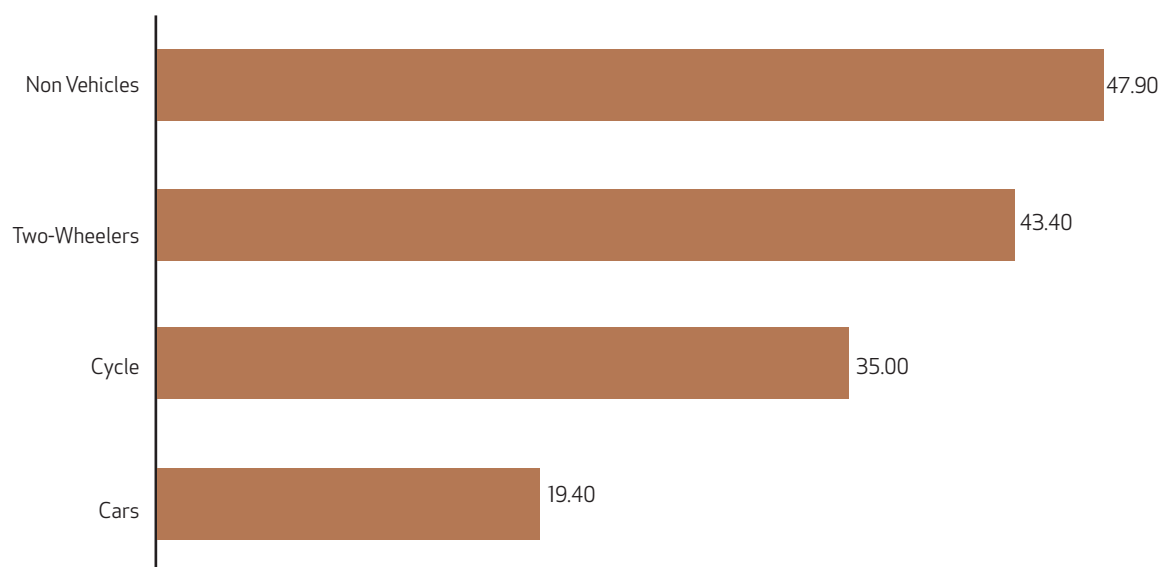
¹³ Health Effects Institute. Outdoor Air Pollution Among Top Global Health Risks in 2010. December 2012. Available online at: <http://www.healtheffects.org/International/GBD-Press-Release.pdf>

Figure 5.4
Registered Motor Vehicles in Some Large Cities, March, 2011
 (Figures in 000s)



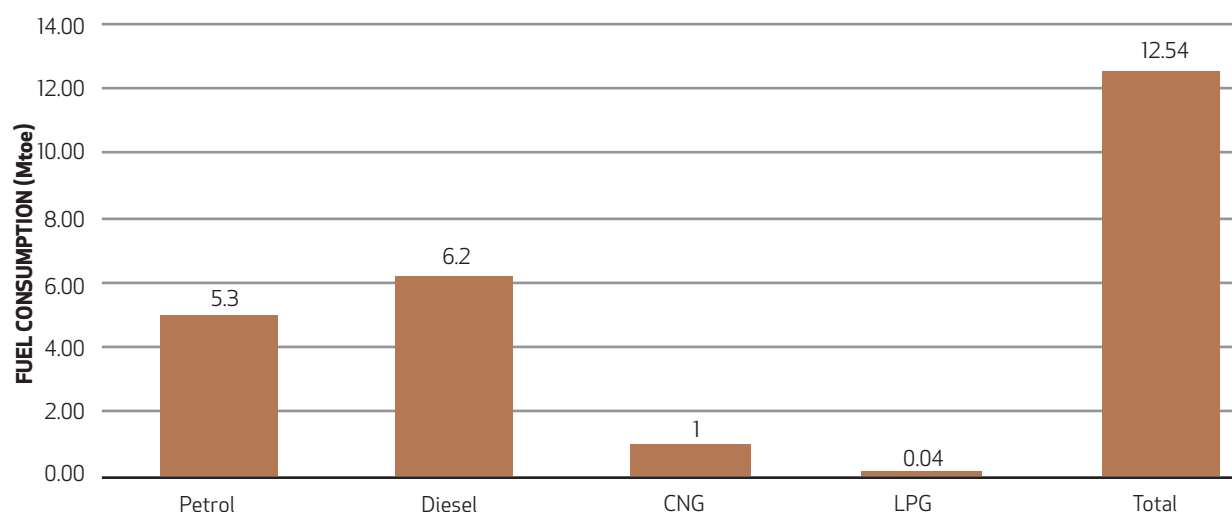
Source : Transport Research Wing, Ministry of Road Transport and Highways, Government of India, New Delhi, Road Transport Yearbook (2009-10 & 2010-11), 2012.

Figure 5.5
Vehicle Ownership in Delhi, 2010
 [Per cent of Households]



Source: RITES, Transport Demand Forecast and development of a Public transport network surveys and studies, Transport Department, Government of NCTD, 2010; adopted from EMBARQ

Figure 5.6
**Estimated Fuel Consumption of Motorised Transport Activities
 in 23 Million-plus Cities (2001)**



Source: RITES, Transport Demand Forecast and development of a Public transport network surveys and studies, Transport Department, Government of NCTD, 2010; adopted from EMBARQ

ing over 80 per cent of the cities that were being monitored, that were not complying with the NO_x and PM standards. The number has most likely increased since.

The complexities of the problems have led to much debate in environmental policy and in the role of transportation. The transportation sector is often subsidised by the public sector, especially through the construction and maintenance of road and mass transit infrastructure and through subsidies in operation. Total costs incurred due to the increasing use of petroleum-based fuels are generally not fully assumed by the users. The lack of consideration of the full costs of transportation could explain several environmental problems. Yet, a complex hierarchy of environmental costs is involved, ranging from internal (mostly operations), compliance (abiding to regulations), contingent (risk of an event such as a spill) to external (assumed by the society). If environmental costs are not included in costing and pricing, the usage of the car is consequently subsidised by society and costs accumulate as environmental pollution. This requires due consideration as the number of vehicles, especially automobiles using petroleum-based fuels, is steadily increasing.

Most recent reports are unanimous in recommending that cities try to arrest their current pattern of transportation growth in order to bring down their

energy consumption by adopting the 'Avoid, Shift and Improve' approach to transport planning and management as articulated by the Bellagio Declaration (May 2009) and advocated by many others.

SAFETY PERFORMANCE

As in other low income countries, fatalities linked to the transport sector, in India, especially road fatalities are expected to increase by more than 80 per cent over the first two decades of the 21st century, while high-income countries are expected to show continuous fatality reductions. As per a WHO report¹⁴, road traffic injuries caused an estimated 1.24 million deaths worldwide in 2010. The outlook is ominous for India, as road fatalities in the South Asia region are projected to increase by 144 per cent from 2000 to 2021.¹⁵ In 2010 as per the Accidents, Deaths and Suicides in India, National Crime Records Bureau, Ministry of Home Affairs, Government of India, 133,938 people were killed in road traffic accidents crashes (NCRB, 2010).

The most recent Government report on this issue (MoRTH, 2011) states that in 2011 the total number of persons killed was 142,485¹⁶. As per the 'World report on road traffic injury prevention' by the WHO, road injuries are now among the top three causes of death for those in the 15-44 age group, compared to fifth place worldwide, and among the top 10 causes of death among children in the 0-4 age bracket

¹⁴ Global Status Report on Road Safety (2013), Supporting a Decade of Action, World Health Organisation, Geneva

¹⁵ Kopits E & Cropper M (2003). Traffic Fatalities and Economic Growth. Policy Working Paper Number 3035. The World Bank, Washington, DC. 2003.

¹⁶ Transport Research Wing, Ministry of Road Transport and Highways, Road Accidents in India - 2011', Government of India, 2011

¹⁷ Margie Peden, Richard Scurfield, David Sleet, Dinesh Mohan, Adnan A. Hyder, Eva Jarawan and Colin Mathers; World report on road traffic injury prevention' World Health Organisation (WHO), Geneva, 2004.

Box 5.2

Valuing Reductions in Premature Mortality from Air Pollution

Studies of the air pollution effects on premature mortality predict how many fewer people are likely to die if air pollution is reduced. For example, a 10 percent reduction in PM10 in Delhi, might result in 1,000 fewer deaths each year, though we do not know exactly which thousand people will be the victims.. This is equivalent to reducing the risk of dying by a small amount for all people living in Delhi so that the risk reductions multiplied by the population adds up to 1,000 fewer deaths. Since reducing air pollution reduces risk of death by a small amount for each person in an exposed population, what, in principle, we wish to estimate is what each person in the population would pay for this small risk reduction. If this willingness to pay (WTP) were added across all 10 million residents of Delhi, it would represent the value of saving 1,000 statistical lives. Dividing the total WTP by the number of statistical lives saved yields the average value of a statistical life (VSL)—the sum of WTPs for risk reductions that save one statistical life.

WTP for a reduction in risk of dying is usually estimated from studies on compensating wage differentials in the labor market, or expenditures to reduce risk of death. These studies are usually referred to as revealed preference studies because they are based on actual behaviour.

Transferred values can be compared with the direct estimates of a value of a statistical life in Delhi (Bhattacharya, Alberini and Cropper, 2007). In the study, 1,200 commuters were asked what they would pay to reduce their own risk of dying (a) as a pedestrian, (b) as a driver of a two-wheeler, and (c) as a commuter, regardless of travel mode. The responses to these questions were pooled to estimate the value of a statistical life in a traffic safety context. It was found that mean WTP to reduce one's risk of dying increases with income and education, and also with baseline exposure to risk, measured by commute time, by whether the respondent travels as part of his job and by whether he drives a two-wheeler. Mean (WTP) is three times larger for a respondent who drives a two-wheeler and travels on the job than for one who does not. It was also found that those responses were sensitive to the size of the risk change valued. For all respondents the elasticity of WTP with respect to the size of the risk change is approximately 0.55. For respondents with a high school degree this increases to 0.80, while for respondents with a bachelor's degree the elasticity is not significantly different from one.

The preferred estimate of (VSL) —approximately Rs 1.3 million or \$150,000 Purchasing Power Parity (PPP)—is based on the mean WTP of a commuter with a high school degree who drives a two-wheeler and travels while on the job. This represents the benefits to a person with high exposure to traffic risks of a reduction in risk of death. This number exceeds the VSL currently used in evaluating the benefits of road safety projects by the World Bank (generally, foregone earnings) or in Indian studies (Mohan (2001) uses Rs 535,000). It is, however, smaller than the VSL that would be used if official values were transferred from high income countries to India assuming an income elasticity of one.

Source: Costs of Externalities, Paper 2-Page 7-10, Ken Gwilliam, August 2011

comparable to countries with much higher vehicular densities¹⁷.

If one takes into account not just deaths, but injuries, related economic losses and losses due to damage to vehicles, these are large enough to seriously threaten development in many countries. Global losses due to road traffic accidents are estimated at around \$518 billion, as per WHO estimates¹³, and cost governments between 1 and 3 per cent of their gross national product. An estimate by the Planning Commission in 2002¹⁸ puts the social cost of road accidents in India, at 3 per cent of GDP, more than the government spends on education or health. Affected families often have to bear huge burdens due to loss of life or serious injury to wage-earners, and medical and rehabilitation costs.

But the extent of the problem, the categories of people affected, and many of the reasons behind this modern epidemic, certainly marks India out as an especially bad case. But the problem is yet to receive the highest priority in government.¹⁹ While most view road fatalities as a simple 'fact of life,' a perception aided by the very word 'accident,' they are nothing of the kind. They are caused by a combination of inadequate road design, unsafe vehicle design, lack of enforcement and lack of expertise dealing with road safety.

While the data presented above can be used to indicate broad-brush trends, it is also important to note that this may reflect only accidents that are registered with the police, which usually happens only with respect to fatalities. Also, much of the information on causes are products of clearly subjective

¹⁸ Ministry of Road Transport and Highways, The Report of the Committee on road safety and traffic management, also known as the Sundar Committee report, Government of India, 2007

inferences at local levels since it is well known that no serious accident cause analysis is carried out by the police except in rare cases of notoriety attracting public attention. A large number of cases are not properly recorded and reported, hence the figures above may be an understatement.²⁰

Delhi had the highest number of road accident fatalities in 2010 (2,829) with a rate of 60.3 per million population. The lowest was in Dhanbad (45) and the highest other than Delhi was Bangalore (832). Delhi accounted for 25.1 per cent deaths of bicycle riders, 18.8 per cent deaths of pedestrians, 16.6 per cent deaths of two wheeler riders and 9.2 per cent deaths of three-wheeler riders in 35 mega cities.

None of the cities in India have safe or adequate facilities for pedestrians and bicyclists. This can be corrected only if road building authorities are forced to design roads by enabling legislation. In addition, it appears that vehicle speeds may be higher than desired especially during non-peak hours along with unchecked driving under the influence of alcohol. This would require the provision of a better trained and adequate traffic police force in every city of India.

Existing institutions are not fully equipped to deal with the increasing traffic on the roads or to adopt the advancements made in the techniques and technology that would promote road safety. The National Road Safety Council (NRSC) does not have adequate statutory backing, budgetary resources or the mandate to be an effective Organisation for executing road safety plans in a mission mode. Therefore to implement the above the institutional arrangements and systems around the improvement of safety aspects of transportation systems need to be strengthened. Responsibility for transportation safety is diffused and there is no single agency to deal with a range of problems associated with safety and there is also no effective mechanism for coordinating the activities of the different agencies dealing with safety. The role of key ministries and public sector agencies in improving road safety is currently seen as peripheral. This will have to change and transportation safety will need to be viewed as a priority area in the country's agenda for development.

The Report of the Committee on Road Safety and Traffic management, 2007, also known as the Sundar Committee report, by the Ministry of Road Transport and Highways (MoRTH), had compared road safety institutional arrangements in various countries. It further laid out a comprehensive road-map for improving road safety conditions in India, which could have a significant impact on urban transport safety and NTDPC is of the view that

the Sundar Committee recommendations should be implemented urgently.

CENTRAL GOVERNMENT INTERVENTIONS

FIVE YEAR PLANS AND THE NATIONAL URBAN TRANSPORT POLICY

The first explicit statement of interest in urban transport came in the 6th Five Year Plan (1982-87), which also mooted the need for a National Urban Transport Policy (NUTP). Despite this early start, a National Urban Transport Policy could be finalised only in 2006, the terminal year of 10th Five Year Plan.

UT was, until recently, covered within the ambit of intercity rail and road travel. It was only in 1986 that the Allocation of Business Rules of the Central Government were modified and the Ministry of Urban Development was made the nodal ministry for policy and planning at the national level for rail-based UT. But all the responsibilities for the technical planning for rail-based UT systems were retained with the Ministry of Railways²¹.

Delhi had the highest number of road accident fatalities in 2010 (2,829) with a rate of 60.3 per million population. The lowest was in Dhanbad (45)

The 8th Five Year Plan saw a shift of the 'Urban Transport' subject from 'Transport' chapter of the Plan document to the chapter on 'Urban Development', signifying some sort of ownership of the problem by the Ministry of Urban Development. It also noted that the traffic had continued to multiply with the result that the UT infrastructure in all large cities is on the verge of a breakdown. In the absence of reliable public transport and convenient and safe walking and bicycling facilities, people are compelled to resort to private vehicles, which have aggravated congestion, pollution and energy intensity. It also pointed out that there is no single agency to plan, coordinate or execute transport policies and programmes in urban areas. It was in this context that the subject of planning and coordination of Urban Transport was entrusted to the Ministry of Urban Development in 1986 and in 1988-89 an Urban Transport Consortium Fund was set up.

The 9th Plan accepted that the UT problem was an institutional orphan and there was critical need to develop UT institutions. It also accepted that there was no escape from upfront investment in the Rail-based mass transit in metropolitan cities but that private sector financing was not the answer for the same and metro rail could be financed only with the active support of Central and state governments,

19 D. Mohan, O Tsimhoni, M.Sivakand MJ Flannagan, Road Safety in India: Challenges and Opportunities, The University of Michigan, Transportation Research Institute, Ann Arbor, Michigan 48109-2150 U.S.A., Report No. UMTRI-2009-1, 2009

20 Dinesh Mohan, Analysis of Road Traffic Fatality Data for Asia, Journal of the Eastern Asia Society for Transportation Studies, Vol.9, 2011

21 Planning Commission, Recommendations of Working Group on Urban Transport for 12th Five Year Plan, Government of India 2011

No Indian city has safe or adequate facilities for pedestrians and bicyclists. This can be corrected only if road building authorities are forced to design roads by enabling legislation

including direct equity participation and tax incentives. The Plan also mandated financing of metro rail through dedicated levies on both users and nonusers and for the first time mooted the idea of setting up of a 'National Urban Transport Fund.' It emphasised an active co-operation and joint collaborative action by Central, state and city governments as the only solution to combat the deteriorating UT scenario in cities and towns of India.

The National Urban Transport Policy first mooted in 6th Five Year Plan, was finally adopted in 2006, the final year of the 10th Plan. The Policy acknowledges the existence of Central Acts and Rules dealing with the urban transport issues and their being administered by the central government, and for the first time focused on the central principle of investment for moving people not vehicles. It also mentioned that the objective of the policy was to ensure safe, affordable, quick, comfortable, reliable and sustainable access for the growing number of city residents to jobs, education, recreation and such other needs within our cities. It recommended that UT become an important parameter at the urban planning stage itself; and encouraged integrated land use and transport planning in all cities so that travel distances are minimised and access to livelihoods, education, and other social needs, especially for the marginal segments of the urban population is improved.

It promoted the greater use of public transport and non-motorised modes by offering Central financial assistance for this purpose and sort the establishment of institutional mechanisms for enhanced coordination in the planning and management of transport systems. It also focused on the introduction of new Intelligent Transport Systems for traffic management and addressing concerns of road safety and trauma response and reducing pollution levels through changes in traveling practices, better enforcement, stricter norms, technological improvements, etc. The NUTP was quite successful in setting out the broader frame of a sustainable UT system. It also outlined an implementation framework, of which Unified Metropolitan Transport Authorities (UMTA) were the centrepiece.. The policy remains a key statement of the direction that the UT sector needs to traverse in India. Major funding for urban transport was made available under the 10th and 11th Plans through the JNNURM programme discussed in the next segment.

More recently, in 2009, the MoUD, which has been anchoring the National Sustainable Habitat Mission as part of the **National Action Plan on Climate Change**, has produced an mission document which has a strong chapter on UT.

The report lists some broad strategies for reducing GHG emissions in the transport sector include:

- Greater Use of Non-Motorised Mode
- Improving Access and Reducing Passenger and Freight-Kilometres
- Emphasis on Railways for Passenger and Freight Transport
- Implementing Tough Fuel Economy Standards
- Use of Alternate Fuels
- Use of Battery Operated Vehicles (BOV) and Hybrid Vehicles (HV)
- Use of Hydrogen
- Use of Compressed Natural Gas

JNNURM

In December, 2005, the Government of India launched the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) to invest over Rs 1,200 billion in urban infrastructure improvements and basic services to the urban poor. The transport sector has received 11 percent of the total JNNURM investment (IIHS, 2011). Till May, 2013, 143 UT projects have been approved, with the majority (80 per cent) in cities with populations of at least 4 million.

Some of the highlights and positive developments under JNNURM :

- Requiring Comprehensive Mobility Plans (CMPs) is a significant reform, which aims at putting local bodies at the centre of urban transport planning, and has encouraged cities to think about mobility in a more holistic way. Although reviewers have found the plans of mixed quality (TERI, 2011), the process has ensured that India's larger cities are now aware of the general principle of 'moving people not cars' embedded in the NUTP.
- Guidelines have been issued and some support for preparation and implementation exist.
- JNNURM has been a significant source of public investment into public transport through its investments in buses and BRT projects

Table 5.11 shows the percentage of JNNURM investment in large cities that have gone into the urban transport sector. This does not include funding for urban buses also made available to certain cities under the scheme. Further, analysis of cities' budgets show that, as in Pune, although the CMP sets out goals of achieving 50 per cent mode share from non-motorised transport and 40 per cent from public

22 Available at <http://www.parisar.org/activities/analysesreports/135-transport-budget-analysis-2011-12.html>

Box 5.3

JNNURM and Urban Mobility

Funding for the procurement of buses came as a late addition to the JNNURM programme. The JNNURM programme reform conditions related to mobility were embedded in the guidelines that accompanied the procurement of buses for the concerned cities. Much of the issues on which action from state government and urban local bodies was sought was in line with the National Urban Transport Policy. Some of the key commitments sought by the Central government were priority for public transport, dedicated lanes for buses, special purpose financing and PPPs for setting up BRTs, dedicated transport fund to be set up through additional vehicle registration fees, setting up congestion and green tax regimes. Other than this it also called for the setting up of the Unified Metropolitan Transport Authority, setting up of fee-based parking systems and the use of urban specifications for buses.

While JNNURM provided an impetus to thinking and action on urban mobility and pursuing the National Urban Transport Policy, Indian cities are far from achieving any significant success in achieving the NUTP outcomes.

Source: Adopted from K.C. Sivaramakrishnan, Re-visioning Indian Cities : The Urban Renewal Mission', 2011.

transport, they allocated 61 per cent of their 2011-2012 budget to motor vehicle-related projects (Parisar, 2011)²². Only 18 per cent of Pune's budget was allocated to public transport projects and 9 per cent to non-motorised transport.

In short, while JNNURM has been quite successful in creating a focus for investments in urban infrastructure in India and the programme is important as the nation's first concentrated effort to try and improve urban infrastructure, there is still much room for improvement in India's urban transport infrastructure. There are a number of lessons to be learnt from the implementation of the programme both in terms of the reforms being pursued as well as the projects funded through the programme.

MOUD'S SERVICE LEVEL BENCHMARKS

A key initiative undertaken by the Ministry of Urban Development in recent years has been the setting up of service level standards for various urban services. For UT service level performance benchmarks have been identified for the following areas of intervention:

- a. Public transport facilities
- b. Pedestrian infrastructure facilities
- c. Non Motorised Transport (NMT) facilities
- d. Level of usage of Intelligent Transport System (ITS) facilities
- e. Travel speed (Motorised and Mass Transit) along major corridors
- f. Availability of parking spaces
- g. Road safety
- h. Pollution levels
- i. Integrated land use transport system
- j. Financial sustainability of public transport

The parameters highlight the performance as would be monitored by the Urban Local Bodies (ULB)/ Development Authorities/Parastatal Agencies. These performance measurements will need to be carried out by the service delivery agencies themselves, reported to higher levels of management and also disseminated widely to the public.

The Ministry of Urban Development, will take the lead for disseminating these service level performance benchmarks. Further SLBs will also be institutionalised through the JNNURM and other programmes of the Ministry.

State governments and their nodal agencies in the urban sector have a critical role in driving performance of ULBs. A state government will need to periodically examine the SLBs as an input for its decisions related to policy, resource allocations, providing incentives and penalties, channelising technical and manpower support SLBs will also be an important input to State Finance Commissions.

ULBs/ parastatal agencies are the most important stakeholders for institutionalisation of SLBs. As service delivery institutions, ULBs will find it useful to institutionalise systems for performance management using SLBs. Benchmarking with other cities within the state or with similar cities would facilitate a healthy competitive environment for continuous improvement.

LARGE URBAN PUBLIC TRANSPORT PROJECTS

In India there has been a tendency to plan large UT projects without adequate analysis of existing transport patterns in cities. What is needed is an

Table 5.11

Transportation Projects under Urban Infrastructure and Governance Component of JNNURM, March 2013

URBAN TRANSPORT AS PART OF JNNURM SUB-MISSION ON URBAN INFRASTRUCTURE AND GOVERNANCE				
BROAD SECTOR	SECTOR (JNNURM MIS)	NUMBER OF PROJECTS SANCTIONED	COST OF PROJECTS SANCTIONED (RS MILLION)	ACA COMMITTED (RS MILLION)
Urban Transport	Roads/Flyovers	100	82,213	33,833
	Mass Rapid Transport System	21	52,110	23,731
	Other Urban Transport	17	7,804	3,655
	Parking	5	8,604	3,372
Sub Total		143	150,732	64,592
Drainage	Storm Water Drainage	73	84,272	34,605
Drinking Water	Water Supply	157	203,409	99,730
Sewerage	Sewerage	113	149,934	71,608
Urban Renewal	Urban Renewal	11	4,865	2,035
Solid Waste Management	Solid Waste Management	45	20,087	10,513
Heritage	Development of Heritage Areas	7	2,254	1,441
Preservation of Water Bodies	Preservation of Water Bodies	4	1,167	686
Total		553	616,723	285,213
Urban Transport as percentage of Total		26	24	23

Source: www.JNNURM.nic.in, downloaded on 14th May, 2013

understanding of demand patterns in order to take an integrated view which should include, mass rapid transit, BRTs, buses, IPT, NMT etc. Much of the attention has gone to designing and implementing large standalone expensive projects without much focus of integration with the rest of the UT system or with wider land-use planning.

Kolkata was the first city to develop mega projects with the initiation of metro rail. The Metropolitan Transport Project (MTP) was set up by the Railways in 1973, which recommended a Mass Rapid Transit System. The MTP prepared a master plan envisaging construction of five rapid-transit lines for Kolkata, totaling a route length of 97.5 km. A second line is now under construction and four other lines are being planned.

The proposal for a mass rapid transit for New Delhi first emerged from a traffic and travel characteris-

tics study carried out in 1969. Over the next several years, many official committees were commissioned to examine issues related to technology, route alignment and governmental jurisdiction. In 1984, the Delhi Development Authority and the Urban Arts Commission came up with a proposal for developing a multi-modal transport system, which would consist of constructing three underground mass rapid transit corridors as well as augmenting the city's existing suburban railway and road transport networks. The Government of India and the Government of Delhi jointly set up a company called the Delhi Metro Rail Corporation (DMRC) in 1995. The first line of the Delhi Metro was operationalised in 2005 and it became the second underground rapid transit system in India, after the Kolkata Metro. Recently a number of other rail-based mass transit systems have been initiated in a number of cities such as Bangalore, Chennai, Mumbai, Jaipur, Hyderabad and Kochi. The 12th Plan document outlines an very

Box 5.4

Metros and the Future of Urban Transport: Two Technical and Planning Issues

Other than costing and financing a number of related issues are presently misunderstood, by decision makers. First, the issue of speed and trip/travel time. Contrary to popular impression, high travel speeds of mass transit systems don't necessarily help reduce door-to-door travel time, which is the most relevant indicator for users and should inform the choice of MRT options. As documented (D. Mohan, 2008), elevated and underground public transport systems do not provide time saving compared to car or motorcycle use unless there is congestion on the road or the trip is very long, due to the time lost on escalators and long walking distances inside underground or elevated metro and mono-rail stations. The metro only becomes efficient for trip distances greater than 12 km, while options including walk, bicycle and Bus rapid transit are efficient for trip lengths of 1-2 kms; 3-4 kms and 6-7 kms respectively.

Ridership capacity is another area where projections and reality have not matched. The original feasibility study for developing a metro system for Delhi justified its economic feasibility by projecting a daily ridership of 3.1 million passengers by 2005 [RITES 1995². This was later reduced to 2.18 million passengers on the first three corridors (65.8 km) when completed in December 2005 as stated by the DMRC CMD, and then in 2005 further reduced to 1.5 million a day. The system was actually operating at around 0.6 million passengers per day at the end of 2007, (and in 2012 on a festive day it recorded a historic peak of 2.2 million passengers on both the phases together close to 200 kms length) less than 20 percent of projected capacity. Similarly, the Kolkata metro is operating at about 10 percent projected capacity³ [Singh 2002]. Peak Ridership capacity in a single direction is also often considered during decision making but never realised in everyday use. While metros are most required at 40,000-50,000 passengers per direction, in reality most often peaks achieved in the system are 1/3 to 1/4th of this. Also aspects such as costing for reduction in pollution and accidents etc, are often over stated and in reality such benefits are not realised (D Mohan 2008).

Source: D Mohan (2008), 'Mythologies, Metros and Future of Urban Transport, Transportation Research and Injury Prevention Programme, Indian Institute of Technology Delhi

² RITES (1995) 'Integrated Multi-Modal Mass Rapid Transport System for Delhi, Economic Analysis for Modified First Phase', RITES Ltd., Gurgaon, Haryana.

³ Singh, Y P (2002): 'Performance of the Kolkata (Calcutta) metro railway', in Godard, X and I Fantozoun (eds) proceedings Conference CODATUX: Urban Mobility for All, A. A. Balkema Publishers, Rotterdam.

liberal technical approach to identifying cities and corridors for metro projects, without simultaneously addressing financial and affordability concerns of residents and cities.

While there is a degree of enthusiasm around cities developing and implementing large and costly mass transit projects, we need to note that there are a large number of inherent risks in taking to large fixed infrastructure projects. With the Metro projects themselves, there are a number of concerns that need to be taken into account before decision making and which are not given adequate attention in the current policy context. Questions related to the high construction costs and the availability of modern, alternative, and more cost effective options are not adequately considered. The decision making process on costs is also inadequately informed as often, funds for Capital costs are provided by external sources and the full operations and

maintenance costs are not factored in and if at all they are, the O&M costs are often paid for by sources other than direct revenue from the project, making them uncertain and often unsustainable in the long run. As discussed in this chapter and earlier in this report, local governments should be the primary decision making tier of government regarding large urban public transport projects in their city and should use a life cycle costing methodologies to inform their decision making process. Furthermore, the project cost should include the cost of feeder systems, public bike sharing and pedestrianisation in the influence zone of metro stations and project plans should include strategies for this complementary infrastructure.

Over the last decade, improvements in computing and communication technologies, and successful demonstration of improved and higher-capacity bus transport projects in a bunch of Latin American cit-

Box 5.5

Regulating Intermediate Public Transport

There are three main types of arrangement for regulating intermediate public transport (IPT), which consists of privately operated small buses and vans.

The first arrangement is for IPT to be viewed as normal public transport and to be subject to the same regulations as traditional bus services. This is the regime under which IPT became part of the main supply of service in Uzbekistan and the Kyrgyz Republic. In these cases, the fragmented operators were encouraged to form associations to bid for route franchises. While the process was not entirely smooth, it resulted in lower fares on small vehicles, while discipline increased. This approach has also gained currency in Brazil.

The second arrangement is for the regulation of IPT to be undertaken by a separate public authority. In Sri Lanka, a public body was created with powers to issue permits to private companies, and to set fares. The issuance of permits became a form of political patronage and there was a large over-issue of permits. As a result, a proportion of buses were kept off the road each day, leading to underutilisation of vehicles and higher costs per passenger. The legislation was later reversed and regulatory powers were passed back to the original transport commissions.

In Bogota, while the new Transmilenio BRT system was regulated privately, the Transport Ministry was in charge of issuing permits for other modes; licensees were able to sub-contract operations to other operators (taking a fee from each) who could compete with the Transmilenio services. This resulted in over-provision of small vehicles of poor quality, and high levels of road congestion. To improve coordination, the role of issuing permits was transferred to the Transmilenio company. The heart of the problem in both Bogota and Sri Lanka is that the existence of a separate regulatory regime for one part of the sector resulted in the administrators acting as the protector of the sector's private interests rather than as a regulator in the public interest.

The third arrangement is for the IPT sector to be allowed, or encouraged, to regulate itself. In Accra, Ghana, the operation of small vehicles (called 'tro-tros') is left to associations, by far the largest and strongest of which is the Ghana Public Road Transport Union (GPRTU), which is itself a federation of a number of smaller associations which operate specific terminals. To provide service, a supplier must be accepted to operate a route from one of these terminal associations. While operation is disciplined, the route structure is very fragmented and inefficient.

Source: Institutions for Urban Transport, Ken Gwilliam, August 2011

ies have led to the implementation of a number of BRT projects globally as well as in India.

With the advent of the JNNURM, a number of new initiatives like BRT systems and procurement of buses have been taken by various state governments. BRT systems already exist in Pune, Delhi, Ahmedabad, and Rajkot, with new ones coming up in Kolkata, Vishakapatnam, Vijayawada, Surat, Naya Raipur, and Hubli-Dharwad. Modern low-floor buses can be found in many cities like Delhi, Mumbai, Bangalore, Nagpur and Chennai etc. JNNURM has also funded 15260 buses in 61 cities.

However, BRTs are not the only way that buses need to be deployed in Indian cities. Buses provide a large number of advantages if a bus system is deployed as the citywide system of choice for public transport. A combination of different energy efficient and clean buses is the most modern, convenient and viable public transport system which provides the backbone to public transport in most cities across the globe. In India too, dense bus based public transport

along with efficient paratransit systems needs to be provided if the public transport system is to become convenient and affordable for commuters to shift from private transport to public.

SUSTAINABLE URBAN TRANSPORT POLICY

Indian cities today suffer from inadequate urban services and environmental degradation. All categories of road users face problems in commuting. Pedestrians do not get a safe, conflict, and obstruction-free path to walk; and both cyclists and pedestrians have to fight for the right of way with fast moving motorised modes of transport, many a times risking their lives. The user of public transport faces long waiting periods, uncertainty in travel time and difficult conditions of travel. Personal motorised modes of transport are slowed down by the slow moving traffic and face significant delays. Road users get restless leading to road rage, rash driving, and accidents.

By 2030, all this should change in cities and urban agglomerations, as well as satellite towns. Public transport should be citywide, safe, seamless, user friendly, reliable and should provide good ambience with well-behaved drivers and conductors. Citizens should get access to jobs, education, social services and recreation at affordable costs and within reasonable time. Transport should be more efficient and less polluting.

Clearly, to attain this kind of Vision 2030 for urban transport, policies, planning and investments needs to be directed towards sustainable urban transport with emphasis on making public transport, walking and cycling attractive, cost-effective, efficient options. This shift in emphasis also needs to be supplemented with the rapid uptake of cleaner technologies, a stringent fiscal regime including rigorous analysis of project costs and social benefits as well as strategic use of targeted subsidies, along with the use of intelligent transport systems.

The policy context, in terms of issues, concerns and objectives, has been steadily evolving and effects policies for transport in general and urban transport in specific. The institutional context to support these policies, however, needs to be developed even as overall urban governance and planning processes are evolving. This report's chapter on Institutions for Transport System Governance (Chapter 5, Volume II) lays out a broad framework for UT governance in India's federal context. The next section in this chapter discusses more granular details.

Both policy and the institutional framework will have to take shape in challenging circumstances with new pressures of resource scarcity and a more limited environmental 'budget' for climate-changing and air-polluting emissions. More developed countries, have developed their UT systems under very different circumstances and policy mandates. A decade ago issues such as climate change, safety, security, and fuel efficiency were low on the policy agenda in India. Now, institutions in India, like elsewhere around the world, are responding to these emerging issues and preparing for investing significant resources in an attempt to achieve improvements in these areas. This Committee is of the opinion that these policy concerns should be the key issues around which UT policy and systems are shaped over the next 20 years.

Barcelona, Bogotá, Curitiba, Dublin, Hong Kong, London, Munich, Seoul, Singapore, Stuttgart, Vancouver, and Zurich are often quoted as examples of cities that have developed sustainably in important aspects of urban transport. These cities have not reached these goals by accident, but by purposeful action that has been maintained over time. No single best practice project alone can turn a city around; sustained effort toward well-defined goals is

required. Indian policy makers must ensure that city governments seek not only technological fixes but also not ignore the fact that real results come from integrated and systematic policy action as a whole.

UT also functions as a nexus between issues of urbanisation, land use, energy use, and climate change. Before energy efficiency and climate change became central policy concerns, sustainable cities defined sustainable UT policies as access-based transport planning oriented around planning for proximity of uses. To control traffic congestion, two tools have been used: provision of public transport (the 'carrot') and demand management (the 'stick'). In 2005, Wright and Fulton²³ showed that when economic and planning measures are added to control vehicles and fuels, goals for energy efficiency and climate change mitigation are also met, thereby proving that the new policy paradigms are consistent with the approaches that have been adopted by sustainable cities.

While a number of reports covering urban transport such as the MGI (2010), HPEC 2011, and the Recommendations of Working Group on Urban Transport for 12th Five Year Plan have been published recently, the NTDP is of the view that UT policy, planning and investment needs to be more responsive to safety, energy, environment and health concerns. It is only by following an integrated view including these policy concerns that urban transport can over the medium term i.e. by 2030, be expected to change towards sustainable transport, that would put peoples mobility issues ahead of access requirements for cars and personal transport modes.

No single best practice project alone can turn a city around. Indian policy makers must ensure that city governments seek not only technological fixes but also not ignore the fact that real results come from integrated and systematic policy action as a whole

OUTLINE FOR A NATIONAL APPROACH

NTDPC, like the National Urban Transport Policy, recommends three well recognised and internationally accepted strands of urban transport policy known as 'avoid, shift, and improve.' To pursue this approach, policy makers will need to focus on (a) the information and metrics basis for planning, design and operating aspects of UT infrastructure, (b) developing and implementing a strong transport demand management regime, and (c) improving implementation of projects and coordination between investments in the urban transport system. The key aspects of the proposed policy approach for sustainable urban transport are discussed in detail in this section. The next section goes on to discuss physical design issues related to developing improved facili-

23 L. Wright and L. Fulton. 2005. Climate Change Mitigation and Transportation in Developing Nations. *Transportation Reviews* 25 (6), pp. 691–717

In recent times, indiscriminate land use planning and the increasing development of peri-urban areas by businesses and households have forced residents to make greater use of motorised transport.

ties for sustainable urban transport and the economic instruments for transport demand management that should be incorporated to incentivise behaviour change in commuters.

Avoid: Sustainable transportation is about moving less. Reduction in the need for travel by promoting city structures and urban densities as well as imaginative use of Information and Communication Technologies, for example, may lead to a reduction in the passenger km and freight-km required to sustain the urban economy.

Shift: Change modal choice to promote lower fuel consumption per passenger-km and/or freight-km and manage traffic and reduce fuel consumption as well as air pollutants.

Improve: increase the energy efficiency of vehicles and use of efficient and cleaner fuels to decrease impacts of distances travelled and reduce the greenhouse gas footprint per litre of fuel consumed.

There is also an established hierarchy within these three complementary objectives, best explained by a transport emission specialist, who noted in 2008, that 'A gallon of fuel conserved, or a tonne of air emissions avoided due to reduced vehicle travel (the result of mobility management—defined to include improved transport options, efficient incentives, and land-use management) is worth an order of magnitude more than the same energy savings and emissions reductions provided by increased vehicle fuel efficiency or shifts to alternative fuels. This occurs because mileage reductions also reduce traffic congestion, road and parking facility costs, consumer costs, accidents, pollution, and sprawl, and often improve mobility options for non-drivers.²⁴ Initiatives across all the three elements need to be undertaken based on peculiarities of individual ground realities in different cities. It also therefore implies that single actions without integrated and systematic policy actions often do not result in reaching the desired outcome.

Other than Avoid, Shift, Improve, the other theme that India needs to focus on simultaneously in the short and medium term to develop sustainable urban transport services is the decision making about and financing of mega projects in UT.

AVOID: REDUCING THE NEED FOR TRAVEL

Accessibility requires mixed land uses in dense cities where arteries are not blocked by congestion. Historically, many Asian- including Indian- cities have measured up well to this ideal, with a range of services and amenities located in each neighbourhood and non-motorised transport and para-transit providing good access. In recent times, however, indiscriminate land use planning and the increasing development of peri-urban areas by businesses and households seeking lower-cost land have forced residents to make greater use of motorised transport. The remedy is judicious land-use planning that reduces residents' need to travel and cuts back on urban sprawl, pollution, and congestion. Mixed income neighbourhoods are also very important as lower skilled service industry workers such as electricians, plumbers, house-helpers etc, need to find employment in the vicinity of their own homes, while higher skilled and better paid workers can afford to travel larger distances for work. Mixed land use policies include integrating residential and commercial neighbourhoods and moving away from concepts of strict zoning by activity. It is recognised, of course, that the efficacy of this approach does have limits as cities grow and people do live at increasing distances from their places of work, schooling and leisure.

SHIFT: CHANGING MODAL CHOICE

Where travel cannot be avoided, policies need to promote the use of public transport over private modes.

Both the 'stick' of traffic restraint and the 'carrot' of attractive public transport are necessary to reduce transportation-related problems. While it is rarely politically feasible to control car ownership, controlling car use meets with less resistance. Indian cities should consider implementation of economic measures to restrain traffic such as parking policies, congestion charging across cordons or within areas, car-sharing schemes and other measures. Where these policies are not possible, cities may consider fuel surcharges along with vehicle license duties that reflect the vehicle's impact on air pollution and other externalities. The net revenues from these measures should be invested in improving the public transport system to secure acceptance for necessary but unpopular policies.

In addition to these measures to prod cities along a sustainable path, competition can be introduced into the supply of funding for public transport services. This is necessary to develop efficient, market facing services. Also an early integration of bus priority ways, busways, BRT, into cities' expansion and development plans would help integrate transport and urban development while maintaining the flexibility to reroute public transport arteries as the city devel-

24 T. Litman. 2008. Smart Transportation Emission Reductions: Identifying Truly Optimal Energy Conservation and Emission Reduction Strategies. Victoria Transportation Policy Institute. www.vtpi.org/ster.pdf

ops. Rail-based metro systems can be considered for some cities with more established patterns of residential and commercial development, after careful examination and attention to the opportunity costs of investing in relatively expensive fixed infrastructure.

IMPROVE: INCREASING THE ENERGY EFFICIENCY OF VEHICLES AND FUELS

The agendas for energy efficiency and climate change require controls on vehicles, and fuels used. Transport policy packages that include these controls greatly mitigate the adverse consequences of motorisation by decreasing distances travelled and reducing carbon dioxide emissions per litre of fuel consumed. They also produce co-benefits by reducing local air pollution (nitrogen oxide, sulphur oxide, and particulate matter) (See Chapter 7, Volume II on Energy and Environment).

Achieving these objectives requires inventive technology, measures to encourage the rapid take-up of that technology, and regulation as well as effective enforcement that controls in-use emissions by ensuring that vehicles are properly maintained.

This also requires careful consideration of the close links between vehicle technologies and fuel technologies. New fuels permit new technologies and new technologies perform better as a result of lower vehicle weights, less aerodynamic drag, lower tyre rolling resistance, and lower-friction lubricants. India's emissions standards currently vary among cities and between rural and urban areas, in part due to differential availability of low-sulphur diesel compatible with the latest emissions control technologies. Cars and trucks that pass between emissions zones often end up damaging their emissions filters by refueling with lower-quality fuel. Also, as King (2007)²⁵ emphasised, carbon dioxide emissions must be considered throughout the life cycle of fuels. There is an ever-present danger of unintended consequences when these matters are ignored. When the contrary occurs, however, the possibility arises that 'technology and the right policies will solve environmental problems...by 2050 so that environmental factors need not be restraints on road traffic growth. Some local areas of poor air quality need to be addressed by other means.'²⁶

Whether India will progress on the paths advocated in these initiatives depends on its openness to latest technology and the replacement rate of the vehicle fleet in response to standards and enforcement. The Bureau of Energy Efficiency has developed the Passenger Car Fuel Economy Labeling & Standards Framework, which needs to be imple-

mented across the country and similar initiatives should also be undertaken for other categories of motorised vehicles, such as two wheelers and heavy vehicles. Policy decisions should also be taken in line with the Corporate Average Fuel Economy (CAFE) standards²⁷, regarding the phased predictable implementation of progressive standards, over the next decade. India currently is five years behind western developed countries in these matters and the government should ensure quicker implementation of improved standards with regard to both vehicle as well as fuel standards²⁸ (Chapter 7, Volume II on Energy and Environment).

BOON OR BANE? LARGE URBAN TRANSPORT PROJECTS FUNDED WITHOUT CITY CONTROL

Large projects can be agents of change in a city but are also risky by nature. Not all large projects are beneficial; major radial expressways, for example, can increase car usage and undermine sustainable urban transport policy. This simple question [whether a mega transport project (MTP) is required] demands many varied and interrelated responses. In the context of MTP planning, appraisal and delivery, these include taking a view on understanding how well risk, uncertainty and complexity have been treated; and, acknowledging the importance of context in decision-making and, most importantly, in making judgments about 'success'.²⁹

Flyvbjerg, et al (2003) study a large number of mega projects internationally, highlighting the fact that major risks have shown up consistently in mega projects over time and across nations. They demonstrate that mega transport projects globally have nearly always had cost overruns: these range from 26 percent in the case of Oresund's coast-to-coast link in Scandinavia, to 196 percent in Boston's artery/tunnel project in the USA. They conclude that in such projects it is impossible to trust cost projections. With respect to demand projections too, they found that a minimum deviation of +/- 20 percent and up to 70 per cent should be considered during decision making. The extent and magnitude of actual environmental impact are not well understood and so post project auditing should be a must in all these projects. The wider substantial, regional or national or international benefits commonly claimed in such

Both the 'stick' of traffic restraint and the 'carrot' of attractive public transport are necessary to reduce transportation-related problems. While it is rarely politically feasible to control car ownership, controlling car use meets with less resistance.

25 J. King. 2007. The King Review of Low-carbon Cars: Part 1, The Potential for CO2 Reduction. The Treasury, United Kingdom. www.hm-treasury.gov.uk/d/pbr_csr07_king840.pdf

26 RAC Foundation. 2005. Motoring Towards 2050. London, England. www.racfoundation.org/files/rac_foundation_2050.pdf

27 <http://www.nhtsa.gov/fuel-economy>

28 Europe is already into a regime of Euro V and VI standards

29 Mega Projects: Lessons for decision makers, 2012, Omega Centre, Bartlett School of Planning, University College London.

One must approach large projects with caution and ensure that the institutional framework is flexible enough to adjust quickly to inevitable surprises. Large projects, while providing a huge opportunity to cities also have enormous associated opportunity costs

projects are difficult to ascertain as the links are quite weak. Actual project viability typically does not correspond with forecast viability, where the latter was often found to be brazenly over optimistic. They conclude that due to these aspects not only does the economic efficiency suffer, but also democratic accountability. Those who bear the brunt of the risks involved in mega-projects must have a commensurate voice in decision-making about the projects.

The lesson is that one must approach large projects with caution and ensure that the institutional framework is flexible enough to adjust quickly to inevitable surprises. Large projects in India too, while providing a huge opportunity to cities also have enormous opportunity costs associated with them. As an example in India, whereas the Delhi Metro rail project (phase 1 of 65 kms) cost Rs 191 billion, the Golden Quadrilateral highway project connecting the four major mega cities in India by four-lane highways cost approximately Rs 300 billion for 5846 kms³⁰. The Delhi metro, including its three phases will provide for less than 15 per cent of commuter trips in the city. (The average metro trip being longer than other trips will, however, account for a greater proportion of urban travel in terms of passenger kms). Similarly, the Kochi metro represents the largest Government of India investment in the state of Kerala. These examples demonstrate that large urban transport projects have significant opportunity costs especially where a variety of basic infrastructure across sectors needs to be improved, and hence decisions to undertake such projects require careful ex ante cost benefit analysis.

There is an increasingly strong momentum in urban India, to take such decisions on megaprojects in a participatory manner involving affected stakeholders. However to implement, support and inform a structured consultation exercise, there is a strong requirement, especially if megaprojects are being conceived, that technical expertise and institutional capacity is set up in all five million plus cities. As discussed later in this chapter and also in Chapter 5, Volume II on Institutions for Transport System Governance, the nodal agency for transport in such cities should be an independently funded agency with statutory backing and a permanent technical staff. We refer to this proposed body as the Metropolitan Urban Transport Agency (MUTA). The NTDP has recommended the setting up of an 'Office of Transport Strategy (OTS)' at both the Central and state

DMRC Projections and Achievements

Phase Length Ridership per day (m)

Projected Realised

I 60 km 2.8 0.6

II 180 km 4.5 1.8

government levels (see Chapter 5 on Governance). The MUTA would function as a metropolitan-level counterpart for the OTS for all cities with over 5 million population. The OTS should be responsible for analysing alternative project possibilities and technologies and then undertaking a broad based consultation exercise to inform decision makers on the options. The state level OTS could support similar exercises in other smaller cities across the state. These institutional arrangements should also be backed by improved instruments for appraisal and decision making.

FULL LIFE CYCLE ACCOUNTING OF URBAN TRANSPORT SYSTEMS

Advanced decision making tools are used by successful cities to solve complex problems and assist in taking difficult decisions. Full life cycle accounting (LCA) for costing of infrastructure and services is increasingly used internationally for decision-making, but is still a relatively new concept. Unlike typical government projects which account for the capital costs alone, life cycle accounting includes costs associated with the operation and maintenance and repair during the life span of the facility created. It also includes costs to the environment: pollution created and energy used during the construction phase as well as the operation phase. This comprehensive way of accounting for the costs of an urban transit systems provides a more accurate basis on which choices between different technologies can be made.

LCA can significantly change the comparison between transport options. TERI (2012)'s LCA of transport modes, commissioned by the NTDP and discussed in more depth elsewhere in the report, found that modes which involve greater capital costs in infrastructure have a larger environmental impact. Although the results of this study are discussed in detail elsewhere in this report, the issue related to urban transport is presented in Tables 5.12 and 5.13.

The report also points out that metro rail has a significant cost of infrastructure construction and maintenance due to energy consumed and CO2 emitted. It also shows that while electric systems are cleaner for the urban areas where they are installed, the process of electricity generation remains polluting and environmentally damaging. Thus, the external costs

30 http://www.delhimetrorail.com/projectsupdate/project_cost.aspx

Table 5.12

Comparison of Options for Mass Public Transport Based on Results of LCA Study by TERI for NTDPC: Fixed Infrastructure

LIFE CYCLE ANALYSIS OF EMBODIED ENERGY AND CO ₂ IN MASS PUBLIC TRANSPORT MODES: FIXED INFRASTRUCTURE						
1	BRTS	Phase	Embodied Energy	Unit	Embodied CO ₂	Unit
1.1	Fixed Infrastructure Construction	1 Km Bus lane only	12.3	TJ/km	371.7	T/km
		1 bus stop	3.6	TJ/stop	346.8	T/stop
1.2	Fixed Infrastructure Maintenance (30 yrs)	1 km Bus lane only	16	TJ/km	446	T/km
2	Metro Rail	Phase	Embodied energy	Unit	Embodied CO ₂	Unit
2.1	Fixed Infrastructure Construction	1 km metro line and one station	245.1	TJ/km	23,246.1	T/km
2.2	Fixed Infrastructure Maintenance (30 yrs)	1 km metro line and one station	8.8	TJ/km	792	T/km

Source: Life cycle analysis of transport modes, TERI 2012

to the environment are often just passed from one location to the next.

The study shows that infrastructure-heavy urban transport modes which are 'fixed' in nature, and have large life spans, limit the flexibility of the city to innovate with new more environmentally favourable technologies, as they arrive. Long lock-in periods with chosen modes precludes the implementation of other options as they are developed.

The NTDPC recommends that advanced, international, contemporary instruments such as the LCA framework should be included in the methodology to evaluate and appraise programmes and projects, especially mega projects, before decisions on funding are made. This is particularly important for projects that may be funded by multiple levels of government but concentrate risk on state or metropolitan governments.

ECONOMIC MEASURES FOR TRANSPORT DEMAND MANAGEMENT

It is not enough to improve traffic flows by building more roads and flyovers, and augmenting urban transport facilities alone. There is also substantial room to use existing infrastructure more efficiently through more effective demand management and traffic regulation. Road space requirements in urban and town planning norms currently in use in the country are most often more favorable for motorised vehicles than for other road users and citizens in gen-

eral. Road right of ways are designed for peak traffic times which could last for very short time spans in the day, but become detrimental to the livability and walkability of the space. Sustainable transport cities have reversed this and provide the least priority to personal transport vis a vis other road users, especially for in-city transit.

There is a need to control the growth in transport demand. Otherwise supply of public transport may never be able to catch up with demand and personal vehicles will increase congestion and negative externalities of urban transport. An economic policy regime to strongly support transport demand management (TDM) needs to be put in place in India.

The time has come in India, especially in cities with the higher motorised vehicle populations to consider the implementation of restricted registration programmes and linking ownership to proof of ownership / availability of parking place, and limiting accesses to zones / areas through measures like congestion charges, high parking fees, restriction on availability of parking in areas served by public transport. Programmes restricting private vehicle registration have been quite successful and have demonstrated their use in countries such as Japan, Mexico, Singapore, and Hong Kong, and more recently in Beijing too.

These TDM measures offer individual commuters a tangible economic benefit or dis-benefit related to

Table 5.13

Comparison of Options for Mass Public Transport Based on Results of LCA Study by TERI for NTDP: Rolling Stock

LIFE CYCLE ANALYSIS OF EMBODIED ENERGY AND CO ₂ IN MASS PUBLIC TRANSPORT MODES: ROLLING STOCK						
1	BRTS	Phase	Embodied energy	Unit	Embodied CO ₂	Unit
1.1	BRT Rolling Stock - Diesel Buses	Manufacture	1.7	TJ/bus	140	T/bus
1.2		Maintenance (full life)	0.3	TJ/bus	22	T/bus
1.3	BRT Rolling Stock - Diesel AC Buses	Operations 2014	458.1	KJ/PKM	36.9	g/PKM
2	Metro Rail	Phase	Embodied energy	Unit	Embodied CO ₂	Unit
2.1	Rolling Stock	Manufacture	2.2	TJ/coach	130	T/coach
2.2		Maintenance (full life)	1.8	TJ/coach	81	T/coach
2.3		Operations	86.4	KJ/PKM	19.7	g/PKM

Source: Life cycle analysis of transport modes, TERI 2012

the use of one or more travel modes. Some, economic instruments that should be used to control the use of personal vehicles in large Indian cities are presented in Table 5.14.

COMPREHENSIVE MOBILITY PLANNING

The conventional UT planning approach has focused mainly on flow of motor vehicle traffic. Since the National Urban Transport Policy, 2006, some attention is now also being placed on 'moving people not cars'. Increasingly, the focus is shifting to accessibility (the ability to reach desired goods, services and activities) and mobility of people, as against mobility for motor vehicle. Thus, planning should aim at improving accessibility, mobility and traffic flow in that order.

The transport modes to be used and the modal mix will depend on the city population, city form and size, availability of road surface and the trip length. The objective should be to restore balance in the use of road space for walk and non-motorised transport and promotion of the use of public transport, above private motorised vehicle use. Priority in planning for modes should be as follows in descending order:

- Walk and bicycle,

- Public transport including para transit
- Personal vehicle transport

Table 5.15 shows desirable modal shares for different city sizes based on trip length distributions in Indian cities (based on Tiwari, 2007)

IMPLEMENTING MIXED LAND USE AND HIGH DENSITY DEVELOPMENTS AND AVOIDING URBAN SPRAWL

Urban Planning for mixed land use, high density and mixed income neighbourhoods, are being recognised all over the world, as the best way to ensure safe and sustainable urban development while minimising the risks and negative effects of transport. Land management is a key element of the Avoid strategy of the 'Avoid, Shift and Improve' approach.

Indian cities have developed over time in a mixed land use format. Only with the segregated design of cantonments under British rule and thereafter new city master plans was this principle first put aside. Thereafter, with the adoption of British town planning parameters, such mixed land use high density development has been discouraged. However, in practice most cities have still developed with considerable mixed land use, high density and mixed income localities, due to the widespread need of poorer peo-

Table 5.14

Economic Measures for Transport Demand Management

TYPE OF INCENTIVE OR DISINCENTIVE	POSSIBLE ECONOMIC INSTRUMENTS	SELECTED ECONOMIC MEASURES
Curb motorised vehicle ownership	Tax/ charge on vehicle purchase/ ownership/ scrappage	Annual Vehicle Tax Registration Tax/ Charge (re)Sales Tax/ Charge Scrappage Tax/ Charge
	Restricting the number of vehicles and/or new registrations	Auction schemes/ competitive bidding for new licenses Licensing car ownership
Discourage motorised vehicle use and encourage switch to public or non-motorised transport	Tax/ charge on vehicle use	Fuel tax Pay-at-the-pump (sur)charges
	Tax/ charge on road and/or infrastructure use; Restricting access to urban centres or special areas	Parking fees City tolls Road pricing Bridge tolls Cordon/ area pricing Congestion pricing
	Subsidies for public transport and/or multi-modal transport (modal subsidies)	Subsidised public transport fees Subsidies for public transport networks and operation Tax-deductible public transport expenses P&R schemes
Encourage lower emission technology use and innovation	Taxes/Charges on vehicle purchase/ ownership/ scrappage; Taxes/Charges on vehicle use; Taxes/Charges on road and/or infrastructure use	Tax differentiations based on emissions Carbon/ energy taxes Emission fees Emission-based surcharges Subsidies, tax rebates for lower emission vehicles/technologies

ple needing to stay closer to work places, which these plans have not provided for. As also discussed in an earlier section, most Indian medium sized and large cities have higher densities than many cities around the world which have successful public transport systems.

Over the last decade, along with income growth and greater use of private motorised transport, new sub-urban developments around larger cities are being witnessed. These low density gated communities, do not provide for mixed land use or mixed income neighbourhoods. These suburban outgrowths lead to significant increase in trip lengths while making public and mass transport solutions less viable and effectively promote increased car dependency, which is posing a critical challenge to sustainable transport in the immediate term. *The NTDP is of the view that future urban development plans over the next 20 years, should be based on principles that create mixed land use, high density and mixed income neighbourhoods, based on norms for persons per hectare and not FSI alone.* This should be addressed through the

appropriate changes in the urban planning norms and should be incorporated into planning standards such as the Urban Development Plan Formulation and Implementation Guidelines (UDPFI) which are followed by planning and development agencies in most states.

Also to be kept in mind is the fact that even in our richest cities, over the next 20 years, affordability levels of users of urban transport systems will remain low, inspite of the high economic growth levels expected. This implies that a large number of users will have limited resources to spend on long distance intra-city travel. Mixed land use, high density and mixed income neighbourhoods also provide for the proximity of different economic strata of society which have to rely on one another to be productive, which augurs well for the city, especially given that the skills and human resource intensive service sector contributes the largest share of the city's economy. High density mixed land use neighbourhood design also has added safety benefits and new research shows that due to mixed use the neigh-

Table 5.15
Desirable Modal Shares for Different City Sizes

CITY SIZE IN MILLIONS	0.05-0.1	0.1-0.5	0.5-1	1-2	2-5	>5
Walk	30	30	30	30	25	25
Cycle	25	20	15	12	10	10
Rickshaw	12	10	8	6	1	1
TSR	8	3	5	3	3	1
PT	12	15	15	20	33	38
Cars	1	1	2	4	8	10
MTW	12	21	25	25	20	15

Source : Urban Transport Working Group, NTDP 2012.

bourhoods are busy throughout the day which help keep away crime and violence Box 5.6.

INTEGRATED LAND USE AND TRANSPORT PLANNING

Urban transport is a derived demand closely linked to urban growth policies. Therefore integrated land-use and transport planning to minimize transport demand is essential. Some types of land use patterns increase the use of car, while others reduce the amount of vehicle travel needed to access goods, services and activities. Some transport policies such as increase in road capacity and speed, Generous parking supply, low road user charges and fuel taxes, poor walking and cycling conditions, inferior public transit service, high public transit fares, tend to encourage use of private motorized transport and also support the development of city sprawl.

In the coming years, much of India's population growth will take place in urban areas. At the same time, increasing wealth, declining household size, central area redevelopment, and other factors are causing a rapid drop in urban density even in India/Asia (Figure 5.7). These trends make most developing cities likely to at least double in physical area over the next two decades.

With the exception of cities in the People's Republic of China, few Asian cities are addressing this issue in a concerted or proactive way. Nonetheless, attention to this aspect is also increasing in India. The process of integrating land use and urban transport, should be driven by the principle that lower income

workers should be closer to their employment areas while higher income workers, can afford to travel larger distances for work.

In addition to being geographically feasible, land-use plans must also be financially and politically feasible—i.e., they must be possible to implement. This requires stakeholders to accept that development is not allowed in certain areas. It also requires authorities to enforce planning regulations and construction standards. In most developing cities, achieving these conditions will require a considerable change in attitudes, greater technical capacity in planning departments, and institutional modifications that place these departments at the heart of the urban management process. While this may seem challenging, cities that have embraced sustainable transport principles have been through these challenging issues and the impacts are now seen on the ground as in Copenhagen (Figure 5.8).

A few Indian cities are also exploring the concept of Transport oriented Development (TOD), which suggests that there should be commerce and settlements around public transport nodes. This idea was vital for Northern American cities with high incomes and low densities such as Portland, Oregon, which have densities of 15-25 persons/ hectare. In our context however, since we have a prevalence of mixed use high density development in most of our cities, it is important to promote high density in newer developments too with smaller block sizes across the whole city and not only at transport nodes. However, the densities in Indian cities need to be further

Box 5.6

Advantages of High Density Mixed Land Use Planning Through Urban Environmental Design

A number of recent researchers using comparative statistics and victimisation surveys show that environmental design can be used as an urban planning tool to reduce crime and violence in our cities and transport systems. Safety from crime and violence can be ensured through neighbourhood design elements in place of vast emptiness and suburban development, as in older inner city neighbourhoods. Bill Hillier et al, have recently in their research analyzed how low burglary in dwelling spaces have a direct linkage with the inter-mix of multiple uses in streets. Researchers have developed a bunch of Urban Planning Strategies aimed at increasing the safety taking into account existing social and physical structures; guaranteeing accessibility and avoiding enclaves; creating vitality (blending functions and activities, attractive layout); providing mixed status (blending socio-economic groups, avoiding segregation); creating adequate urban density to allow vitality and natural surveillance; avoiding physical barriers (due to infrastructures etc.) and waste land.

Urban Design Strategies for safety should include layout considerations such as continuity of urban fabric and pedestrian/bicycle routes; specific location of activities; time schedules coordination to guarantee continuous natural surveillance; visibility (overview, sight lines between e.g. dwellings and public space, lighting, etc.); accessibility (orientation, alternative routes, limiting access for un-authorised people); territoriality-human scale, clear public/private zones, compartmentalisation; attractiveness (colour, material, lighting, noise, smell, street furniture); and robustness (materials e.g. street furniture, fences).

Source: Gronlund, B. 2013. Crime in streets and public spaces: reducing fear through urban planning and design. In: Mohan, D. (ed.) Safety, Sustainability and Future Urban Transport. New Delhi: Eicher Goodearth Pvt Ltd.

increased along the mass transit corridors through a process of redevelopment with smaller block sizes to promote walking, cycling and easy access to public transport.

WALKING AND NON-MOTORISED TRANSPORT

Provision of pedestrian and bicycling facilities which are – safe from road accidents and crime by design is the third most important learning from successful cities for the Indian context. Infrastructure for walking and bicycling needs to be improved urgently across urban India to (a) provide for safe and convenient transit for the large number of commuters who currently use this mode and (b) to attract more commuters to use these modes.

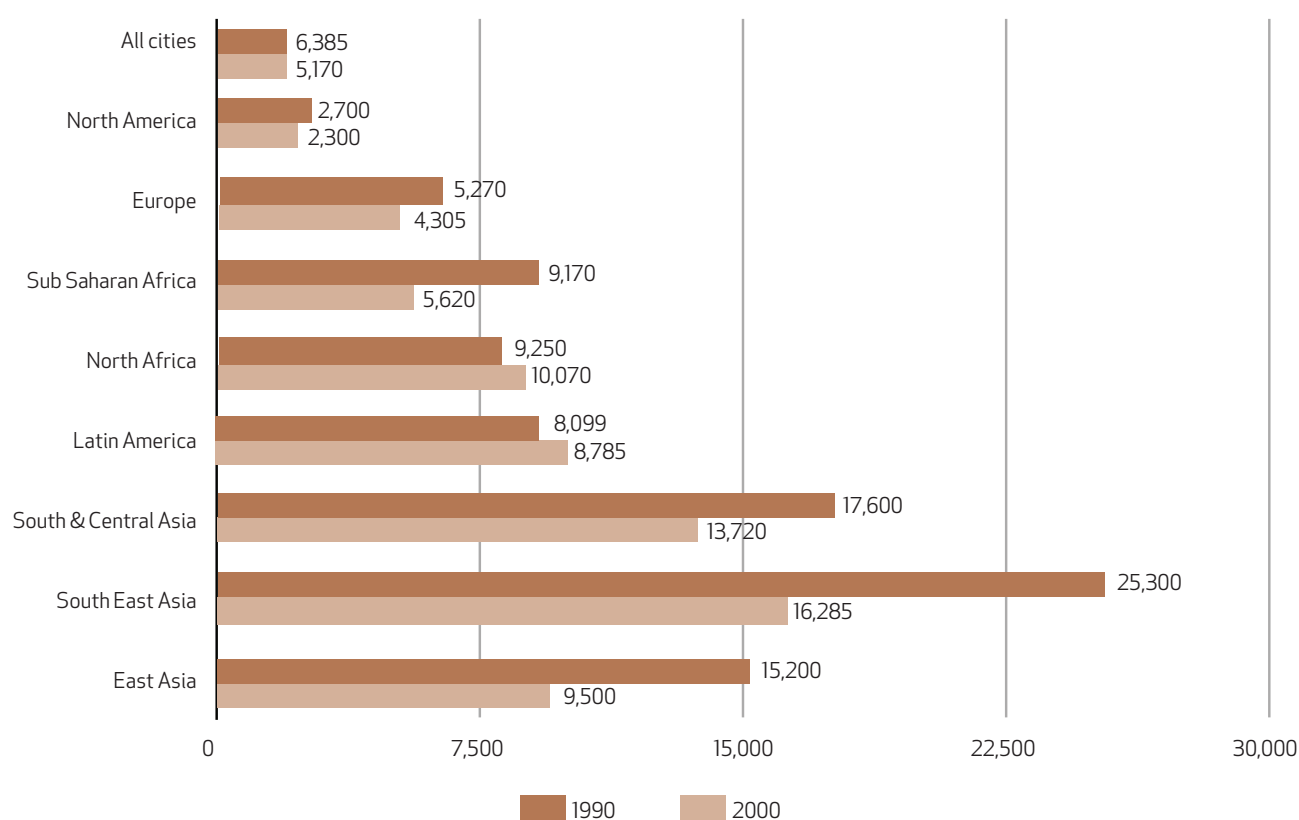
Walking and bicycling represent the largest share of trips in most cities with low affordability and mixed land use. In spite of this, often there is neglect of facilities for safe use of these modes, which needs to be corrected in the short term. Walking and to a large extent bicycling are also inexpensive, emission-free, use no fossil fuel, offers important health benefits and, for those without substantially impaired mobility, is accessible regardless of income. But walking and bicycling in all Indian cities is more challenging due to the poor quality of infrastructure and amenities for pedestrians and bicyclists. Pedestrians are particularly vulnerable, and account for about 35-50 per cent of road traffic fatalities in most Indian cities. Walk facilities should be designed and managed to accommodate a wide range of uses. People walk

alone and in groups, walk pets, push strollers and carts, run, skate, bicycle, stop to gaze and talk, play and eat on sidewalks and paths. Footpaths serve as both travel-ways and stopping areas. Walking isn't only a mode of transportation but is also very important to social life in a city. The vitality of a city is closely associated to citizens being outdoors on the streets. However due to risks and perceived safety risks to walking and bicycling, these modes are losing favour among those who have choices (upper and middle income households) quickly and this trend needs to be reversed soon, to achieve sustainability in urban transport.

Lowering motorised traffic speeds is a key to improving pedestrian safety and can be done by introducing traffic calming designs and wider pedestrian paths. (See Box 5.7) This also would help those who have impaired mobility, such as mothers negotiating traffic with young children, walkers carrying heavy items or older pedestrians and the differently abled. Special facilities and amenities for universal accessibility for wheelchairs also need to be made part of street design. In India, whenever new urban transport projects such as city roads and mass transit systems are being planned, it is recommended that facilities for pedestrians are integrated suitably in the main project itself. This needs to be ensured by national, regional and local legislation.

Many of the strategic macro level points raised in a recent report of the International Transport Forum,

Figure 5.7
Urban Densities in 1990 and 2000



Source: Angel, S.C. Shepperd and D.L. Civco. 2005. The Dynamics of Global Urban Expansion. Washington DC: The World Bank

are also important for Indian cities and need to be adopted as listed below.

1. Implementation of clear administrative responsibilities, with the urban local body in the centre, but across all levels of government for coordination of initiatives to promote walking.
2. As mentioned before, the MoUD has come up with Service Level benchmarks, and it is important that the SSLB be implemented for measuring, reporting and monitoring pedestrian accessibility and mobility. A 'system' approach is needed for the design of walking environments, where the 'safe system' recognises that road users make mistakes and requires road design to take account of this to reduce the risk of serious injury.
3. Implement the pedestrian planning guidance for local administrations. Each local body should develop, notify and implement, their own guidance and controls on street and road, such as in the city of Chicago, and include targets for future levels of walking and cycling.
4. Encourage employers to create incentives for

employees to walk and cycle to work.

5. Implement traffic-calming zones and designate 30 km/h zones in all residential areas, school and hospital areas and shopping districts, areas with high pedestrian activity and local streets.
6. Review current traffic codes to strengthen the legal and financial protection of pedestrians.

Safe facilities for NMT i.e. footpaths and dedicated cycle lanes should be developed on priority basis along with accompanying facilities such as parking booths, drinking water kiosks and street furniture. These should be citywide to assure the commuter that he can complete his journey all the way by walk or bicycle if he so chooses. NMT facilities should become a national norm and get first priority in infrastructure development and funding. Funds allocation for major transport infrastructure should be linked to achieving targets for creating facilities for NMT.

A number of guides and resources including from IUT for the MoUD, by the UTTIPEC and more recent-

Figure 5.8

Copenhagen: From Car Domination in the 1970s to Pedestrian Friendly Streets and Bicycling City



Mobility Promotes: Economic viability

50% earned in 7 extra years of productive life
20% saved on fewer days of illness
30% on health care savings



Source: Risom, J & Mookerjee, C (2013). People first design: Integrating Mobility and Public Life in: Mohan, D (ed.) Safety, Sustainability and Future Urban Transport, New Delhi (Eicher Goodearth Pvt Ltd).

Box 5.7

Complete Communities

'Many communities were not designed to make it easy for residents to walk, bicycle or use public transportation. The streets may be too wide for safe crossing, or a lack of sidewalks may inhibit a walk to the store or transit stop. Now, states are embracing "complete streets",' which entails planning, designing, constructing, maintaining and operating transportation projects and systems, keeping in mind the needs of all users—motorists, bicyclists, pedestrians and transit passengers—regardless of age and ability. Twenty-six states, the District of Columbia and Puerto Rico have some form of complete streets policy; in 17 states, policies were enacted by the legislature. In 2011, New York and Washington enacted complete streets legislation, and such measures typically are considered by a number of states and localities each year. The District of Columbia also enacted its Sidewalk Assurance Act, which requires installation of sidewalks to ensure a safe and accessible environment for pedestrians and those with disabilities. The law provides that, for road segments that lack sidewalks on both sides of the street, road reconstruction or curb and gutter replacement must include installation of a sidewalk on at least one side of the street. At the federal level, the U.S. Department of Transportation issued a policy statement on bicycle and pedestrian accommodations in March 2010. It states that, "The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide—including health, safety, environmental, transportation, and quality of life—transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes'. It encourages states to adopt similar policies, which many states already have done.'

Shinkle, D. 2012. Bicycle and pedestrian safety. Transportation Review. Denver, CO: National Conference of State Legislatures.

In India, whenever new urban transport projects such as city roads and mass transit systems are being planned, it is recommended that facilities for pedestrians are integrated suitably in the main project itself. This needs to be ensured by national, regional and local legislation

ly from the Chicago Department of Transportation provide theoretical principles and information on best practices for improving non-motorised travel conditions. Some key design elements are as listed below:

- Integrate non-motorised planning into all transport and land use planning activities.
- Educate all transportation professionals in non-motorised transport planning principles
- Fund non-motorised transport at a comparable rate as other travel modes
- Ensure that all roads are suitable for walking and cycling unless these modes are specifically prohibited and suitable alternatives are available
- Use current planning practices and design standards, including Universal Design (inclusive design for the differently abled)
- Include non-motorised travel in transport surveys and models
- Create pedestrian-oriented Commercial Centres and neighbourhoods
- Perform user surveys to identify problems and barriers to non-motorised travel
- Improve sidewalks, crosswalks, paths and bike lanes
- Correct specific roadway hazards to non-motorised transport (sometimes called 'spot improvement' programmes)
- Improve Non-motorised Facility Management and Maintenance, including reducing conflicts between users, and maintain cleanliness
- Develop pedestrian oriented land use and building design
- Increase road and path Connectivity, with special non-motorised shortcuts, such as paths between cul-de-sac heads and mid-block pedestrian links
- Street furniture (e.g., benches) and design features (e.g., human-scale street lights)
- Traffic Calming, Streetscape Improvements, Traffic Speed Reductions, Vehicle Restrictions and Road Space Reallocation
- Safety education, law enforcement and encouragement programmes
- Integrate with transit (Bike/Transit Integration and Transit Oriented Development)
- Provide Bicycle Parking
- Address Security Concerns of pedestrians and cyclists
- Public Bike Systems (PBS), which are automated bicycle rental systems designed to pro-

vide efficient mobility for short, utilitarian urban trips

- Pedestrian ways, which are indoor urban walking networks that connect buildings and transportation terminals
- Create a Multi-Modal Access Guide, which includes maps and other information on how to walk and cycle to a particular destination
- Provision of multi-storey car parks for residents (paid for by residents) in order to gain public space on the road and gradually reducing parking space on the streets in order to promote cycle and walking
- Monitoring of public parking space with a special control task force
- Additional park and ride facilities at the periphery of the city

The NTDPC recommends that all cities should be responsible for pedestrian ways and facilities, which should be embedded in a law, linked to targets for improving streets and their maintenance within a period of 10 years.

PUBLIC TRANSPORT MODES

Public transport consists of:

- Mass rapid transit;
- Intermediate public transport, and
- Personalised public transport.

Mass rapid transit is the backbone of city transport in large cities as it is the mode that carries a very large number of commuters using minimum space. Intermediate public transport, i.e. tempos and mini buses supplement mass rapid transit in large cities and are the main mode of public transport in nearly all medium and small size cities. Personalised public transport i.e. autos and taxis and cycle rickshaw cater to the demand of commuters seeking a substitute for personal transport.

MASS RAPID TRANSIT

The main modes of mass rapid transit are:

- High capacity: Metro rail, commuter rail, BRT, LRT, monorail, HSST (Mag lev), Linear Metro, Automated guide-way transit (AGT), Automated people mover (APM), inland water transport and several other modes, which are grade-separated from other traffic.
- Lower capacity: Trams and buses of various sizes operating in mixed traffic metro cable in hill cities

High capacity metro rail and commuter rail (suburban rail) are already in use in India; so are buses of various sizes. BRTs have also started operating in Ahmedabad, Rajkot, Delhi, and Pune. An increasing number of cities in India are constructing/planning facilities to operate BRT. Use of Modern Tram (also called Light Rail Transit) may be possible in many cities. Broadly, the light rail system is similar

Box 5.8

Financing Urban Transport : Non-Motorised Transport-Financing Cycle Paths and Cycles

Both segregated cycle paths and sidewalks for pedestrians are generally assumed to be part (or not part, as the case may be) of the normal design and financing process for roads. Finance for them thus comes usually from the road budget. The most extensive segregated network in the developing world is the 340 km cycloruta network constructed in Bogota during the same three years as the initial phase of Transmilenio. The \$50 million which this cost was funded from the city investment budget. In such circumstances the critical issue is whether provision for NMT is contained within the national urban road design standards. Bogotá prepared and has available a Design Manual and Good Environmental Construction Practices guidelines for public works on its cycle way system.

There are some recent signs of development of earmarked finance for NMT. In 2008, the South African government published its draft proposals for NMT, which included the obligation for NMT plans to be prepared at both the provincial and local levels, and for an NMT fund to be established from part of the national Road Fund revenues (South Africa Department of Transport, 2008). A similar initiative is being pursued in Botswana.

In poorer countries bicycle ownership has been a constraint. An early attempt to provide credit for cycle purchase in Lima, Peru failed because of the problem of collateral with the traditional municipal bank, as did an early lease programme in Tanzania. But group savings programmes in Kenya were more successful, as have been promotional bicycle sales in South Africa. Government support is critical, as in the South African shova kalula programme inaugurated in 2001, which now aims to roll out a million bicycles by 2014, but had only introduced 72,000 bicycles by early 2011. The elimination of import duties helps, as in Kenya. (Earthtec, 2007). Other interesting recent contributions have been the bicycle recycling project in which old bicycles from the city of Aachen in Germany are recycled to the poor in Cape Town, South Africa; and the development of a short term bicycle rent programme in Hangzhou, China. Security of bicycle property is still a problem satisfactorily tackled in Japan and the Netherlands but not yet overcome in many poor countries.

Source: Financing Urban Transport, Paper 1-Page 29, Ken Gwilliam, August 2011

in design and operation when compared to closed BRT systems. Modern Tram being at grade is very convenient for commuters. It doesn't cause any local pollution when compared with BRT. It allows for the possibility of operation of both trams and buses on the same tracks, depending on local circumstances.

Monorail, HSST (Mag lev), Linear Metro, (AGT), (APM) and several other modes are currently available internationally but are not in use in most cities as public transport systems. They are mainly used in special lines such as airport connection lines, local entertainment areas, amusement parks etc.

Medium capacity modes such as electric trolley buses or buses can be used for mass transit. These vehicles when used at grade with mixed traffic allow for low capacity but are often more flexible and convenient for commuters, especially over short distances.

Choice of MRT mode depends mainly on urban form, costs and benefits, demand level on a corridor, available ROW and the capacity of the mode. Other considerations are land use along the corridor, the location of building lines, and the potential for increasing

the ROW, financing options—including how costs for capital investment and operation and maintenance are to be shared etc. Other features such as convenience, cost, safety, eco-friendliness, energy and land conservation, aesthetics and local technology maturity from maintaining the system should be given due weight.

An important issue is at-grade or grade-separated construction. At-grade MRT is the most convenient facility for the commuter. Grade-separated modes increase trip time by 10 to 15 minutes to account for the need to go up or down. At-grade construction should therefore be the default priority.

In the metro rail projects undertaken so far, the concern to keep costs within manageable limits has seemingly resulted in a preference towards elevated construction. MRT projects have a very long project life. Elevated structures are often more land-intensive than underground modes. Cost calculations most often do not take into account the long term opportunity cost of the land. Underground metro rail has the advantage in keeping the city landscape more aesthetic. Elevated modes, road or rail have not

Box 5.9

Designing Safe Public Transport

Research now shows clear evidence that the success of Public Transport systems is often dependent on the safety and perceived safety that it provides to commuters. Public transport safety needs to be guaranteed during the whole length of the trip: on the routes of access to stations or stops, during the waiting time and on vehicles. Old people and women are particularly sensitive to the problems of personal safety on public transport networks, and require special consideration in design. Communication and information, is an essential ingredient of a safe public transport system. It is necessary to offer as much information as possible and as clearly as possible so that public transport users are not disoriented or feel vulnerable in unknown areas. The reliability of the service is often seen as a key element in making for a secure experience of travelling. In public transport systems, unexpected failure to deliver punctually creates disorientation and generates anxiety, leading to commuters feeling unsafe. Interventions such as, a reliable night bus service makes an important contribution to safe local transport. Maintenance and design is another key factor in making people feel comfortable and safe. Lighting, good design, visibility at stops and stations are an essential component in creating feelings of safety and security. The immediate surroundings of public transport stops and stations have also to be checked in terms of safety.

Source: Cardia, C. 2013. Designing safe public transport: a crime prevention approach. In: Mohan, D. (ed.) Safety, sustainability & future urban transport. New Delhi: Eicher Goodearth Pvt. Ltd.

been laid in the last few decades in any developed country and many important western cities have also destroyed these structures to rejuvenate cities and street. Therefore the desirability of elevated systems needs to be examined very carefully.

In Indian cities however there is a requirement for affordable, dense and safe MRT networks – that should be financially sustainable based on city resources, as far as possible. The MRT services should be designed as an integral part of any new development in urban areas. Dense, integrated public transport is required in our cities. Only such dense MRT (based on buses if they are to be majorly funded by city governments) can support transit in the already dense parts of our cities and can assist a shift towards high-density, mixed-use walking and transit-oriented urban environments. A city as a first step should organise the existing public transport into an integrated network to cover the whole city. These services can be operated by buses of various sizes as appropriate to demand level. Actual ridership will guide adjustments in the capacity needed and to be provided on each route. When the demand level exceeds the capacity of bus services and BRT, other guided MRT modes may be considered.

The safety and safety perception of MRT modes is a key factor in its wide based use and should be a key feature in the design on an MRT network. If the public MRT is not safe or perceived to be unsafe its usage cannot be ensured or improved, as large sections of users would avoid using such systems.

As per a recent analysis, ‘the high rate of various taxes are one of the important reasons for the financial unviability of MRT modes, especially buses in India. Besides, as compared to other modes of transport, the levies on the MRT modes are quite inequitable.’ (P S Kharola and G Tiwari, 2008) An important step that the government needs to take to promote MRT is to reduce/remove all taxes on MRT and taxis and make them more attractive.

PARA-TRANSIT / INTERMEDIATE PUBLIC TRANSPORT MODES

While para-transit modes are not a major mode in most developed country cities, many cities in the developing world including in east Asia have proactively worked out solutions to meet the varied requirements of users at affordable costs.

In India too some cities have been trying to integrate informal para transit with MRT. The informal para-transit systems are often organised in India, and with some Organisational support from city governments they could be converted into formal public transport modes while improving the quality of service provided by them. New Technologies need to be used to improve service quality and provide more efficient urban transport, such as on-call cycle rickshaws, smart cars / battery operated taxis and solar motor cycles. Para transit has essentially grown in market segments at price ranges that are not catered to, by the formal sector and therefore offer a very valuable service to users. This mode also has to be supported to develop dense integrated sustainable public transport systems across Indian cities.

Box 5.9A

Importance of Perception of Safety in Public Transport

Equally important, violence and fear undermine attempts to improve active living, including active transportation, thereby exacerbating existing climate effects and illnesses, and also in multiple ways increasing the risk for onset of disease. The presence of violence also contributes to a diminished community environment and has social and economic costs, including decreased business development and fewer educational and employment opportunities for community members. The perception of violence exerts the same weathering effect as violence itself. Violence in the environment promotes a deep level of community-wide fear, which can lead to pervasive feelings of distrust, suspicion, and isolation and a subsequent drop in social interactions. Compromised social interactions contribute to decreased social cohesion and, consequently, underutilization of local assets, such as community centres walking paths, and parks that would otherwise facilitate healthy behaviors

Source: Cohen, L., Guzman, C., Chehimi, S. & Realini, A. 2013. A good solution solves multiple problems: how promoting safety can encourage active transportation and address climate change. In: Mohan, D. (ed.) Safety, sustainability & future urban transport. New Delhi: Eicher Goodearth Pvt. Ltd.

These para-transit modes have the flexibility to move from acting as personalised transport to mimicking public transit by operating on fixed route for multiple passengers. Radio taxis are increasingly becoming popular in large cities, while para-transit as public transport is expanding its role in small cities and some large cities in areas where the formal public system is not needed for the commuter demand. Improved technology in user interface as well as in vehicle efficiency and the inclusion of road space for locating these para-transit services can go a long way in making the service provided by these modes more convenient and effective for commuters while ensuring sustainability.

As stated earlier, use of intermediate public transport in Indian cities is extensive. Para-transit modes are playing an important role in providing mobility to a large section of the population. They are attractive for commuters as they often provide transit services at a variety of more affordable price points than other modes. While a number of safety and convenience factors in these modes need to be improved, they have a potential of providing clean mobility. Manufacturers should be encouraged to invest in improving the technology of these vehicles by:

- Setting up emission and safety standards under the Motor Vehicles Act.
- Banks and financial institutions providing low interest loans for small scale industry producing these vehicles, and attractive replacement schemes for operators.
- Dedicating 10 per cent of the cess money available with the Ministry of Industry from the transfer of technology for vehicle manufacturing for the improvement of intermediate public transport vehicles.
- Move from a 'closed permit systems' to an 'open permit system', for para-transit/intermediate public transport modes to make

public transport more convenient³¹. This regime change should be accompanied BY strict training and maintenance norms.

MULTIMODAL INTEGRATED AND CITY WIDE PUBLIC TRANSPORT NETWORK

Transport is inherently multimodal. Transport demand varies from corridor to corridor and so does the capacity of various modes. For an economic public transport network, the mode for a corridor should suit the demand level on that corridor. NUTP requires that a public transport system is coordinated and well integrated with efficient inter-change infrastructure and should offer a seamless journey to the users (NUTP, Para 21). The public transport network should be citywide so that the commuter is assured that he can complete his journey all the way by using public transport.

An essential adjunct of Multimodal Transport is the interchange points where commuters shift from one mode to the other. Efficient interchange points that avoid conflicting movements and impose minimum time penalty have a very important role in providing seamless travel to the commuter. This will make the commuter decide to use the public transport network as a matter of choice.

It is equally important that public transport is made user-friendly so that the commuter uses it voluntarily. The most important aspect is Multimodal integration; Physical integration, network integration, fare integration, Information integration and institutional integration. Besides the Passenger information display system, integrated ticketing for all modes (Common mobility card) and interchange facilities, Use of Intelligent Transport System, Facilities for handicapped, safety and security against hooliganism, vandalism and terrorism, national public transport helpline number are criti-

31 Centre for Infrastructure, Sustainable Transport and Urban Planning (CISTUP), 2012, 'A study of the Autorickshaw Sector in Bangalore city – Suggestions for improved governance', Indian Institute of Science, Bangalore.

Box 5.11

Uzbekistan: Mobilising the Informal Sector in Secondary Cities

Uzbekistan has a population of 24 million, with over TWO million living in the capital city Tashkent. No other city is as large; major secondary cities have populations of 500,000 or less. Rigid control of public transport fares in successor companies to the Soviet-era state transport agency Uzavtotrans led to a severe squeeze in operating margins, resulting in a decline in service and maintenance standards. In most urban areas, bus enterprises were only able to provide less than half of the planned capacity. In 2000, with an average age of over 10 years, 30-35 per cent of buses were unavailable for service at any given time and out of the buses that were put on the road on any given day, 25-40 per cent broke down after a few hours of operation. The decline in state urban transport services has been partly compensated by the emergence of private bus operators, which are typically single owner-operators with minibuses of seven or 11 seats. Their growth is fueled by cheap credit available to purchase seven-seater 'Damas' minibuses produced by Uz-Daewoo. Even though the private sector was performing an important role in maintaining an adequate level of service, it was undercapitalized and was deemed to operate in an uncoordinated and undisciplined way.

To introduce discipline and quality into a fragmented informal sector, the government reorganised the road transport sector in 2001, with Uzavtotrans dissolved into 400 Joint Stock Companies (JSCs).

This leveled the playing field by exposing JSCs to competition from private operators through competitive tendering for the allocation of urban passenger routes. By 2006, 941 urban passenger routes operated in Uzbekistan, and over 93 per cent were allocated on a tender basis. Consequently, the share of the private sector increased from 40 per cent in 2000 to about 70 per cent in 2005. Following the success of the franchising experience for urban bus routes, the government allowed open tenders for the allocation of suburban, long distance and international passenger routes.

A fundamental problem concerned the financing of new vehicles. The danger was that direct financing by the IFIs of vehicles for the traditional public transport undertakings would undermine the developments which had been achieved in the shift towards a more competitive sector, and would drive out the existing private sector undertakings. An independent bus leasing arrangement (Uztransleasing-UTL) was introduced in 2004 to overcome this; it would be able to satisfy the IFI requirements for finance without giving an unfair access to cheap funds for the traditional operators. The process was supported by technical assistance to develop financial management and operational procedures, model contracts to be used by UTL for bus leases, provisional agreements for prospective lessees, as well as substantial support for the staffing and training of the company.

The main aspects of this experience which appear to be of relevance to India are:

- The introduction of a competitive tendering system capable of handling both small and large operators in the bidding process
- The necessary restructuring of the public sector bus operation to make competitive tendering work effectively
- The development of leasing institutions that can assist small and medium enterprises to compete

Source: Case Studies in Urban Transport Development, Ken Gwilliam, September 2011

cal to promote public transport and should be a part of planning.

Door-to-door' planning should be done in terms of time, cost and convenience to the commuter. Improved accessibility and last mile connectivity should be a vital feature of transport planning.

- Regular and dense public transport stops, within close walking distance from homes/office
- Places for bicycle parking at the public transport stops
- Safety and perceptions of safety at bus stops

can be enhanced through proper design, maintenance as well as regularity and frequency of the public transport mode itself³².

REGIONAL AND SUBURBAN TRANSPORT

The influence of urban centres extends to towns both in the immediate neighbourhood and those at some distance. These requirements should be met by suburban and regional services respectively. An important criterion in suburban and regional transport planning is the trip time and the level of comfort during travel.

32 Cardia, C. 2013. Designing safe public transport: a crime prevention approach. In: Mohan, D. (ed.) Safety, sustainability & future urban transport. New Delhi: Eicher Goodearth Pvt. Ltd.

Box 5.12

Modal Integration in Public Transport

To attract customers to public transport, which is necessary to solve congestion and environmental problems, it is essential to deliver a convenient and affordable product. A high level of service integration allows multimodal journeys to be undertaken without significant penalties either in total journey time or total journey cost. The first requires physical integration and the second requires commercial integration between the modes.

Efficient physical integration can be achieved using a hub-and-spoke philosophy, with slower modes or smaller vehicles serving low density residential areas feeding to a trunk network of higher speed modes. The trunk services in this sort of arrangement are not necessarily all conventional metros. For larger cities, such as London, Paris and Munich, suburban rail systems perform major trunk movement functions. In many Latin American cities, such as Bogota, Colombia, and Curitiba, Brazil a segregated BRT system operates.

Without a through ticketing system or an electronic travel card system accepted on all elements of the system, the monetary costs of modal transfer may preclude transfer, however good the arrangements for physical integration. While physical integration requires a long planning horizon for big infrastructure projects, commercial integration is cheaper and faster. Commercial integration can be achieved by a common payment mechanism that allows seamless transfers with automatic transfer rebates. In London the introduction of the electronic 'Oyster Card' made interchange between privately operated buses, private suburban railways and the London Underground carry no greater penalty than a change of line within the underground system itself. While negotiations of sharing of revenues can be difficult, the evidence of London suggests that there is sufficient overall benefit from co-ordination for all modes to benefit.

In many cities this sense of integration has been achieved by the establishment of a 'brand image' so that travelers can feel confident that there really is an integrated system at their disposal. The existence of a single marketing company for integration, sitting above the individual operating companies is often the critical requirement. The system in Curitiba is an example. Curitiba's buses are owned by 10 companies, managed by a quasi-public company that handles marketing.

Source: Institutions for Urban Transport, Ken Gwilliam, August 2011

Once the suburban rail enters the city, it becomes a part of the urban transport system. Regional/suburban transport services should be integrated with the city network for easy dispersal. Institutional mechanisms need to be put in place to enable this integration. Currently, suburban rail is under the Ministry of Railways and the contribution of the state/city in the development of the stations is nil. There needs to be put in place a corporate institution, with the agreement of both the Railways and the city transport system, which will articulate the integration of the suburban rail services with the city mobility services. The area around the stations can be developed by the corporate entity on the principles of transit oriented development and it could be the platform for enabling common protocols like the common Mobility Card.

URBAN FREIGHT TRAFFIC

Freight traffic and movement of goods within the city and 'passing through' intercity traffic affects overall city mobility. Passenger movements are con-

centrated in the morning and evening peak hours; freight movements are spread over a 24-hour period. The size, low maneuverability, noisiness, and high pollution output of goods vehicles make their presence particularly objectionable. Goods pick-up and delivery in city centres are also seen as seriously problematic because of limited parking too. At the same time, goods vehicles, which typically are 10-15 per cent (GOI 2010-11) of the registered vehicles in a city, are vital to the economy and well-being of society. Commerce is dominated by goods vehicles, and the logistics industry in particular is dependent on road transport for pick up and delivery. Globally 'in urban areas, freight contributes considerably to both environmental and social challenges : upto 20 per cent of the traffic, 30 per cent of street occupation and 50 per cent of greenhouse gas emissions are generated by freight.³³ Garbage pick up and fire protection are among many essential services that are vehicle oriented.

Logistics and freight transport in urban areas are a key input for the productivity and economic vital-

33 Michel Savy, 2012, European Urban Freight: A comprehensive approach, in Urban Freight for Liveable cities - how to deal with collaborations and tradeoffs.

Once the suburban rail enters the city, it becomes a part of the urban transport system. Regional/suburban transport services should be integrated with the city network for easy dispersal. Institutional mechanisms need to be put in place to enable this integration

ity of cities. There is a direct relationship between freight and urban jobs. In high density mixed-use planned neighbourhoods and in western Europe and Japan, with the changing demands on freight distribution new designs are being adopted. These new designs include laying out of the street, so as to facilitate deliveries, efficient management of delivery places and harmonising all elements of operation regulation (size of vehicles, time of access, etc.) at the scale of urban areas based on the trade-off between job creation and logistics nuisances.

Urban freight is a complex system, in constant change due to change in demands (decrease in door to door informal traders, more malls, more internet shopping, etc) and has economic, technical, political and social dimensions. It also has to straddle the bridge between these and there is no single decision maker, likely to transform the situation, but a constant effort of comprehensive innovation and cooperation of various stake holders. Several new concepts are being tried out which include delivery relays in commonplace shops, logistics shops, electronic lockers (Germany), drive-in retail shops, reliable home delivery and differentiation according to products (value, size and weight of consignments).

Currently, in most Indian cities the vehicles used are old, polluting vehicles operated with little professionalism, low productivity (direct cost), high nuisances (social cost) and have numerous illegal stops (second lane, middle of the street) and present a worsening congestion, an important hidden social cost. However land prices as well as some larger cities' strategies are driving Logistics exchanges/'mandis' further and further into the urban outskirts. This practice then leads to longer final haulage, potentially contributing to increased pollution, cost, and congestion. This is another area in which choices about land use and transport practices must be jointly considered in order to arrive at the optimal approach.

In urban India, especially in the large cities, over the next 20 years the urban freight sector will be a very important component, either aiding or constraining urban economic development. Currently for local authorities, urban logistics are not yet integrated within their concept of territory and their know-how but their inputs often have a significant impact on the sector and in turn on the productivity of the city's economy. The subject needs to be studied in depth to evolve planning norms that permit goods

movement without affecting passenger movement. The current strategic trend of restricting and pushing out logistics and freight vehicles and interchanges to the outskirts of the city needs to be relooked at for better integrating urban freight to support job creating in cities and improve the vitality of cities.

Urban planners and policy makers have now proposed a set of measures to help improve the efficiency of goods vehicle operations. Some measures adopted from Arne Wittlov (2012),³⁴ include:

- Providing space on streets for loading and unloading of goods vehicles
- Supporting urban consolidation centres
- Measures to encourage night delivery services
- Installing shared bus and lorry lanes
- Improving vehicle design and customization
- Integrating planning and not pushing logistic depots into the cities periphery
- Encouraging the use of information systems and telematics applications
- Providing lorry maps in paper form and outline
- Providing information about prevailing traffic conditions and relevant facilities
- Encouraging the use of environmentally friendly goods vehicles

PARKING

It is now well recognised that parking demand is insatiable, in an environment of rapid increase in private vehicles in larger cities. Conventional policies encourage more parking supply to meet ever-increasing demand. The approach should instead shift to modulating supply to maintain a sustainable level of vehicle traffic and space devoted to parking rather than other urban amenities. NUTP, for example, has advocated levy of high parking fee that represents value of land occupied and to allocate parking space to public transport and non-motorised transport on priority.

Under the on-going reform process in India, cities are expected to make the transition from the conventional approach of providing more parking facilities, to using parking as a demand management tool. This is the case in most developing country city contexts as elaborated in Box 5.14. The strategy should be to minimise and avoid serving each building with its own parking. It is more judicious to build parking for the neighborhood. If the policy can be reoriented to provide parking for each development area instead of each building then the parking requirement will also be modest. Standards can vary from zone to zone or city to sub-urban areas within the city and may be reviewed periodically and revised if necessary. The key message is that parking should be shared, common and not individually owned, and it should be priced. However this of late has led to the propa-

³⁴ Arne Wittlov, 2012 'Introduction Urban freight and transport: Challenges and opportunities', in the Urban Freight for Livable Cities: How to deal with collaboration and trade-offs. Volvo Research and Educational Foundations, ed Christian Wolmar.

Box 5.13

Parking as a Restraint Measure in National Urban Transport Policy

It is also time to assess if the new investments in parking are consistent with the policy position of the Government of India. The policy position emerges from the NUTP which is administered by the Union Ministry of Urban Development. It is important to note that the NUTP has taken on board the travel demand management principles very explicitly. It states:

Land is valuable in all urban areas. Parking places occupy a large part of such land. This should be recognised in determining the principle of parking space.

Levy high parking fee that represents value of land occupied.

This should be used as a means to make use of public transport and make it more attractive. Graded parking fee should recover the cost of the land.

Public transport vehicles and non-motorised modes of transport should be given preference in the parking space allocation. This along with easier access of work places to and from such parking spaces, can encourage the use of sustainable transport.

Park and ride facilities for bicycle users with convenient interchange are a useful measure.

In residential areas also, byelaws need changes to free the public carriageway from parked vehicles impeding the smooth flow of traffic. Make provisions in the appropriate legislation to prevent the use of right of way on road systems for parking purposes.

Source: Centre for Science and Environment, Parking: Multi-level dilemma. Lessons from Multi-level parking in Delhi. 2012.

gation of the construction of a number of multi-storied parking facilities, as 'Cities are clueless about the ultimate goals of parking policy and how the multi-level car parks fit, if at all, into the overall policy paradigm.' According to in the report 'Parking: Multi-level dilemma. Lessons from Multi-level parking in Delhi' published by the Centre for Science and Environment, in 2012.

Parking standards should vary from zone to zone or city to sub-urban areas within the city and may be reviewed periodically and revised if necessary. The key message is that parking should be shared, common and not individually owned, and it should be priced.

The NUTP has advocated levy of high parking fee that represents value of land occupied and to allocate parking space to public transport and non-motorised transport on priority. It treats parking as an essential infrastructure that must service all buildings and recommends that public infrastructure funding should be tied with it. Some positive principles which need to be followed are:

- Parking management is to be used as a demand management tool – to decrease use of private vehicles and thus reduce overall demand of parking, and shift travel to public transport, para-transport and non-motorised modes.
- Parking is a consumer commodity, not a legal right. No subsidised parking is to be provided

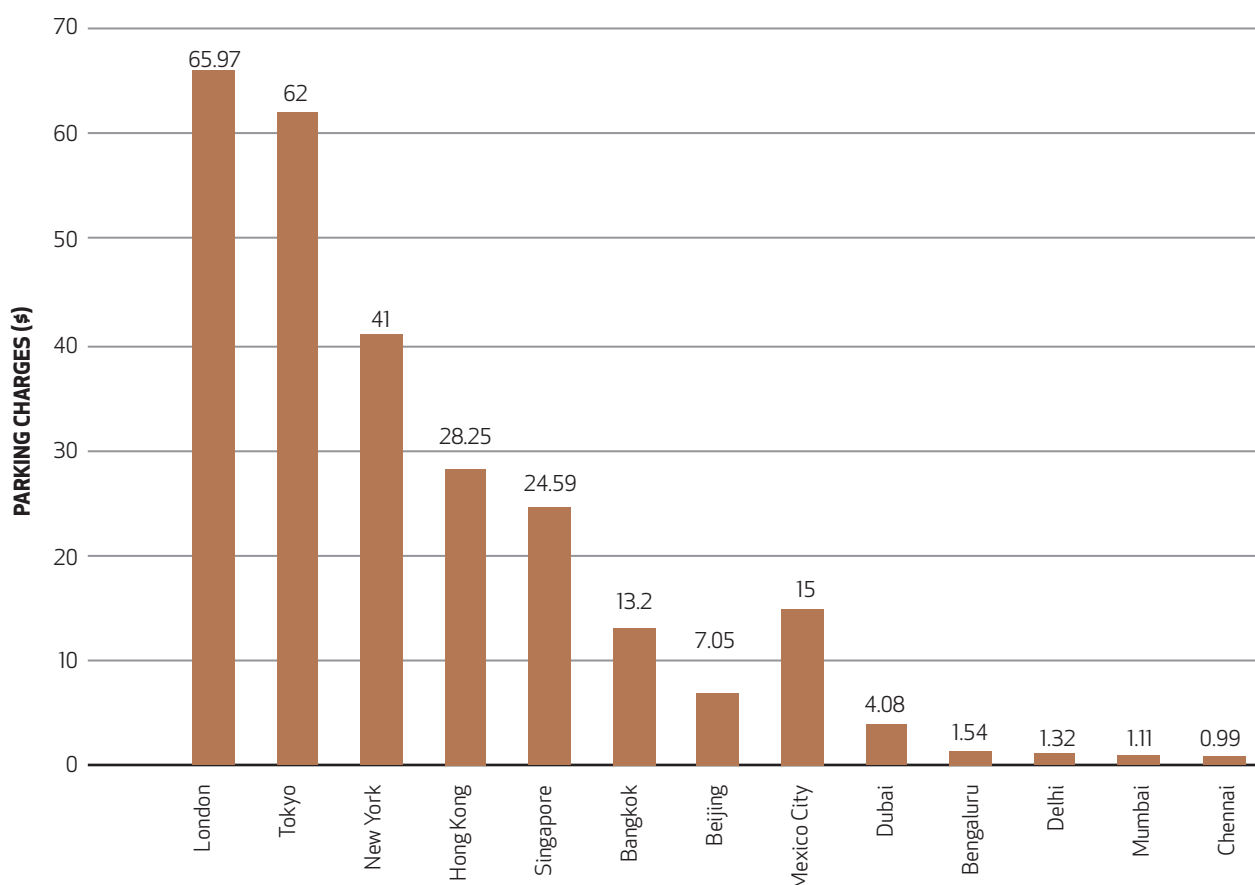
in public spaces. User must pay full cost of parking facility based on land opportunity cost, capital cost, O&M costs and temporal demand.

- Private vehicle must be parked on 'a fully-paid rented or owned' space. Proof of the same must be furnished before registering a private vehicle.
- Spaces already designated for parking must be utilised to highest efficiency and financial viability.
- In the influence zones of the MRTS stations, a maximum limit on parking spaces should be imposed so as to enable shift to public transport from personal transport.
- On street parking should be discouraged to the maximum extent possible or should be highly priced as compared to off-street parking.
- Off-street parking must be provided with park and ride facility and the responsibility of keeping the streets, in the vicinity of multi-story parking, free from unauthorised parking with the help of traffic police should be with the multistory parking operator.

TRAFFIC MANAGEMENT MEASURES

Smart traffic engineering and management optimisation measures do not carry major costs and are critical to avoid congestion. A traffic management unit is therefore essential in each city. Table 5.16

Figure 5.9
Comparison of Parking Charges in Various Cities, 2011



Source: Collters International (2011)- CBD Daily parking charges (in US \$)

shows the typical Functions and Responsibilities of a Traffic Management Unit:

SAFETY

The need to improve safety in urban transport in India does not need any justification. Fatalities in India per million of population have steadily increased. The actual situation may be much worse as a number of accidents are not even reported. Within adequacy of the existing road infrastructure to handle the ever increasing traffic, road safety is deteriorating rapidly and requires urgent attention. A MORTH Committee on Road Safety and Traffic Management, also known as the Sundar Committee, estimated about 50 per cent increase in road accidents over a 10-year period (2005-15).

Some of the major concerns regarding road traffic safety are (Mohan et al., 2009):

- Traffic fatality rates have been increasing in most cities
- Pedestrians, bicyclists and two wheeler riders comprise of 60-90 per cent of the total fatalities
- Motorcyclists represent a large portion of urban fatalities (about 25 per cent)
- Several studies indicate that the involvement

of trucks in fatal crashes is high

- Nighttime driving in India is substantially riskier than daytime driving
- Alcohol involvement in road traffic crashes has become a serious concern

All million plus cities should have measureable urban transport safety plans and indicators developed in the short term. There should be a programme that ensures that the plan is implemented over the next 10 years. The measures/strategies for road public transport safety should include specialised facilities for non-motorised transport; should curtail speed of vehicles in arterial roads and in local streets to help enforce all safety aspects as prescribed in the Motor Vehicles Act.

Today no single agency or department is responsible for improving safety in a comprehensive, scientific and a systematic manner in a city. The organizational framework to deal with all road safety related issues should be provided by creating a Safety Board at state level with safety cells in cities with dedicated personnel and budget. Relevant R&D shall be a part of the research programme to minimise injury and the consequences in the event of an accident. Rescue services should be organised to provide relief in the

Box 5.14

Controlling Private Vehicle Use: Parking Policies

European cities have reallocated street space in favor of pedestrian, bicycle, and public transport use by reducing available parking spaces. Copenhagen has used parking removal to create a network of pedestrian areas, and Strasbourg, where on-street parking was removed and placed underground to make way for a tram line. In recent years, some larger European countries have instituted maximum limits on the total number of parking spaces (on-street and off-street) that may be provided in congested city areas. European cities deploying these measures include Budapest, Copenhagen, Hamburg, London, Paris, Strasbourg and Zurich. This reform has required changing building codes to freeze the existing supply and ban any future development of parking spaces. For every off-street space created in central area of Zurich an equal number of on-street parking spaces must be eliminated. These maximum limits in European cities have had a positive effect in reducing traffic congestion. Similar to establishing parking quantity by zone, several European cities also regulate parking duration by zone. These zonal designations are developed to better tailor parking pricing and duration to the land uses, densities, and transit characteristics in these zones. This policy is also followed in some Asian cities (Barter, 2010).

It is now standard practice for all large European cities charge for on-street parking in areas with significant parking demand. However, as city size becomes smaller the application of paid on-street parking becomes less common. For example, all cities in the Netherlands with a population of over 100,000 levy street parking charges. In contrast, only 1/3 of cities with 20,000 to 50,000 persons have paid street parking, and only about 15 per cent of cities with fewer than 20,000 inhabitants use paid parking systems.

While the primary purpose of charging for parking should be to limit traffic and to better ration the use of available parking spaces, revenues from parking can be substantial. In Amsterdam, a city of approximately 1.4 million population, the city was estimated to collect EUR 130 million (approximately \$175 million) in parking fees during 2009 or nearly a quarter of its total tax revenues. London, (population 7.6 million), also collects substantial sums from motorists from on-street parking amounting to 170 pounds sterling (approximately \$270) per registered vehicle during the fiscal year 2008/09.

Source: Energy Efficiency, Paper 3-Page 16-17, Ken Gwilliam, August 2011

fastest time possible. Also protocols of Road Safety Audit (RSA) by an independent and well qualified auditor who reports on any deficiencies in safety aspects and prepares recommendations on improvements that may be necessary, need to be put in place.

With respect to other aspects regarding improving safety, the recommendations of the Sundar Committee report on road safety and traffic management, should be speedily implemented. A more detailed elaboration of safety issues is presented in Chapter 12 on Safety in this report.

SECURITY

The need for security against vandalism and crime is increasing by the day. Security is needed for commuters, particularly women and children and operators and staff on duty. It needs to be dealt with in a systematic manner. Security is important over all parts of the journey: stations, stops, shelters and on-vehicle. It covers both passengers and operators.

The presence of young people and people who have been drinking tends to make other passengers more

uneasy. Young people are more likely to be bullied or intimidated by other young people than by adults. People with learning disabilities are particularly subject to harassment and bullying. Majority of incidents of harassment or intimidation go unreported. Developing an Effective Strategy is the need of the hour and should include:

- Design solutions including the use of robust materials, good lighting, clear sightlines
- Management solutions such as the presence of trained staff, effective surveillance, procedures for reporting incidents
- Partnership initiatives such as effective liaison with the police, work with schools, and sponsoring initiatives which promote public transport to young people
- Planning for security should become a part of urban transport planning
- Use of principles outlined by professionals promoting Crime Prevention Through Environmental design (CPTED)

UNIVERSAL ACCESSIBILITY

Table 5.16

Typical Functions and Responsibilities of a Traffic Management Unit

DIVISION	FUNCTIONS AND RESPONSIBILITIES
Traffic Management Policy	Formulate and Implement city wide 'Traffic Management Policy' to comply with objectives defined by the 'city council' which would include, at least such areas as determination of (i) a functional road hierarchy; (ii) the appropriate balance between transport system users (private transport/public transport/NMT/pedestrians; (iv) priority programmes for action and, (iv) a 'five year' investment plan.
Traffic Research	Assemble/survey, monitor, analyze and evaluate all traffic and accident data to enable trends to be identified, problems quantified and traffic management plans and improvements to be prepared.
Traffic Management Plans and Improvements	Plan, design, implement, monitor, evaluate, fine-tune and continuously up-date traffic schemes and policies to realize the agreed Traffic Management Policy. The programme would cover all motorised road based modes (cars, public transport, trucks, etc.) and all non-motorised modes (pedestrians, cycles). Plans and improvements would range from simple junction improvements or marking and signing programmes through to far reaching city wide strategies such as extensive bus priority or pricing. Safety considerations are part of any scheme planning and design process but specific safety programmes and accident counter measures would be a responsibility.
Traffic Control Devices	Plan, design, install, operate, and maintain all traffic control devices including (i) traffic signal systems including computer controlled systems; (ii) road markings; (iii) road signs and, (iv) enforcement devices (cameras etc.)
Traffic Regulations	Formulate traffic regulations to realize the proposed Traffic Management Plans and Improvements, for enactment by city government and for enforcement by the traffic police.
Parking Management	Prepare off and on street parking policies and programmes including approval for the location of and access to parking areas proposed by others. Parking enforcement and administration (for example, where paid parking applies) would be carried out by a separate parking authority' or equivalent.
Approvals and Co-ordination	Evaluate and advise city government on all schemes (e.g., new roads) and developments (developed both by public and private sector agencies and including major new land or building developments) which have a significant traffic impact to ensure that they are consistent with agreed traffic policy. In effect carry out traffic impact studies for all major development proposals.
Consultation	Consultation with the public and stakeholders on traffic policy and on the impacts of specific schemes and measures.
Budget	Preparation of an annual budget for submission to city government for (i) implementation of Traffic Plans and Improvement Schemes; (ii) traffic operations and maintenance of control devices; and, (iii) the continuous work of the traffic management agency.

The Constitution of India ensures equality, freedom, justice and dignity of all individuals and implicitly mandates an inclusive society for all including persons with disabilities Box 5.15. In the recent years, there have been vast and positive changes in the perception of the society towards persons with disabilities. It has been realized that a majority of persons with disabilities can lead a better quality of life if they have equal opportunities and effective access to rehabilitation measures.

Universal accessibility needs to be provided, by the UT systems, both at the systemic level and the Infrastructure level.

- Accessibility at the systemic level implies that components of public transit systems like trains and buses, their stations and stops, the ticketing and any other user interfaces should be within reach of people with different types of impairments.
- At the infrastructure level, pedestrian paths and crossings, parking facilities and access to public land uses should be inclusive in their design for differently abled persons.

NEW TECHNOLOGY APPLICATIONS

New technologies have the potential to address the key challenges for UT and change the way we commute. New transportation innovations and linking and optimising them could provide convenient, affordable door-to-door trips for users.

Sustainable mobility is not only about private motorised vehicles becoming more smart, which however can contribute to improved environmental outcomes through hybrids engines, plug-in electrics, or even about alternative fuels like ethanol. While many private manufacturers are investing in improving technology to make vehicles safer, more fuel-efficient and environmentally sound, the real contribution would be to improve the performance parameters in Public Transport and para-transit modes. Clear policy directions would encourage mass transit modes to mainstream greener vehicles. Sustainable mobility is a system where public transportation is central and personal vehicles are peripheral, but both operate on improved environmental norms and standards.

Recent efforts of technical innovators aligned with public transport managers has been to rapidly infuse all these disparate modes with Information Technology (IT) and telecom interfaces, thereby creating passenger-information platforms that can tell commuters beforehand, through a mobile phone or any device, when their bus will arrive, or when and which metro train to board for their onward journey. It would also promote common ticketing across modes.

The auto sector is attempting to reduce congestion and grid-locks on roads and in the short term this is expected to give a fillip to vehicle-to-vehicle communication technologies and collaborative consumption like car sharing. While the private car industry is investing heavily into improving technologies, serious attention needs to be paid to improving technologies for public transport and para-transit. Some companies have been improving buses and bus systems. Recent technology allows a person at a base station to monitor if the driver of a bus is accelerating too fast, braking aggressively, or whatever, and much of this data can be gathered. However more effort would be required to improve the efficiency of inter-modal transfers through IT-based methods. Also more emphasis is necessary of using intelligent systems to integrate taxi and auto rickshaws, para-transit, public and personal (dedicated autos/cycle rickshaws etc) with the public transport network on a round the clock basis, as this could also go a long way to make public transport more attractive to users.

SECTOR INSTITUTIONS AND GOVERNANCE

INSTITUTIONAL FRAMEWORK

India's ability to meet the ambitious goals for transformation of urban transport as part of a larger urban development strategy requires more than policy commitment. The institutional framework for defining, refining, and implementing policies will also have to be strengthened and integrated with India's larger federal governance structure. The Constitution of India, does not specifically list the urban transport sector, making it to a large extent a constitutional and institutional orphan. The present institutional arrangements to manage urban transport are fragmented and the responsibility is diffused. At the city level, several agencies are involved in the management of various components of UT (see Annex D). At the State level, UT is managed either by the Urban Development, Municipal Administration, or by the Transport Ministry as a subject, though often there are a number of agencies that provide urban transport services that may not report to these departments administratively. At the Central Government level, UT is being managed by three Ministries Urban Development, Railways, and Road Transport and Highways. Other than this the laying down of standards and norms for urban roads is being undertaken by the Indian Roads Congress.

This state of affairs is not conducive to the provision and growth of urban transport along a sustainable path. Rectification of this weakness has become all the more urgent in view of the huge investments projected to be made in this sector.

Long Way Ahead for Disability Access on The Ground

'I have been in a wheelchair for the last five years and in all this time, accessibility has not improved one bit in public spaces, at least not enough to enable me to venture out on my own. People on the road still stare, awareness continues to be limited', reveals a former ace swimmer, who is now on a wheelchair after a swimming accident. Articles 14, 19 and 21 of the Indian Constitution recognises that persons with disabilities shall be provided accessibility on an equal basis with others to the physical environment, transportation, information and communications, and other facilities and services provided to the public, both in urban and in rural areas. Yet, inspite of the estimated number of differently abled people being as high as 70 million in the country, they continue to be an 'invisible minority'.

A new updated disability bill draft is being considered by the government. The new bill aims at updating provisions, while widening the definition of disability. It also envisages the establishment of national and state disability rights authorities.

However many experts and social activist feel that new laws are meaningless and regulations have remained on paper, after decades of neglect and continued stigma, they are not convinced that new laws will see any improvement on the ground. Disability planning needs to be streamlined at all levels. Disability is now being captured in the Census data. The 1995 Disability Law clearly stated that public spaces should be made accessible for persons with disabilities, there still is a long way to go to achieve this goal. Even new buildings that have been constructed post-1995 are yet to be made barrier-free. At a daily level, the barest of daily activity that the 'abled' take for granted in India's big cities are mostly inaccessible: 'None of the traffic lights are audio-enabled. Pavements are not smooth enough for a wheelchair. Even in supposedly inclusive systems like the Delhi Metro, there is only one entry-exit that has an elevator. What if you need to cross the road? The metro feeder buses are inaccessible. At most bus stops, there is no seamless movement from the platform into the bus. The BRT system too is flawed—how will a person with physical disability get to a bus stop planted in the middle of the road? And now there is talk of replicating it, despite protests,' says the founder of non-governmental agency AccessAbility.

Most government effort to address better accessibility has been sporadic, while what is required is that civic agencies come together to build long-term, large-scale barrier-free infrastructure. Some private companies are now trying to engage differently abled persons and developing offices which are barrier-free. New ways of partnership are required to make disability access a national movement so that all public spaces and relevant private spaces provide equal access opportunity for the differently abled. Source: Adapted from <http://www.outlookindia.com/article.aspx?282663>.

Urban transport institutions also require investment in appropriate expertise, both in terms of human capital as well as data and decision support systems. Proposed institutional framework

Chapter 5, Volume II on Governance highlights the two overarching priorities for urban transport: (1) building up expertise on urban transport strategy, particularly at the urban and state levels where decisions on responses to varied needs will need to be taken; (2) defining the locus of responsibility and accountability for urban transport in a way that encourages and enables integration across modes and between urban transport and broader urban development efforts. This chapter provides additional detail on how such changes could be initiated.

In order to provide dedicated attention to urban transport to enable it to grow along a sustainable path and to incur the level of expenditure envisaged, the institutional framework to deal with this sector is proposed as follows:

- The primary responsibility for UT should lie with state governments. This report has recommended creation of state-level Offices of Transport Strategy which may be the locus for urban transport, in collaboration with agencies for urban development. Devolution of expertise, formal notification of jurisdiction in keeping with the Constitutional division of powers, and rapid investments in building state capacity for safe, environmentally sustainable, urban transport must be undertaken. Urban transport is a key component of urban development, which as per the Schedule 6 of the constitution is a state

subject, Therefore, the key responsibility for urban transport should explicitly lie with the state government and the Urban Local Body.

- States should also enact comprehensive urban transport laws, with the possibility of model guidance from the Centre. The Centre can set out the roles and responsibilities of the multiple city and state-level entities with regard to public transport, land use and public transport integration, multi-modal integration, safety, facilities for walk and NMT, etc.
- Over time, UT responsibilities should be devolved to metropolitan and city authorities, particularly for cities of more than 1 million. This report has recommended strengthening of the Metropolitan Urban Transport Authorities as a counterpart to state and national OTS. The 74th Constitutional Amendment 1992, which aimed at transferring a number of urban service responsibilities to urban local governments, did not mention urban transport/public transport, but transport responsibilities are integral to the urban planning functions recommended for the Metropolitan Planning Committees to be established in larger cities. This arrangement is also consistent with the principle of subsidiarity guiding recommendations in Chapter 5 on Governance. Box 5.16 on Recife provides an example of this kind of arrangement. The national government will inevitably retain an important role in financing urban infrastructure, given India's fiscal structure. Such funding should be technology-neutral as far as possible, and linked to mobility, access, environmental, and other system outcomes rather than specific approaches to urban transport.
- The national government may also play a role as technical advisor while state expertise is being created. This report proposes creation of a national Office of Transport Strategy which would liaise primarily with the Ministry of Urban Development, and also with Rail, and Road Transport and Highways as needed to generate overarching strategy guidelines.
- The national government would be responsible for creating standards for urban transport performance, including safety, environmental impact, and other national goals.

The Central government cannot be directly responsible for urban transport in each city in a federal set up like India, with a wide diversity of contexts. Central government oversight of urban transport, other than in setting standards for national goals such as safety, efficiency, and environmental impact as well as public investment management, is inconsistent with international experience as well as economic logic.

States are a natural locus for urban transport in India's current circumstances. Larger cities can and should assume the primary responsibility for metropolitan transport as broader urban reforms catch up with constitutional commitments. The arrangement in London, a city with approximately the same population as Bangalore (and less than Bangalore Urban Agglomeration) is elaborated in Box 5.17 as a reference point.

However, states would continue to play a role in ensuring equitable development of urban transport and efficient use of expertise for smaller cities that may not have the economies of scale to develop their own urban transport strategies.

This new institutional framework would redirect lines of accountability from existing agencies engaged in implementation and operation of UT-related projects to ensure that they would continue in their present implementing roles, but guided by more integrated decision-making.

ROLES OF DIFFERENT STAKEHOLDERS

Within this broad framework, the roles and responsibilities need to be clearly defined.

CITY GOVERNMENT

Most of India's cities would work closely with their respective state governments to design transport strategies appropriate for their size and growth. Cities should be expected and empowered to be the locus for data collection on traffic pattern, land use patterns and proposed land use changes, and other factors feeding in to the transport strategy. In this way, urban local governments could 'learn by doing' as they grow.

Cities to which urban transport authority has been devolved must be provided with a strong institutional framework, an effective organisational set up with a dedicated agency to look after planning, coordination and implementation of urban transport services, legislation, a resource generation policy and adequacy of skills. A three level organisational set up is therefore proposed for the city.

- Metropolitan/District planning committee/inter-municipal cooperative arrangement.
- Dedicated authority for urban transport (MUTA)
- Other existing city transport agencies

METROPOLITAN PLANNING COMMITTEE

The constitution and activation of the 'Metropolitan/District planning Committee' as envisaged in the 74th constitutional amendment for cities especially with more than a million population is important to address both inter-sectoral coordination as well as geographic jurisdictional coordination, particularly for large regional urban transport projects. While

Voluntary Collaboration in The Recife Metropolitan Region, Brazil

Brazil is a federation of states, with the attribution of responsibilities between the jurisdictions contained in the formal constitution. Each level of government has a democratically elected government to implement the powers attributed to that jurisdiction by the constitution.

The Recife metropolitan region (RMR), in the north east of Brazil, consists of 14 contiguous municipalities with an area of 2,208 km² and a total population of 3,337,000, at a density of 1232 per km². The state capital, Recife accounts for 1,422,000, and the three central municipalities (including Recife) for 2,370,000 of the total.

Responsibility for urban public transport in RMR is divided between the state of Pernambuco (generally responsible for inter-municipal transport) and the constituent municipalities (generally responsible for intra-municipal transport). However, with the exception of Recife the majority of trips generated in all the municipalities are inter-municipal. For that reason, the governments of the state and the Recife municipalities, committed themselves to work together in a consortium to address the problems of urban transport. It is expected that the other municipalities will join the consortium as it develops. The formal sector bus services and the metro system were brought together in the Estrutural Integrado Sistema - SEI which consists of a network of services, integrated both physically and in terms of a through ticketing system, which allows interchange in closed terminals without payment of a second fare. The SEI is complemented by an open system, with ticket sold for single trips.

The tariff structure in the RMR is zonal, based on a set of semi circular rings around the centre of the metropolis. The number of zones, originally five, has been progressively reduced to two, with the last simplification being the merging of all trips above 32 km into a single zone, which occurred in 2004. There are also special tariffs for the trunk lines of the SEI and for some lines operated by minibuses. The metro system has its own tariff, but is also included in the SEI so that passengers can use the metro lines for trunk movements in multi-modal trips at the integrated tariff rate.

A social survey of April 2004 indicated that public transport is the transport of the relatively poor, with 53 per cent of the public transport users having family incomes less than 2 minimum salaries, and 89 per cent having less than 5 minimum salaries...However, the issue of the affordability of essential transport to the poor is dealt with directly by the 'vale transporte' system. If requested to do so by an employee any employer is obliged to provide a ticket for the journey to work, for which he can deduct a maximum of 6 per cent of the workers' salary. As in principle the VT is only sold for use on the formal public transport system the it should tie employees to the formal public transport operators. In practice, however, the VT became a secondary currency, which could be used on informal transport as well as formal. To overcome this the VT has been converted into a personalised, electronically readable ticket.

The executive authority for implementation of policy is the 'Empresa Metropolitana do Transport Urbanos (EMTU). This body establishes the lines, schedules, frequencies, types of vehicle and all other matters pertaining to the control of inter-municipal bus transport in the RMR. The responsibility for control of intra-municipal bus services rests with the individual municipalities, though Recife and Jaboatao have delegated this responsibility to EMTU. In practice, therefore, the bulk of the bus services in RMR are controlled by EMTU, which makes all the effective decisions of a policy nature.

All bus services are provided by private companies. The maintenance of some less unremunerative services (and operators) by internal cross subsidy within the system is facilitated through a clearing house known as the Camara do Compensacao Tarifaria (CCT). Individual operators retain the direct fares that they collect, and the revenues obtained through cashing in of VTs with EMTU. Payments for student concessions go directly to CCT and form a buffer which is then distributed to balance the interests of different operators. The entitlement of each individual operator is calculated by a cost based formula including fixed costs (vehicle depreciation) and variable cost components. The payment is in the form of a price per vehicle kilometer planned, related to the particular fleet operated.

The state and the municipalities will establish a 'Consortium' and will transfer the integrated management and development of all public transport modes to this consortium. 50 per cent plus one of the shares of the consortium will be held by the State, 30 per cent by the municipality of Recife and the rest by the other municipalities in proportion to the magnitude of their participation in the sector. The small vehicles (kombis, VPP) which have operated in a very irregular and uncontrolled way have been driven out of the central municipal area of Recife, while some of the kombis are being integrated into the existing system through regulation and issuing of licenses through a tendering process.

Source: Excerpted from Annex 2 of Gwilliam, Kenneth, 2011. 'Institutions for Urban Transport,' Paper 5 prepared for the NTDP and World Bank. August 10, 2011

the MPC/DPC has made limited progress so far, it is an important and constitutionally legitimized focal point for resolving inter-jurisdictional and macro regional decisions and coordination issues, which have significant investment impact. UT like other large network investment projects can be a strong beneficiary of such an institutionalised and capacitated system. The MPC would inevitably subsume the current Development Authorities.

DEDICATED AUTHORITY FOR URBAN TRANSPORT (MUTA)

The NTDP is fully supportive of the National Urban Transport Policy 2006, that large metropolitan cities with population in excess of one million set up the 'Unified Metropolitan Transport Authority' (UMTA). The MUTAs proposed in this report could be thought of as fulfillment of this mandate. This authority should take care of the connectivity with the surrounding suburbs and region as well. As per the NUTP, the MUTA should not report to the Secretary of Urban Transport in the State Government, but to the MPC/DPC. The UMTAs created till date report to Development Authorities and would need to be re-aligned.

As discussed in Chapter 5, Volume II on Institutions for Transport System Governance, the current UMTAs act more like advisory committees and not as empowered technical decision making and coordinating bodies, more often representing state-level interests than local-level ones.

The NTDP is strongly of the view that this is not a desirable approach and proposes that instead of calling the entity 'Unified', it could be called 'Urban', thereby putting to rest any ambiguity on the reporting/ownership arrangement of this entity. Thereby the 'Metropolitan Urban Transport Authority, (MUTA)' should either report to the MPC/DPC or to an inter-municipal cooperative arrangement created by the urban local bodies involved. Hereafter the mention of the MUTA means the Metropolitan Urban Transport Authority.

The NTDP, in line with the NUTP 2006, envisages the MUTA primarily as a holistic and integrated decision making and coordinating body to bring about

Policy, Planning and Service Co-ordination, to decide on capital financing and long term investments and to monitor implementation. As in the NUTP 2006, the MUTA should be further supported by a professional body that will study and make recommendations on various issues for consideration and decision by MUTA. Rather than have two separate bodies NTDP proposes that MUTA be made into a full time professional body working under a city council with representation from all city agencies and stakeholders including the surrounding region.

The MUTA should undertake all work related to urban mobility in the city. This will include; Strategic and Policy Functions; Regulatory Functions; Integrated planning; Transport Demand Management; Organising services; Providing Common Services; Resolution of day-to-day matters and Monitoring the work assigned to implementing agencies both for the city and the surrounding region. For MUTA to be effective it should be backed by legislation and the entire funding for urban transport should be routed through MUTA. All one million plus cities should have an MUTA and this should be incorporated in an inter-municipal cooperative manner. In large five million plus cities, the MUTA should host its own counterpart to the Office of Transport Strategy (OTS), which would be a dedicated technical-strategy team looking at future plans and responsible for analysing alternative project possibilities and technologies and then undertaking a broad-based consultation exercise to inform decision makers on the options. This function of the OTS could be centralised at the state level for other million plus and smaller cities in the state.

While inter-municipal bodies are common in many countries there are, very few Indian instances. Some can however be witnessed, as in a couple of municipalities north of Mumbai, when a cluster of smaller towns cooperate to run common facilities such as fire stations, joint water source development projects, solid waste management facilities and common urban transport routes/buses.

Operation of bus, rail and other guided transit modes, Bus Priority Schemes, Water transport

Unified Transport Authority: The Case of London

The Greater London Authority is a unitary authority headed by a directly elected mayor. It is responsible for a number of functions including transport, policing, fire and emergency planning, economic development, land use planning, culture, environment, and health.

Within the transport sector the Mayor is responsible not only for public transport but also for the major road system and for traffic management and parking policy. By combining these functions he is able to formulate transport policy on a comprehensive and strategic basis, integrating the traffic and public transport functions and determining the priorities for expenditure in the sector. The Mayor sets bus, underground and taxi fares, and determines how much money is available for procuring tendered services. He might thus be regarded as a one-man elected Transport Authority.

While key strategic powers rest with the Mayor, operational responsibility lies with Transport for London (TfL), which is accountable to the Mayor and responsible for delivering an integrated and sustainable 'Mayor's Transport Strategy'. The Strategy covers all modes for which TfL has responsibility including buses, metro, roads, walking, cycling, freight and water transport. Although not responsible for sub-urban rail, the Strategy promotes a policy of partnership with the responsible agency.

In addition to the Strategy, Transport for London (TfL) is responsible for:

- Managing the 580 km network of major roads termed the Transport for London Road Network (TLRN)
- Managing/operating/owning all traffic signals (about 4800 installations)
- Managing London Buses through London Bus Services Ltd which regulates the service (provided by over some 3730 kms of bus routes), contracts the routes to the private sector (operating some 7000+ buses); TfL provides and owns infrastructure (stops, terminals) and finances on-road bus priority (currently 1000 bus lanes totalling 240+ kms) on both its own TLRN roads and Borough (2nd tier authority) roads
- Managing London Underground (the metro system)
- Managing/operating/owning some lesser public transport services such as London River Services, Trams (28km), and Docklands Light Rail (26km).

The Mayor obtains funds partly from transfers from the central government, partly from local taxation and partly from the congestion charge road-pricing scheme. The level of subsidy has varied greatly over the last two decades. From covering less than 50 per cent of costs from the farebox in the early 1980s, after the introduction of competitive tendering of services from private sector suppliers the deficit was reduced to nearly zero by 1998. Since then, a political decision to increase the quality of service, while keeping fares down has resulted in the deficit rising to about 40 per cent.

Source: Institutions for Urban Transport, Ken Gwilliam, August 2011

etc. are often entrusted to specialist agencies. This should continue. Construction of infrastructure, operation and maintenance thereafter will be by the relevant agency. Permits for stage carriage operation including para-transit should be issued only as approved by MUTA.

To enable the proposed institutional framework to deliver, it must be provided with adequate means and authority. The best way of imparting the desired strength to institutional framework essentially MUTA is to give it the authority for allocation of funds to various agencies in the city to undertake various UT-related activities. The performance of MUTA can be measured in terms of parameters such

as the travel speed and the level of air pollution in the city. Thus the aim should be to have an authority with full powers, but which should be accountable. The mandating of this format of the MUTA needs to be part of any new model legislation on UT developed by the Central Government.

International experience offers two broad lessons for building strong metropolitan transport authorities: first, funding is necessary to create convening power and the ability to motivate coordination across stakeholders; and second, other than access to funding, there is no one best answer for institutional form to ensure coordination.

There is no 'best practice' strategy for urban transport planning, in part because it is intertwined with other aspects of urban governance. Institutional frameworks can and do take many forms. The case studies summarised in Boxes throughout this report outline a wide range of institutional possibilities, starting with three levels of metropolitan transport coordination. Transport can be part of the duties of a metropolitan-level government, a special-purpose metropolitan-level transport agency that coordinates the systems for a number of city/suburb-level governments in an urban agglomeration, or a public transport authority focused on a public transport system operating on and alongside the infrastructure for private motorised /non-motorised transportation. The legal forms of institutions also vary, with some created by national law, others by state law, and some by voluntary association between municipalities. The organisational structures also vary from being a committee of the municipal government, independent agencies reporting to political appointees of local and in a few cases national government, or companies managed by a board representing stakeholders. It is difficult to rank the varying arrangements' performance given variation in their purposes, institutional context, and limited data.

THE IMPORTANCE OF MUTA FINANCIAL AUTONOMY AND AUTHORITY

The saga of the United States Metropolitan Planning Organisations (MPOs) (Box 5.18) is a particularly well-documented case of the timeframe for developing metropolitan planning organisations. It took five decades and at least three significant pieces of federal legislation in a context with otherwise strong city governments to get to the point where MPOs appear to be able to fight for their own institutional place as representatives of regional interests rather than subsidiaries of state governments in UT planning. It is useful to discuss the experience of these organisations in some detail.

Australia's efforts to integrate transportation illustrate what can happen when the 'integrating agency' does not have its own financial authority. Well-funded road-building departments were simply renamed and merged with lesser-funded agencies. The result: 'the power imbalance within the public service has tended to bias any attempt at 'integration' of transport planning, which invariably came to mean a balance strongly in favour of roads.'

The Lagos Metropolitan Area Transport Authority (LAMATA), an accelerated 'big bang' version of institutional reform for specific metropolitan emergencies, was also centred on creating a new agency with the power to direct investments. The LAMATA Law was signed in January 2002, and the corporate body charged with overseeing all aspects of metropolitan transport planning, from traffic management to public transport was launched in 2003. The

independent 13-member Board of Directors comprises representatives of transport operators, transport unions in Lagos state, the organised private sector, the general public, local government areas, and transport related LSG agencies, with a full time Managing Director/Chief Executive Officer (MD/CEO). It functions as a corporation, with private sector levels of pay and open recruitment. LAMATA has the power to levy and collect user charges as well as tariffs, fees, and road taxes approved by the Governor, but also relies on the World Bank for 40 per cent of its funding (and 80 per cent when started). According to Gwilliam (2011), 'LAMATA has already been successful in (a) preparing a strategic long-term plan for the transport sector in Lagos; (b) coordinating activities of the multiple agencies involved in the sector; (c) rationalising motor vehicle tax administration, resulting in a substantial increase in revenues; (d) maintaining, upgrading, and rehabilitating 632 km of the declared road network; (e) implementing a pilot Bus Rapid Transit (BRT) 'Lite' system from Mile 12 to Church Missionary Society (CMS); and (f) most important, changing the attitude among users towards bus transport system.' It is not clear how widely applicable or scalable this model would be, nor is there substantial documentation of its successes and failures.

OTHER EXISTING AGENCIES

Existing agencies managing various components of urban transport will continue to be a part of the institutional framework as the third level in the cities for executing works as per the prioritised programme approved by the MUTA. The professional skill with existing agencies in implementation and operation will be much needed. It is important that the large number of agencies presently involved do not feel left out. The respective city agency will be responsible for maintenance of assets as well.

STATE GOVERNMENT

UT is intertwined with urban development which is primarily a state subject and hence the State Government should play a pro-active role in the growth of UT facilities in its cities. It should create a separate department to deal with UT within the urban development or municipal administration departments. The State Government should lay down policies, administer laws, rules and regulations, organise education and enforcement and allot funds to cities on a pre-determined basis. It should assist the cities with guidelines and manuals to plan and provide sustainable urban transport.

The regulatory functions of licensing, vehicle inspection and enforcement may continue with the Transport Commissioner. All other functions related to planning and provision of services in the city should be looked after by the department of urban transport.

Box 5.18

Metropolitan Planning Organisations

The United States' Metropolitan Planning Organisations, today one of the more powerful local-level transport agencies in the world, came about when the Federal Highway Act (1962) required urban areas with population of more than 50,000 to form an MPO. These were advisory bodies in the early years; charged with representing metropolitan concerns in a 'continuous, comprehensive, and cooperative' planning framework but without the financial authority to transform these concerns into investments. They were nominally distinct from state governments, but state governments often sat on the consultative committees and staffed the technical agencies that supported MPO analysis. In some cases the MPOs effectively acted as administrative subdivisions of the state departments of transportation (DOT). The MPOs appeared to be an after-thought to put a technocratic gloss on the political decision to include substantial funding for urban highways in the Federal Aid Highways Act of 1956.

Thirty years later, as national focus on the interstate system subsided and the challenges of connecting urban nodes into the national grid became more apparent, the national government passed legislation to strengthen the MPOs. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) reorganised the legal basis for MPOs to make state agencies stakeholders rather than advisees. The federal government began to provide significant transportation funding directly to MPOs, along with making their function and powers more uniform across metros. A fifth of ISTEA funds, or more than \$9 billion of Surface Transport Programme funds, were to be spent by 137 of the larger MPOs covering populations of 200,000 or more. ISTEA also tasked MPOs with new responsibilities: to make sure that the metropolitan transport plans were fiscally consistent (could be paid for with funds that were likely to come in) and to run mandatory participatory processes for public and private stakeholders. Large MPOs were required to include representatives of local and state government as well as heads of transport system on their policy-setting boards. The legislation requires the MPOs' Transport Improvement Plans (TIP) to be included in the state's TIP without modification, though the states do have some discretion about how to allocate some parts of federal transport aid across jurisdictions.

The federal government re-affirmed the MPOs' position in the Transportation Equity Act for the 21st Century (TEA-21), providing more funding and new responsibilities for MPOs. The federal re-affirmation of the strong MPO seemed to help tip the scales toward MPOs, though an 2002 evaluation of six large MPOs found that the relationship between the MPO and state Department of Transport (formerly the dominant sub-national transport entity) varied and that the perceived quality of the relationship was correlated with the perceived extent of the performance on meeting long-run transport needs.

The power to determine how federal funding was spent was clearly a turning point for U.S. MPOs. The 1991 transfer of federal funding to MPOs was not a trivial change; it was the first time that federal gas tax revenues were transferred to any sub-national entity other than state transportation departments. Still, legislative empowerment did not immediately transform MPOs' actual ability to pull stakeholders including state government departments together. While ISTEA placed MPOs in charge of developing transportation plans and gave them new financial powers, it directed them to work 'in cooperation' with their state governments without specifying the details of 'cooperation.' Many states resisted.

Available evidence from the literature and our own research suggest that MPOs and state DOTs are only now beginning to discover how to make their new relationship operate effectively. As recently as 1995, MPOs generally gave poor ratings (an average of 3.07 on a scale of 1 to 10) to their relationships with state DOTs (Gage and McDowell 1995, 148-149). Well into the mid-1990s, some states continued to resist granting MPOs their full statutory role in the transportation planning process, either by refusing to allocate federal funds to them or by dominating voting power within them (GAO 1996, 25). In five states, including Virginia and North Carolina, governors delegated veto power over MPO decisions to their state DOTs, effectively undermining MPO authority (Prendergast 1994, 41). The New York State DOT directly controlled the staff of the New York Metropolitan Transportation Commission, hampering the regional agency's ability to operate Metropolitan Planning Partnerships independently, reducing the full participation of local officials, and preventing the agency from taking a true leadership role in its region (Lyons 1996b, 9-11). In several other cases (e.g. Milwaukee), MPOs have been given only partial project selection authority.

Tensions between states and MPOs on procedural matters continue: MPOs are supposed to develop plans to respond to air quality mandates, but the state actually compiles the full investment plans and determines what gets into the plan for meeting attainment goals. This has led to solutions that the MPO sees as ineffective for air quality and bad for transportation, while the air quality agencies feel that the MPO is not open enough about its plans as they are being formed and might be revised.

Today's MPOs, however, are significantly anchored in municipal government, with 42 per cent of the board seats held by municipal elected officials. Nearly all have legal and fiscal powers independent of the state departments of transport, though many are intertwined with regional councils of government or municipal governments. Still, the Association of American MPOs (AMPO) (www.ampo.org) continues to argue for more powers and funding to be devolved to MPOs from states. MPOs are responsible for large pools of federal money, but they do not have formal powers to coordinate or obtain information or plans or otherwise link to state agencies in order to fulfill their mandate. They have no taxation powers.

With respect to traffic safety the establishment of a high level, multi-agency working group, generating comprehensive safety programmes, has led to very significant and rapid improvements in road safety in cities as widely spread as Melbourne, Durban, and Brasilia. A board should be set up in each state to deal with safety issues in a comprehensive manner.

CENTRAL GOVERNMENT

The Ministry of Urban Development is the nodal ministry for urban transport at the centre. Two joint secretary level posts with some support staff are currently functional in the Ministry. NTDPC proposes that this UT department gets strengthened with a strong technical unit and data cell. As and when a new Ministry of Transport is developed, the UT department in the Ministry of Urban Development would focus on advising the Ministry of Transport on urban transport issues and their linkages with broader urban development goals. This integration of UT with broader transport strategy responsibilities is consistent with international practice.

The Central Government should lay down a national policy framework for urban transport; enact laws as required to uphold this framework; draft regulations and lay down planning standards and norms for national common standards (without restricting local operational efforts to achieve these outcomes); prepare guidelines and manuals including those for private sector participation; design, install and maintain standards for a common national database built from state and metropolitan databases; disseminate data; promote research in UT including safety issues; and organise capacity building.

Another important role for the Central Government is to supplement the financial support provided by

states to cities on a pre-determined basis to enable them to plan and coordinate the implementation of major infrastructure augmentation schemes including bus and rail transit. Such funding should be designed to focus on incentives on outcomes while remaining technology-neutral for approach to urban mobility. In addition, the Central Government may help with the setting up of an effective institutional framework across states and cities.

LEGISLATION

There is no single legislation at present that covers the requirements of UT comprehensively. Urban transport will inevitably be influenced by a number of Acts, ranging from the Motor Vehicles act addressing vehicle licensing to the Air (Prevention and Control of Pollution) Act addressing ambient air standards and forming the basis for emissions controls, to frameworks for public-private partnerships and Acts governing specific modes of transport.

This poses two challenges: First, reworking of technology-specific Acts to ensure that they are coherent in their treatment of how states and cities approach a particular purpose. The Railway Act, Metro Construction Act, and Tramways Act, for example, should be examined and, if needed, amended to be mutually consistent in their treatment of rail-based urban transport. The second challenge concerns ongoing coherence in the policy framework given the many different goals for which laws are enacted.

The Office of Transport Strategy and the national Ministry of Urban Development could be focal points for ongoing research and consultation to identify areas of conflict and suggest resolution.

Too often, decisions are reactive, buffeted by events, and struggling to keep on course. A risk management framework has the potential to quickly transform a city's urban transport management style from reactive to proactive

States may also wish to enact comprehensive Urban Transport Acts addressing system characteristics, liability, pricing, safety, and other aspects. In the current Constitutional setting, however, these would not supercede national policy, so the Ministry of Urban Development would also have to develop an enabling framework for these State Acts.

UT plans have to be implemented over a period of time and hence require continuity. Urban transport however has many characteristics that need to be firmly established and would benefit from a legislation to set aside ambiguity and fragmentation that are negatively impacting the development of the sector in India. Such Acts have been implemented in Eastern Europe and Latin America in the recent past.

IMPROVING IMPLEMENTATION PROCESSES

At the implementation level, there is also a strong need to improve institutional and human capacity. It does not take long for city leaders to run up against challenges of implementation. Implementation currently at the city level is often confined to major roads. In instances where comprehensive plans were actually implemented, the results are not yet available. There is little evidence of effective asset management or performance monitoring.

This poor record can be explained by governments' failure to create processes to translate strategies and plans into operation. These processes are features of sustainable cities. Putting them in place does not require more effort per se but rather more effective effort. To achieve that, authorities need to manage cities and plan transport strategies and projects proactively. To do this, planners must analyse and manage strategic risk.

Too often, the sector decisions are reactive, buffeted by events, and struggling to keep on course. A risk management framework has the potential to quickly transform a city's UT management style from reactive to proactive. To make projects more adaptable, and suitable for the future, planners should create a technically sound strategy that has robust performance in the uncertain future and enjoys stakeholder support. To formulate coherent plans, to identify and develop effective projects and policies, and to manage the transport system proactively, one must employ strategic processes. Along with this, a transport asset and performance management process

also needs to be adopted at the city level, wherein processes should facilitate the proactive management of the city's transport system and should create pressure for improvements, due to fair performance assessment and monitoring (eg. Box 5.19 for the city of London).

Transport systems comprise valuable assets such as roads and equipment, which deteriorate and require investments for their maintenance, upgrading, or replacement. Politicians and city authorities of most cities ignore this responsibility, seeming to find new projects more appealing than the mundane management of the city's asset base. For this reason, asset management is often an 'elephant in the room.' Actors fail to recognise that the good functioning of the public and private transport system depends on well-managed transport assets without which the city would cease to function.

CAPACITY BUILDING

The second important requirement besides institutional clarity and a clear legislative framework, in meeting the challenge of sustainable urban transport, is to improve the skills, knowledge and capacity of decision makers and implementers at the city and state levels. Unfortunately the capability for undertaking a coordinated approach addressing the issues involved is lacking at the State Government and City level. There is an urgent need for capacity building; both institutional and individual.

Individual capacity building should be in two parts; city officials and university-educated professionals. The focus of training for existing city officials should be to develop awareness, skills and a deeper understanding of the requisite issues in urban transport. The focus of the education component should be to create a pool of skilled manpower to be available in the country for recruitment by various organisations engaged in UT. Alumni from such training programmes should be potential recruits for State Transport Corporations, State Transport Departments, municipal bodies etc. Simultaneously State Governments should be encouraged to create a cadre of urban transport professionals and create jobs for such professionals.

The Ministry of Urban Development, Government of India has initiated the establishment of centres of excellence, which are expected to create new knowledge and train UT professionals. Based on the success of this initiative the MOUD is keen to set up more such centres. These centres are important precursors to stronger MUTAs, enabling urban areas to build up expert groups with roots in the local context.

These should be aided by incentives from the Ministry of Human Resources Development along with

Box 5.19

City of London Performance Indicators

Every local authority in the United Kingdom is required to produce an annual monitoring report that charts its progress in achieving the policy objectives of its local plan. Objectives cover business development, housing, air quality, parking, and other aspects of civic life. Quantified performance indicators are identified for monitoring purposes and the results are made public to allow comparison between authorities. This creates pressure for improved performance. The City of London goes to great lengths to market its performance as a way of attracting foreign investment and to help ensure future prosperity.

Source: www.cityoflondon.gov.uk/Corporation/LG_NL_Services/Council_and_democracy/Performance/Council-performance_indicators.htm, accessed on 21st June 2011

financial outlays from the MOUD, for creation of new faculty positions and provision of research scholarships. Alongside this the curriculum in universities should be reviewed from time to time to ensure that the graduating professionals, have imbibed the most modern knowledge base, such as planning and design of BRT, facilities for NMT etc, in the current context.

A concerted effort is also needed to upgrade skills in the sector. Currently, most planning is done by consulting agencies appointed by cities. It now appears that neither do the consultants always have the desired level of skill in the assigned task nor do the cities have the necessary skills to supervise and monitor the work of the consultant. A compulsory system of certifying experts to handle specific tasks perhaps needs to be introduced. Capacity building is an ongoing need and hence should be institutionalised.

The MOUD has launched a comprehensive scheme for capacity building for UT. It involves the following 10 activities:

- Training
- Education; Development of curriculum and faculty development of academic Institutes
- Dissemination of information—Conferences and Journals
- Development of legal and administrative frameworks
- Development of manuals, codes and standards
- Development and strengthening of Institute of Urban Transport (India), a national level institute for, training, coordinating research and dissemination of information
- Development of a National database
- Promotion of National level consultancy organisations to provide a pool of professional manpower to assist state/city governments
- Setting up of institutions for the Research and Design; and safety certification of externally

guided rail-based transit systems and other new systems that may be developed for urban transport

- Setting up of Unified Metropolitan Transport Authority (UMTA) and Urban Transport Cell in various mission cities.

This scheme is consistent with the institutional development outlined here, though the new UMTAs should be created along the lines of the MUTAs discussed here rather than as additional consultative committees.

This scheme should be run for a few years and then pursued based on its effectiveness. Presently UT is not the responsibility of any dedicated organisation in a city or state. UT professionals are generally not employed by transportation agencies which are essentially staffed by administrators. There is a general lack of UT skills amongst city/state officials of other departments involved in urban transport. For the training and skill building programme to be beneficial, states should be mandated to immediately constitute a dedicated agency for UT in each city with a million plus population and at the state level, create a cadre of UT professionals. States should also identify officials to be appointed to these agencies, send them for training and on return post them to these agencies/departments.

RECRUITMENT AND RETENTION OF PROFESSIONAL STAFF

Recruitment and retention of trained UT professionals in various cities is essential. The main reason for lack of professional skill in cities is that the few UT professionals today do not have career growth prospects in states/cities. Institutional framework must therefore be such that the professionals get their due place in the scheme of things in the city and are offered reasonable career prospects.

Recruitment and retention of trained urban transport professionals in various cities is essential. The main reason for lack of professional skill in cities is that the few UT professionals today do not have career growth prospects in states/cities

It is proposed that the states create a new state cadre of UT professionals to be posted to various cities and managed by the UT group within the Office of Transport Strategy). These professionals would also be eligible to rotate through the UT group at the Ministry of Urban Development and Ministry of Transport (when formed).

KNOWLEDGE MANAGEMENT AND DATABASE

The virtual lack of a database has severely constrained the ability to formulate sound UT policies and plans and reliably assess the impact of different initiatives that have been taken. Action has been initiated by MOUD to set up a 'Knowledge Management and Database Centre' (KMC) with the support of some external funding agencies, but the efforts in this area need to be scaled up. The NUTP has recommended the setting up of a national level institute to build up a database and be a national store house for all UT sector related data and information. Similar database centres should be set up by state governments and large cities as well. These data centres are another precursor to building metropolitan capacity and integrated decision-making—they create a common understanding of the challenge.

This KMC at the national as well as state levels should have a full fledged library and a publishing wing. The library will include not only Books but also National and International Journals and Periodicals, Project Reports, Study Reports, Manuals, Tool Kits and all other such material. The library is to provide a single window for accessing relevant text and reference material, particularly by Professionals, Students, Planners and Researchers, with an e-catalogue on its website with appropriate linkages. Data from Masters and PhD thesis work will be channeled into the database. Regular collection of data and information, both from primary and secondary sources to keep the data base and the library at the proposed KMC up-to-date should be institutionalised.

RESEARCH AND DEVELOPMENT AND TECHNOLOGY UPGRADE

Research in UT in India is being undertaken mainly as an academic exercise without any coordination and without trying to match it with the need of the users. Over the last 10 years nearly 1400 research projects on transport have been undertaken by 20

organisations as reported in the CRRI reports. These include 11 research organisations such as CRRI and nine academic institutes. Only about 200 projects relate to urban transport. Research in UT in the country needs to be stepped up urgently in a coordinated manner and its dissemination organised.

INVESTMENT REQUIREMENTS AND FINANCING

The funding requirements for UT is the largest when compared to other urban development and infrastructure services sectors such as water supply, sanitation, waste management etc., including housing. Given that this sector has received meager funding in the past, it is essential that sufficient funds be available if the vision of sustainable UT is to be realised. However, while the funding made available has to be at the scale and size of the requirements providing for adequate funding isn't the only aspect of the financing challenge. Development of an appropriate financing and a sound funding system is central to ensuring that the high levels of funding that flow into this sector result in sustainable outcomes, across the country.

GOALS TO BE ACHIEVED BY THE YEAR 2032

For augmentation of public transport infrastructure goals as framed by the committee are listed below. The order of priority from a national perspective, in which the investments need to happen are in the order laid out below. The first two are essential and need to be prioritised at a nationwide level for safety and security purposes. However as discussed in the above section, these will essentially have to be choices made by each city and taken at the city government level and not imposed by either the Central or state Governments;

1. Creation of an effective institutional and implementation framework as well as capacity building arrangements to manage urban transport and projected investments
2. Walk and cycle lanes to be provided in all 100,000 plus population cities and state capitals
3. Development of organised dense city bus service as per urban bus specifications i.e. Vehicle tracking Systems (VTS) and Passenger Information Systems (PIS) in all 100,000 plus population cities and state capitals
4. As a thumb rule BRTs of approximately 20 km/1 million population in cities with population > 1 million may be needed and investment requirements could be based on this assumption
5. Road network in all 100,000 plus population cities to be completed with missing links and with good surface and drainage
6. Smaller cities starting from 20,000 popula-

- tion should also have organised urban public transport, with the use of para-transit modes
7. Metro rail projects to be planned based on the findings of a comprehensive mobility plan for the city. Initially, to be restricted to cities with 5 million plus population if required. Principle should be the ability of the city to cover all costs through user charges or fiscal costs.
 8. Safety, safety audit and security to be upgraded
 9. Technology to be used for Multimodal integration, Enforcement and traffic management
 10. Suburban rail services to be considered in urban agglomerations with population >4 million.

INVESTMENT REQUIREMENTS

The Working group on Urban Transport constituted under the NTDP (WGUT) has made investment requirement projections for the urban transport sector till the year 2030. The estimates have been developed for three scenarios as listed below:

- Scenario 1: the Business as usual (BAU); which assumes that policies, strategies and trends continue as witnessed currently. The WGUT estimated that if current trends continue an investment of Rs 22.78 trillion, will be required over the next 20 years.
- Scenario 2: The intermediate scenario is a scenario which has been estimated by the WGUT to be in between the desired sustainable scenario and the BAU scenario:- Rs 17 trillion
- Scenario 3: Desired scenario; is the scenario which will be closest to the sustainable urban transport scenario. The estimated investment requirement will be Rs 15 trillion

Average annual outlays are in the range of **Rs 750 billion to Rs 1 trillion** across scenarios.

Investment of the order envisaged in the future far exceeds what has been achieved so far; though, it is difficult to estimate the total expenditure incurred by cities currently. It is very interesting to note that the investment required in the desirable scenario—which is a more environmentally sustainable scenario, is much lower compared to the BAU scenario. However, which scenario India achieves depends on how fast and how effectively various policy interventions needed to achieve the vision for 2030 are implemented. Given that capacities in the sector are currently weak it will take effort and time to scale up the expenditure to required levels. Assuming the intermediate i.e. scenario 2 is achieved, the investment during every five-year period in the next 20 years will be in the range Rs 2, 4, 5 and 6 trillion for each following plan period.

COMPONENT-WISE REQUIREMENT:

As per the WGUT's projections, roads account for the largest share of investments, 70-80 per cent across all scenarios.

- On an average, 10-15,000 km of new streets need to be developed
- Another 10,000 km of road are to be reconstructed
- 20 per cent of estimated expenditure on roads is required for non-motorised vehicles (NMV) and pedestrian facilities

Also, public transport requirements in terms of network and fleet require significant investments (20-30 per cent)

- Although the WGUT has projected that 500 to 700 km of Mass Rapid Transit Network needs to be built every year, this does not appear to be feasible, or even desirable
- To sustain growth 50-60 per cent of trips should be on public transport.
- Buses form the backbone of transport in major cities (30-40 per cent share).
- Tempos/Auto-rickshaws are major modes of public transport especially in many small and medium sized cities. Since about 40 per cent of the urban population will reside in small and medium towns, this mode will continue to play a critical role as public transport provider (5-10 per cent share).
- Rail transit systems are likely to meet about 10-15 per cent of aggregate demand, mainly in mega cities.
- Every year 8-10,000 buses need to be added to take care of replacement needs as well as to accommodate new demand.

Difference in the three scenarios in terms of type of infrastructure and the corresponding investment needs is shown in Table 5.17.

Between the BAU to the desired Sustainable Transport Scenario the use of bus and BRT increases while the use of rail transit decreases. The spending on roads as a percentage of total however seems higher in the sustainable transport scenario, essentially because it also incorporates a range of sub components, aimed at improving the safety and convenience for pedestrians, non-motorised vehicles including cycle-rickshaws.

COMPARISON OF INVESTMENTS REQUIREMENT PROJECTIONS: THREE RECENT STUDIES

Table 5.18 compares the investments projected in Study reports by the McKinsey Global Institute (MGI, 2009), the High Powered Expert Committee (HEPC, 2010) appointed by the MOUD, and the study by the Need Assessment sub-group of the Working group on Urban Transport.

The investments estimated by all three studies/reports are comparable at the aggregate level. However, the MGI study focuses much more on Mass Rapid Transit while the HPEC report lays much more emphasis on Urban Roads, both attributing it to the huge backlog. The estimate by the WGUT is more in line with the HPEC projections. Details of the projection methodologies of the two reports are placed in Annex A.

FINANCING FOR NEW INVESTMENTS AND OPERATIONS AND MAINTENANCE

The estimates of investment outlined above need a financing strategy to support them. Given the distribution of taxation powers between the Centre, the states and local Bodies, currently the only viable method of financing the large scale investments required in UT including the establishment of new mass rapid transit infrastructure would be through capital funding support from the Centre (or state) to the cities for new projects, even if such funding can then be serviced over time through user charges and local imports.

The strategy proposed for funding capital cost and operation and maintenance expenses of UT projects is based on a two pronged approach. This consists on developing and promoting a consortium approach in which Centre, state and city, along with various agencies and the private sector participate in co-financing new investments and simultaneously creating robust **urban transport funds at the national, state and city levels.**

The creation of robust national, state and local funds, will ensure that diversity of funding instruments that are used to create sustainable financial structures that can add the requisite level of predictability and confidence to the UT sector. This, along with the use of consortium based funding for large mass transit projects or citywise – citywide, public transport improvement programmes, will also ensure (i) high levels of transparency and accountability around project development and implementation, and (ii) evolving project/programme specific financial structures which are better tailored to the specific requirement of each project and city circumstance. However other than just raising the financial resources required for this system to function well and improve over time, clear affordability parameters, prioritisation principles and expenditure management responsibility and rules would need to be established. This also implies that institutional accountability and authority for UT have to be firmly entrusted to local government's, which have to be strengthened with adequate resources to shoulder this responsibility.

BASIC SOURCES OF FINANCES

Financing of the investment needed for consortium funding will come from six key sources; (i) user charges, (ii) support from national Government, (iii) tax concessions and dedicated levies, (iv) Land Monetization, (v) recovery from non-user beneficiaries and (vi) debt and PPP. These are discussed in detail below.

- i User charges: The main source of direct funds for UT projects are user charges. However, most systems internationally and in India, do not rely on user charges alone. The low levels of affordability of a large section of society in India, alongwith political considerations do not permit full cost recovery through these. However, user charges are the most stable source of revenue for projects and strategies need to be adopted to try and achieve a situation where most of the project costs are met from user charges. User charges are essentially a local government or operator-levied charge and therefore the funds available represent the local contribution in a consortium funding scenario. User charges are often the most predictable revenue source for the project. They should essentially look to at least cover all operation and maintenance expenses related to the project. If this is achieved the quality of services delivered by the system will be free from uncertainties associated with all other financing mechanisms discussed later. However, operating and maintenance losses, when only user charges are taken into account, in public transport services are quite common. This is because user charges cannot be increased indefinitely as there is an optimal limit to them after which the revenue would decrease due to commuters limiting their use of the facility. Also, transportation projects are often planned not as revenue or profit maximising business enterprises, but because of their positive impact on the wider economic, social, environmental and physical landscape, thereby justifying the use of other sources of financing to be used to develop, operate and maintain some elements of the system.
- ii Support from national government is linked with the national budget, hence often unpredictable and inadequate, given the large number of national priorities. Central support can also be designed as schemes funded through the five year plans, such as JNNURM or RAY, though care must be taken to ensure that funding creates strong incentives for UT outcomes rather than approaches. While the JNNURM scheme has been funding urban transport projects in terms of grants, as discussed in an earlier section it is not well-designed for UT projects. Other than this, there is also a strong case that part of the CRF (central road fund

Table 5.17

Percentage Share of Investment Required: Three Scenarios

SCENARIOS	SCN-1	SCN-2	SCN-3
Street Infrastructure	70.08	71.90	78.48
Buses	1.19	1.63	2.00
BRTS Network-km	3.37	4.07	3.95
Rail Transit-km	23.74	19.77	12.25
Depot	0.51	0.74	0.86
Terminals	0.29	0.50	0.65
Workshops	0.08	0.13	0.15
ITS &ATC	0.42	0.72	0.95
Parking	0.29	0.50	0.65
Capacity Building	0.03	0.05	0.06
Grand Total	100	100	100

should also become available for UT projects. Given that the CRF has already been used to fund the construction of national highways, **it is recommended that going forward the primary application of this fund could be for UT** as the CRF's primary revenue source is a surcharge on petrol and about 80 per cent of petrol is used in urban areas.

Additional funding has to be generated from the last four sources.

- iii Tax concessions and dedicated levies: Tax concessions in India potentially reduce the funding requirements by nearly 20 per cent at the project cost level. This would be part of all national, state and local projects on which taxes are being foregone.

Central and state taxes constitute up to 15 per cent of the cost in rail transit projects and up to 19 per cent in the case of buses³⁵. Since public transport is a social necessity, it should not be treated as a business venture. In the case of Delhi Metro, remission of taxes was extended for Phase-I and Phase-II of the project. To improve the financial viability of public

transport, Central and state taxes concessions should be extended to all public transport systems at least for the next 10 to 15 years, by which time public transport will become the preferred mode of transport. These tax and duty remissions should be extended to projects undertaken by the private sector as well.

Subsidy in the form of cheaper electricity, etc can also be justified if public transport and intermediate public transport are not treated as commercial activities and accordingly, revenue generating activities. The fact is that these are social services and need to be viewed differently with the appreciation that all sections of the population are to be provided with safe, speedy, comfortable modes of public transport at affordable prices.

- iv Land Monetisation: the value created in the proximity zones can be recovered through land monetization; i.e. a 'Betterment Levy' or 'Land Value Tax' or enhanced property tax or grant of development rights. This will be a local body contribution in a consortium funding scenario.

35 NTDP, Working Group on Urban Transport, 2012

Table 5.18

Comparison of Investment Estimates for Urban Transport by Various Committees (2010-2030)

ITEM	MGI	HPEC	WGUT: SPRAWL	WGUT: INTERMEDIARY	WGUT: DESIRED
Urban Roads	8.90	17.29	12.08	9.41	9.17
Transit	17.64	4.49	10.55	7.44	5.56
Others	0.50	0.90	0.15	0.15	0.27
TOTAL	27.04	22.68	22.78	17.00	15.00

- v Recovery from non-user beneficiaries: Dedicated levies can be levied on non-user beneficiaries mainly users of private modes. This revenue source depending on which institution is best placed to capture it could be part of the state or local contribution to a consortium-based funding arrangement.

It is now widely recognised that governments should (for ecological, equity and economic reasons) make a distinction between investments that generate value for public good, and those that generate value for private benefit. The incidental private benefit that accrues to private modes of travel from public investments in infrastructure should be tapped either to recover a portion of the investments or to develop new funds for future investments.

The source of income from private vehicles is through taxes levied on their consumption of fuel. Typically, cities can add taxes or cesses applicable within their jurisdiction, collecting money for use in making improvements to public transport schemes. Congestion pricing, parking fees, fuel taxes and cesses, all have one important feature—they are easy connectors between private use of scarce resources (urban space and fuel) and their application for public use (in transport systems, for pedestrian improvements, bicycle paths, etc). As such, they have considerable acceptance among the public, especially in these days of increasing consciousness about the environmental impacts of human activity.

Another source of funds that has emerged in recent years is carbon credits. However, the overall trading scenario around such credits is full of uncertainty. Effective planning around these trading regimes is complex, and

they cannot be counted upon as consistent sources of revenue and funding.

Annual fees in lieu of lifetime taxes should also be considered for all users alongside public transport projects. There needs to be annual validation of driving license as well as registration certificate; and annual road tax instead of life time road tax. This is as per global practices and can be implemented now with the advent of technology and possibility of payment through the internet and other low cost/effort modes. This move will while improving safety and environmental compliance also enhance government revenues which can then be used to fund other public transport projects.

- vi Commercial Debt and raising initial project cost through PPPs: This is another area which can make available significant resources through institutional credit and capital, in projects, which are well-structured and where the various primary revenue sources are secured and committed. In typical consortium based project finance structures for large projects due to increasing limitations on Government funding, the private sector is being involved. Both the Government and the private partner contribute equity and raise debt for the balance amount. Bilateral soft loans should be tapped and funding from multi-lateral agencies should not be ruled out.

PUBLIC PRIVATE PARTNERSHIP

The experience of PPP has been mixed. One consensus view that emerged was that it may be prudent, to divide public-private partnerships in the transport sector into two phases—one, early-stage PPPs during the establishment of a project (say, during the first five to seven years) to bring in specific expertise pertaining to the creation of infrastructure, and two,

Box 5.20

Financing Urban Transport: Avenues for Local Authority Borrowing

The most critical avenue for sustained financing of urban infrastructure will be domestic credit markets. In designing local credit initiatives to reduce the private sector's perceived risks of financing urban infrastructure and to mobilize domestic resources through domestic capital markets, a number of countries have adopted innovative measures that are some combination of the municipal bonds models of North America and Western Europe with access to long-term savings deposits and government contributions.

These initiatives to help mobilise domestic commercial debt resources for sub-sovereign infrastructure finance include the creation of:

- Quasi-independent municipal credit institutions—such as the Municipal Development Fund in the Philippines, the Municipal Fund for Infrastructure Finance in the Czech Republic, and the Tamil Nadu Urban Development Fund of India—to channel borrowed and grant funds to local governments
- Credit enhancement mechanisms such as the Local Government Units Guarantee Corporation in the Philippines and the Infrastructure Credit Guarantee Fund in the Republic of Korea
- Special purpose vehicles such as the Water and Sanitation Pooled Funds in Tamil Nadu and Karnataka in India to raise finance for small municipalities through bonds, the Investment Fund for Urban Development in Vietnam, and the Urban Development Investment Corporations in China) to manage specific sectors of urban infrastructure in each of the major cities. Using special purpose vehicles as pilot issuers of municipal bonds is being actively considered in China.

Source: Financing Urban Transport, Paper 1-Page 7, Ken Gwilliam, August 2011

for long-term operations, the terms for which can be identified after a running stability has been achieved for the project. While the loan life need not match life of assets and should be left to the market, in the case of megaprojects, if longer loan repayment periods can be worked out, it could become more viable.

BOT finds extensive application in transport infrastructure projects. In the BOT framework, a public administration or any institution, which does not have adequate capabilities, resources or inclination to raise resources, execute and manage large projects by itself, delegates to a private sector entity, to design and build infrastructure and to operate and maintain these facilities for a certain period.

In general, a project is financially viable for the private entity if the revenues generated by the project cover its cost and provide sufficient return on investment. On the other hand, the viability of the project for the host government/institution depends on its efficiency in comparison with the economics of financing the project with public funds/borrowings. Other factors like, the expertise and efficiency that the private entity is expected to bring, as well as the risk transfer could warrant a BOT Model.

NATIONAL, STATE, AND LOCAL URBAN TRANS-

PORT FUNDS

The second component of the financing strategy recommended is the creation of urban transport funds at the three tiers of government, which capture resources from the mechanisms described above along with enhancing fund availability through a few suggested sources, as described below.

Since there are huge investment needs for urban transport and competing demands for resources on the budgets of the Central and state Governments, traditional budgetary sources alone will not be adequate. The NTDPC recommends that new innovative financing mechanisms are put in place. Learning from the global examples, dedicated (non-lapsable and non-fungible) Urban Transport Funds (UTFs) should be set up at National, State and City levels. A National Fund has already been envisaged in NUTP, 2006. The UTFs, apart from meeting capital needs, may also be required to cater to certain operational needs of large infrastructure projects. The UTFs should be funded in a robust manner by implementing the following measures:³⁶

- **Levy of a Green Cess of Rs 2 per litre on petrol sold across the country:** the rationale here is that petrol is consumed exclusively by personalised vehicles. A Green Cess on diesel is not recommended because of multiple

36. This funding mechanism for augmenting the resources for the urban sector has been recommended both by the NTDPC Working Group and by Planning Commission's Working Group on Urban Transport for 12th Five Year Plan.

Box 5.21

Land Based Financing of Urban Transport : Public Sector Joint Venture

An alternative to the Central government corporation is the creation of a joint venture between Central government and the conurbation or municipal authority which is to be relieved by the overflow. Orestad in Denmark is a good example of this approach. Orestad is a new town outside Copenhagen connected to central Copenhagen by a 22-km automated metro serving 60 million passengers a year, which began operations in 2003. It was planned, developed, and financed through such a joint venture between central and municipal government. The government provided land amounting to 45 per cent of the 310-hectare site. Copenhagen owned and contributed the other 55 per cent of land. The two partners share ownership of the developer, Orestad Corporation, in proportion to their contributions of land. Both the infrastructure development for the new town and construction of the metro line are being financed primarily through land sales.

Orestad's development plan called for early construction of the metro line and phased development of six town centres within the overall development site. As a consequence, infrastructure and metro investment has been financed by commercial rate borrowing. At the end of fiscal 2006, total debt stood at Dkr 13.7 billion, or \$2.75 billion. The debt is being repaid primarily through land sales, supplemented by property taxes on new construction. While land market development was slower than expected, and metro construction was delayed, both land prices and land sales accelerated rapidly as development proceeded and commercial occupancy began. The Orestad Corporation now projects that all borrowing will be repaid ahead of schedule and that all infrastructure and metro construction will be financed, as planned, without government subsidy beyond the land contributions

Source: Financing Urban Transport, Paper 1-Page 9, Ken Gwilliam, August 2011

Box 5.22

Rail Mass Transit: Operations and Maintenance-Earmarked Local Taxes

Rail mass transit systems are usually loss-making. This is not necessarily a reason not to have them if they generate substantial external benefits in terms of reduced congestion and air pollution. But it does raise problems of finance for the responsible authority.

The grant of taxing powers to local authorities can still be used in a very purposeful way if earmarked and conditional on specified behaviour by the subsidiary bodies. The most striking example of this is the French 'versement transport'. Introduced in July 1971 and only applied as mandatory levy in the Paris region, the 'versement transport' payment of transportation (VT) has been successively extended, at the option of the authorities, to the transport authorities of any urban area of at least 10,000 inhabitants which chooses to identify an urban perimeter and introduce a transport organising authority. The VT must be paid by any employer of more than nine employees, except for foundations and non-profit associations whose activities are of social character. Employers who either house their workers or directly provide transport for the journey to work are also exempt. Ceiling rates are still fixed by the law outside the Ile-de-France, though the transit authority is free to set rates below the ceiling. The highest rates are in the Ile de France, where the tax is as high as 2.6 per cent in Paris and the Hauts de Seine, though lower in the outer departments. In 2008 the VT accounted for 35 per cent of the total revenue of the Ile de France transport authority STIF

Source: Financing Urban Transport, Paper 1-Page 22, Ken Gwilliam, August 2011

uses of diesel and the problems anticipated in segregating diesel sold for personalised vehicles. However, we may need to reconsider this position if a significant fraction of personal vehicles start using diesel. The estimated collection ³⁷of green cess from petrol in the base year is Rs 31 billion and over the period of first four years is Rs 140 Billion.

- **Levy of a Green Cess on existing Personalised Vehicles:** All vehicles in India are required to be insured every year. There are several public and private sector enterprises in India which provides insurance to the vehicles at the rate of 3 per cent of the annual insured value both for car and two wheelers. It is proposed that an additional 4 percent of the vehicle's insured value shall be collected as Green Cess. It is estimated that during the first year the revenue collection will be Rs 180 billion and the collection over first four years will total to Rs 832 billion. For ease of collection, the annual cess will be collected through insurance companies. Insurance companies would return 4 per cent of insured value to the government to be put in the dedicated fund;
- **Levy of a Transport Cess on Purchase of New Cars and Two Wheelers:** at 7.5 per cent of the total cost of the petrol vehicles and 20 per cent in case personalised diesel cars. In case of diesel cars, the transport cess has been recommended at 20 per cent as diesel is available at substantially subsidised price and will continue to be so in near future. The matter of levy of differential rates of cess on diesel and petrol vehicles³⁹ can be reconsidered when the control on diesel prices is lifted. The estimated collection from this cess is Rs 180 billion in the first year and Rs 888 billion over the first four years.

A fixed proportion (say, 70 per cent or as presented in Annex B) of the resources generated by the above levies, as decided by the Central Government, should be earmarked for UT, and the remaining may be utilised for developing infrastructure for rural³⁸ transport. These levies will not only help in generating a dedicated pool of resources for taking up urban transport projects but would also serve as a significant disincentive for use of personalised vehicles, as part of the overall strategy for demand management. This will serve the twin purpose of providing quality public transport infrastructure and services at affordable cost and reducing congestion and curtailling travel demand on account of use of personalised vehicles. All the above revenue sources have a

high impact and high feasibility in terms of annual accrual to the urban transport funds.

At a time when the exchequer faces the dilemma of meeting ever growing demand from various sectors amidst constrained government sources of finances and in an environment where PPP can only marginally meet the financing needs of urban transport, the proposed UTFs present themselves as an effective means for funding urban transport investments. In fact, the actual potential of these sources is much higher than the present yields. **The total estimated** yield from these three sources is Rs 400 billion in the first year; it adds up to Rs 1860 billion in first four years and reaches Rs 22 trillion in 20 years. Detailed calculations and assumptions made are listed in Annex B. These estimates reflect the total availability of transport funds through these levies. As proposed above, a part of these funds could be earmarked for rural transport, and the rest would then go for urban areas.

This report has argued that responsibility for UT should essentially rest at the state and city levels. In the case of large cities with population of over 1 million, this should essentially be at the city level, whereas state governments would need to be responsible for the policies and organisation of urban transport in other towns and cities within their respective states. Consistent with this general proposition of decentralisation of responsibilities for UT, arrangements would need to be made so that UT funds thus collected devolve appropriately to the state and city levels.

Two components of the cesses proposed above, i.e. the cess on petrol and green cess on existing personalised vehicles, would need to be levied and collected by the Central Government⁴⁰. Adequate provisions would have to be made in the budgetary process for the collection and distribution of these components. Until such time as the unified Ministry of Transport, as recommended by the NTDPCC is set up, the Ministry of Urban Development could function as the nodal Ministry.

The third component of the cesses proposed above, i.e. the transport cess on purchase of new cars and two wheelers, could be levied by the Central Government and collected by the state governments along with VAT at the time of sale of such vehicles.

The devolution of these resources to the state and city level UTFs should be on an entitlement basis and not at the discretion of the central government. The NTDPCC recommends that this proposal may be examined by the Finance Commissions, preferably

³⁷ The number of diesel cars has been assumed to be 30 per cent of the total cars as against 35 per cent of the present annual sales.

³⁸ For example, these funds can help in augmenting the resources available for construction of rural roads.

³⁹ As per news reports, in Nov 2012 the Supreme Court had asked for Government's response on an application that, on the basis of 'polluter-pays' principle, inter-alia asked for imposition of various taxes/charges on vehicles – including imposition of a levy on purchase of diesel cars, and an annual levy on private vehicles in the National Capital Region.

⁴⁰ In May 2013, the Goa State enacted 'The Goa cess on Products and Substances Causing Pollution (Green Cess) Act 2013' that allowed a cess of up to 2% to be levied on certain products/substances – including petroleum products – causing pollution. The objective of this legislation is to reduce pollution and the proceeds of the green cess shall be used for undertaking measures to reduce the carbon footprint. Even though a State Act has imposed the 'green cess' in this case, we recommend that Central Government legislate on this matter for the sake of uniformity of taxation structure and for administrative convenience.

beginning with the 14th Finance Commission, with a view to devising a robust framework for (a) division of total pool of available resources from the three levies between the urban sector funds (national, state, and city), and the rural sector (b) division of the available urban sector funds between the one national-level fund, various state-level funds, and various city-level funds, in a manner similar to the provisions for tax devolution to state governments that is normally proposed by the Finance Commission.

As proposed, the UTFs would be maintained at three levels – national, state, and metropolitan areas. The proposed national and state-level Offices of Transport Strategy and MUTA should, in due course, administer these funds respectively. Until such time these offices/agencies are set up, the nodal ministries/departments dealing with the subject of urban development at the National/State levels and the Municipal Corporations could administer these funds.

The nodal ministries/departments at the national and state level should distribute the funds collected in a timely and transparent manner as per a formula prescribed by the Central Government based on the recommendations of the Finance Commission. After ascertaining the actual collection of cess/surcharge/tax, the nodal ministry should release the funds expeditiously (on a quarterly basis) to MUTAs/municipal corporations (and other organisations) as mandated by the distribution formula. However, until the Finance Commission's recommendations on the matter are received, NTDPCC recommends that at least 70 per cent of the total resources collected from the three levies be earmarked for the urban sector. Further, at least 50 per cent of the total resources earmarked for the urban sector should be transferred⁴¹ to MUTA/municipal corporations, and at least 30 per cent of the total resources earmarked for the urban sector should be transferred to the state governments.

Resources from UTFs maintained at the state level should primarily be used for the transportation needs of smaller urban areas (sub-metropolitan areas). They can also supplement the resources of MUTAs for undertaking large projects. Resources from UTFs maintained at the national level should primarily be utilised for creating infrastructure for training, capacity building, and research activities, and setting up standards for national goals such as safety, efficiency, and environmental impact.

Figure 5.10 Urban Transport Proposed sources of funding

The UTFs at the State and city level could also be supplemented through other sources, like land monetisation, betterment levy, land value tax, enhanced

property tax or grant of development rights, advertisement, employment tax, congestion, a cess on the sales tax, parking charges reflecting the true value of the land, traffic challans etc. A model where the National and State Level Funds also contribute to the city level funds over a period of time would ensure that the urban transport responsibility and accountability is well nested at the city level.

Pimpri-Chinchwad Municipal Corporation has already set up a dedicated UTF through land monetization and advertisement rights. Similarly, Karnataka has set up a dedicated UTF through MRTS cess on petrol and diesel sold in Bangalore which is being used to fund the metro rail projects.

Certain items, like employers' tax, have not been considered here because of their low contribution and difficulties in collection. Similarly, certain demand management measures, like congestion charges, have also not been included because of their small contribution.

AFFORDABILITY, PRIORITISATION AND EXPENDITURE RESPONSIBILITY

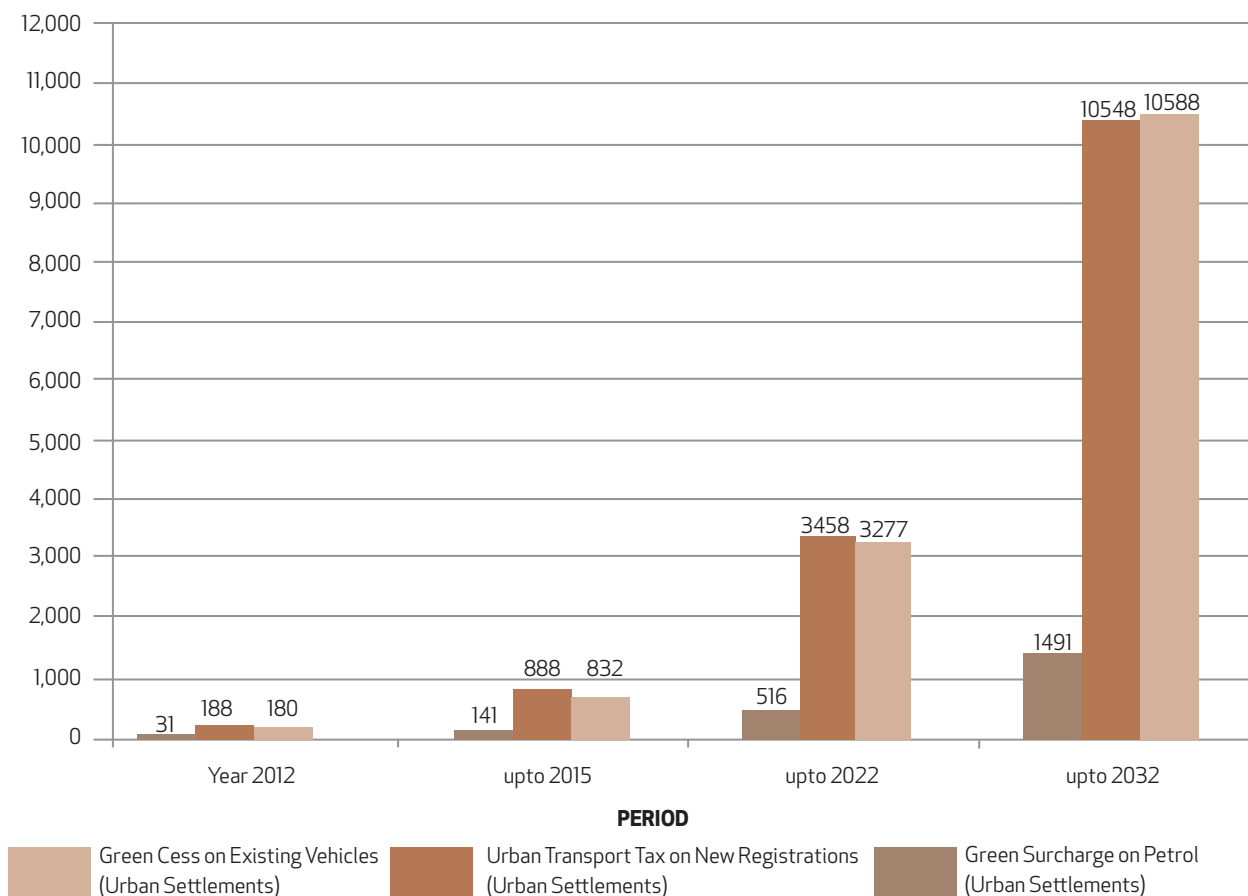
While the funding arrangements and structure recommended above, if implemented, would lead to significant resources for the sector, the full effectiveness and impact of that effort would materialise only if proper policies addressing affordability parameters, prioritisation principles and expenditure management responsibility are established and implemented.

In the current system, a significant portion of funding for mega UT projects comes from the central government. In principle, the municipal corporation and the state government concerned first approve such a project through their own approval systems. It is only after such approvals are obtained that these large projects are posed to the Central Government for funding. In principle, the central government may refuse to fund a project if it is found to be not viable. At present, it insists on an 8 per cent financial internal rate of return (FIRR) for metro projects.

The NTDPCC is of the opinion that these procedures need to be strengthened further so that affordability and local prioritisation concerns are adequately addressed. Over time, it is essential that in large cities, the local bodies should be fully responsible for decisions on large UT projects and need to develop institutional capacity and resources to make such transport decisions over the next 20 years. For projects that need financial support at the national level, an improved institutional framework needs to be evolved, which puts the large cities at the centre of decision making. State governments and municipal corporations should not be incentivised to view cen-

41 A natural method of making the inter-se distribution amongst MUTA/municipal corporations is as per their population recorded in the last decennial census.

Figure 5.10
Urban Transport Proposed Sources of Funding
 (Rs billion)



tral funds as being free leading to projects that may not be sustainable in the medium to long term.

The key consideration for approval of such large projects should be their efficacy in providing urban mobility solutions at the local level, and the ability of the local economy to sustain them over the long term.

Core to the development of the investment requirements and the financing strategy, are the way affordability and investment prioritisation is established. In the JNNURM scheme, there are City Development Plans and Comprehensive Mobility Plans which are drawn up at the local government level and are seen as the primary instrument to establish the priority of the investments required. However, this methodology has proved to be inadequate given that the links between these plans and the projects are weak and remain unimportant since the projects grant based financial structure is predetermined, and do not require consortium based specific tailor made financial structures. With affordability of users and the city in mind, cities and transport agencies need to develop transparent mechanisms to identify activities and projects which are essential while oth-

ers could only be considered important or desirable to be taken up in a medium term horizon. Therefore it is important to define a public sector budget envelope that secures funding for essential activities and projects and only promises funding for other activities and projects.

The expenditure management policies of the UTF at the national level should put in place institutional mechanisms and policies to scrutinise difficult questions before agreeing to fund any proposal. Clear criteria for accepting proposals for funding should be placed transparently upfront. Proposals of funding from the NUTF should have (a) high Impact in terms of actual annual contribution to the NUTF; (b) use Polluters Pay principle; and (c) reduce the use of personal vehicles. Some project-level financing and prioritisation questions could be:- Who pays? How are the payments made? How is the spending being prioritised? and Is there a role for the private sector in financing?—These are all elements that are linked and need to be considered and structured so that the financing system is sustainable. The expenditure management policies of the UTF should be built to ensure that the following overall principles are fulfilled for stability and sustainability of the financing system.

Box 5.23

Affordability and City Management: Manila

In 1982, Manila, created an institutional context that allowed priorities to be determined against available financing. The city developed an investment strategy across all municipal sectors: highways, public transportation, water supply, sewerage and sanitation, garbage disposal, housing, social infrastructure, and others. Working from past expenditures and future prospects, planners identified a set of projects that could and must definitely be financed (the 'core investment' programme) and a second set of projects that could be implemented if additional funds became available (the 'core plus' programme).

Manila used a transparent, comprehensible system to separate unambiguously good from unambiguously bad projects and to classify the remaining projects using objective criteria and different weights for different scenarios. The strategy established the robustness of each project under a range of scenarios and provided a basis for dialogue among government agencies that questioned the rankings. Considerable progress was the result.

Source: Asian Development Bank

- Financing for core public transit activities and projects such as must be secured and financing mechanisms must allow for flexibility to address risks emerging from uncertainty.
- Lessons from cities that have developed sound financing systems, demonstrate that most funds must be obtained from users directly through tolls, charges, fare boxes, etc.
- According to economic principles too, users, other beneficiaries, and polluters should pay for the benefits they receive or for the costs they impose. Taxpayers should only pay when no other practical mechanism exists.
- Financing must be prudent and cost-efficient and credit ratings can reinforce the essential discipline of long-term financial planning.
- When inter-governmental funds are made available, it should be ensured that responsibility clearly lies with the city authorities and that they have a major stake in the development of the system. This prevents cities from competing for free central government funds that distort strategy and undermine good governance.

ROLLING PROGRAMME

A rolling five-year programme which would lead the sector investments has also been suggested. The rolling programme should be adopted alongside the financing strategy to lay out a macro-national-level trajectory for improvements in urban transport. The rolling programme is based on the 'service level bench marks' developed by MOUD and described in an earlier section. The SLBs provide for four levels of service. It is assumed that all cities are at the starting point (when under implementation, a rapid appraisal to establish the true starting points for each city would be desirable) and will move up

one notch every five years up to 2030 through different routes chosen by themselves. Different size cities require different infrastructure. Short and long term actions are required to encourage use of Public Transport and to retain the existing modal share of NMT and walk. The City Mobility Plans are instruments that cities should use to plan to move to the desired and sustainable scenario, in a phased manner. The Rolling Plan is presented in Annex C.

SUMMARY AND CONCLUSIONS

OVERVIEW

The rapid economic growth over the last two decades has entailed a significant structural transformation of the economy away from agriculture and toward more employment in services. At the same time, India's cities have expanded and are likely to grow faster in the future. Urban India has been driving the country's economic growth recently and is expected to contribute 70 per cent of India's GDP by 2030⁴². These are centres of wealth-the per capita income in the largest cities is much higher than the average per capita income of the country as a whole and, in some cases more than double the national average-but they are also intertwined with the national and rural economy through consumption patterns, remittances, and other links. Over the next 20 years, there could be very significant variations in affordability across cities, thereby affecting and shaping the needs and demands for a desirable urban transport system, based on city size, category and income.

NTDPC's scope has been spread across a range of issues related to development of comprehensive and sustainable policy for meeting the transport requirements of the country through various modes of

42 India's Urban Awakening, McKinsey, 2009

transport. Each of these modes must respond to the changes in demand of the movement of goods and services in the most integrated and cost effective manner as possible. While looking at the changing nature of demand for transport and the particularities of each mode of transport, urban transport cannot be neglected since more often than not, it accounts for the last mile in any other inter-city transport trip. Urban transport cumulatively, in all country contexts is a significant percentage of the overall transportation trips. It is often productive, but also contributes significantly to congestion, environmental pollution, energy dependence and other social concerns. It is also complex: it is multi-modal by definition and the overall performance of the system depends critically not only the individual components but also their interaction.

Urban transport in India is in need of an overhaul. At present, there is inadequate understanding of, and inconclusive data on, the modal share distribution between these various transport modes, across city types and sizes in India. There is also limited information on the extent of urban freight movement. What is clear, however, is that very few Indian cities currently, have organised, registered and regulated public transport systems. More and more urban residents are relying on personal vehicles and traffic congestion, air pollution, accidents, and fuel use are on the rise as a result.

Attention to urban transport in the past has been sporadic and fragmented. The first explicit statement of interest in urban transport came in the 6th Five Year Plan (1982 – 87), which also mooted the need for a National Urban Transport Policy (NUTP). Despite this early start, a National Urban Transport Policy could be finalised only in 2006, the terminal year of 10th Five Year Plan. The JNNURM has channeled significant investment in transport systems for some of India's largest cities, but much more remains to be done to increase the level and quality of investment. In particular, urban transport policy, planning and investment needs to be more responsive to safety, energy, environment and health concerns. Moreover, attention needs to be focused on the mobility needs of people rather than the facilitation of higher vehicle speeds.

This will require institutional as well as policy change. Authority continues to be divided within and across levels of government. The Ministry of Urban Development is the nodal ministry for policy and planning at the national level for rail-based urban transport whereas all the responsibilities for the technical planning for rail-based UT systems are with the Ministry of Railways⁴³. State governments contribute to UT planning as part of their involvement in urban development authorities and departments of transport. Local governments have a limited role in transport planning but are gener-

ally responsible for maintenance. Multiple agency control, and diffused attention is not conducive to the provision and growth of urban transport along a sustainable path. Rectification of this weakness has become all the more urgent in view of the huge investments projected to be made in this sector.

AVOID, SHIFT AND IMPROVE

Broadly speaking, the recommendations of NTDPC are to build up on an 'avoid, shift, and improve' framework for urban transport:

Avoid: Sustainable transportation is about moving less. In recent times, indiscriminate land use planning and the increasing development of peri-urban areas by businesses and households seeking lower-cost land has forced residents to make greater use of motorised transport. The remedy is judicious land-use planning that reduces residents' need to travel and cuts back on urban sprawl, pollution, and congestion. Mixed land use policies include integrating residential and commercial neighbourhoods and moving away from concepts of strict zoning by activity.

NTDPC is of the view that urban development plans over the next 20 years, should be based on principles that create mixed land use, high density and mixed income neighbourhoods on the basis of persons per hectare and not FSI alone. Integrating land use and urban transport should be driven with the principal that lower income workers should be closer to their employment areas while higher income workers, could afford to travel larger distances for work. The current strategic trend of restricting and pushing out logistics and freight vehicles and interchanges to the outskirts of the city needs to be relooked at for better integrating urban freight to support job creating in cities and improve the vitality of cities.

These aims should be addressed through the appropriate changes in the urban planning norms and should be incorporated into planning standards such as the Urban Development Plan Formulation and Implementation Guidelines (UDPFI) which are followed by planning and development agencies in most states.

Shift, or change modal choice to promote lower fuel consumption per passenger-km and/or freight-km and manage traffic and reduce fuel consumption as well as air pollutants. Indian cities should consider implementation of economic measures to restrain traffic such as parking policies, congestion charging across cordons or within areas, car-sharing schemes and other measures. Where these policies are not possible, cities may consider fuel surcharges along with vehicle license duties that reflect the vehicle's impact on air pollution and other externalities. The net revenues from these measures should be invested

43 Planning Commission, Recommendations of Working Group on Urban Transport for 12th Five Year Plan, Government of India 2011

Broadly speaking, the recommendations of NTDPCC are to build up on an 'Avoid, Shift, and Improve' framework for urban transport

in improving the public transport system to secure acceptance for necessary but unpopular policies.

PUBLIC TRANSPORT

Public transport also needs to improve, through an early integration of bus priority ways, busways, bus rapid transit (BRT), into cities' expansion and development plans would help integrate transport and urban development while maintaining the flexibility to reroute public transport arteries as the city develops. Rail-based metro systems should be considered only for some of the largest cities with more established patterns of residential and commercial development, after careful examination and attention to the opportunity costs of investing in relatively expensive fixed infrastructure.

Dense, integrated public transport is required in our cities. Only such dense MRT (based on buses if they are to be majorly funded by city governments) can support transit in the already dense parts of our cities and can support a shift towards high-density, mixed-use walking and transit-oriented urban environments. As a first step, a city should organise the existing public transport into an integrated network to cover the whole city. These services can be operated by buses of various sizes as appropriate to demand level. Actual ridership will guide adjustments in the capacity needed and to be provided on each route. When the demand level exceeds the capacity of bus services and BRT, other guided MRT modes may be considered. The safety and safety perception of MRT modes is a key factor in its wide-based use and should be a key feature in the design MRT network.

It is equally important that public transport is made high quality and user-friendly so that the commuter uses public transport voluntarily. The most important aspect is multimodal integration: physical integration, network integration, fare integration, information integration and institutional integration. Besides the passenger information display system, integrated ticketing for all modes (common mobility card) and interchange facilities, use of intelligent transport system, facilities for the handicapped, safety and security against hooliganism, vandalism and terrorism, national public transport helpline number are critical to promote public transport and should be a part of planning. It is essential to improve the quality of all types of buses so that they are seen as a high mode of transport.

Improve, or increase the energy efficiency of vehicles and use of efficient and cleaner fuels to decrease

impacts of distances travelled and reduce the greenhouse gas footprint per litre of fuel consumed. Achieving these objectives requires inventive technology, measures to encourage the rapid take-up of that technology, and regulation as well as effective enforcement that controls in-use emissions by ensuring that vehicles are properly maintained.

INTERMEDIATE PUBLIC TRANSPORT

This principle also applies to vehicles used for intermediate public transport in Indian cities; these play an important role in providing mobility to a large section of the population. While a number of safety and convenience factors in these modes need to be improved, they have a potential of providing clean mobility through emissions. Manufacturers should be encouraged to invest in improving the technology of these vehicles by:

- Setting up emission and safety standards under the Motor Vehicles Act.
- Banks and financial institutions providing low interest loans for small scale industry producing these vehicles, and attractive replacement schemes for operators.
- Dedicating 10 per cent of the cess money available with the Ministry of Industry from the transfer of technology for vehicle manufacturing for the improvement of intermediate public transport vehicles.
- Move from a 'closed permit systems' to an 'open permit system', for para-transit/intermediate public transport modes to make public transport more convenient⁴⁴. This regime change should be accompanied with strict training and maintenance norms.

NON-MOTORISED TRANSPORT (NMT)

Priority in planning for modes should focus on improving mobility through non-motorised transport, public transport and para transit, and personal vehicles in that order. Safe facilities for non-motorised transport (NMT) i.e. footpaths and dedicated cycle lanes should be developed on priority basis along with accompanying facilities such as parking booths, drinking water kiosks and street furniture. These should be citywide to assure the commuter that he can complete his journey all the way by walk or bicycle if he so chooses. NMT facilities should become a national norm and get first priority in infrastructure development and funding. Funds allocation for major transport infrastructure should be linked to achieving targets for creating facilities for NMT. The NTDPCC recommends that all cities should be responsible for pedestrian ways and facilities, which should be embedded in a law, linked to targets for improving streets and their maintenance within a period of 10 years.

INSTITUTIONAL FRAMEWORK FOR URBAN TRANSPORT

To pursue this approach, policy makers will need to focus on

- a. **The information and metrics basis for planning, design and operating aspects of urban transport infrastructure, including, especially, a shift to full life cycle accounting.**
- b. **Developing and implementing a strong transport demand management regime leveraging all available policy and administrative tools, and**
- c. **Improving implementation of projects and coordination between investments in the urban transport system.** It is especially important to improve the governance for large projects. The NTDPDC recommends that advanced, international, contemporary instruments such as the LCA framework should be included in the methodology to evaluate and appraise programmes and projects, especially mega projects, before decisions on funding are made.

The institutional framework to deal with this sector is proposed as follows:

ROLE OF STATE AND CITY LEVEL GOVERNMENTS

The primary responsibility for urban transport should lie with state governments. This report has recommended creation of state-level Offices of Transport Strategy which may be the locus for urban transport, in collaboration with agencies for urban development.

States should also enact a comprehensive urban transport law, which sets out the roles and responsibilities of the multiple city and state-level entities with regard to public transport, land use and public transport integration, multi-modal integration, safety, facilities for walk and NMT, etc. A model law can be developed by the Central Government to be then adapted by state governments as felt to be necessary. Over time, urban transport responsibilities should be devolved to metropolitan and city authorities, particularly for India's larger cities of more than 1 million. A three level Organisational set-up is therefore proposed for the city:

- Metropolitan/District planning committee/ inter-municipal cooperative arrangement.
- Dedicated authority for urban transport (MUTA). The NTDPDC in line with the NUTP 2006, envisages the MUTA primarily as a holistic and integrated decision making and coordinating body to bring about Policy, Planning and Service Co-ordination, to decide on capital financing and long term investments and to monitor implementation. As per the NUTP 2006, the MUTA should be supported by a professional body that will study and make recommendations on various issues for consideration and decision by MUTA.

Rather than have two separate bodies NTDPDC proposes that MUTA be made into a full-time professional body working under a city council with representation from all city agencies and stakeholders including the surrounding region.

- Other existing city transport agencies. Existing agencies managing various components of UT will continue to be a part of the institutional framework as the third level in the cities for executing works as per the prioritized programme approved by the MUTA. The professional skill with existing agencies in implementation and operation will be much needed. It is important that the large number of agencies presently involved do not feel left out. The respective city agency will be responsible for maintenance of assets as well.

NTDPDC is of the view that urban development plans over the next 20 years, should be based on principles that create mixed land use, high density and mixed income neighbourhoods on the basis of persons per hectare and not FSI alone

ROLE OF THE CENTRAL GOVERNMENT

The central government will inevitably retain an important role in financing urban infrastructure, given India's fiscal structure. Such funding should be technology-neutral as far as possible, and linked to mobility, access, environmental, and other system outcomes rather than specific approaches to urban transport.

The Central-Government may also play a role as technical advisor while state expertise is being created. This report proposes creation of a national Office of Transport Strategy, which would liaise primarily with the Ministry of Urban Development, and also with Rail, and Road Transport and Highways as needed to generate overarching strategy guidelines.

The central government would be responsible for creating standards for urban transport performance, including safety, environmental impact, and other national goals. The Central Government should lay down a national policy framework for UT; enact laws as required to uphold this framework; draft regulations and lay down planning standards and norms for national common standards (without restricting local operational efforts to achieve these outcomes; prepare guidelines and manuals including those for private sector participation; design, install and maintain standards for a common national data base built from state and metropolitan databases; disseminate data; promote research in UT including safety issues; and organise capacity building.

The central government cannot be directly responsible for UT in each city in a federal set up like India, with a wide diversity of contexts. Central government oversight of UT, other than in setting standards for national goals such as safety, efficiency, and environmental impact as well as public investment management, is inconsistent with international experience as well as economic logic. States are a natural locus for urban transport in India's current circumstances. Larger cities can and should assume the primary responsibility for metropolitan transport as broader urban reforms catch up with constitutional commitments. Cities to which urban transport authority has been devolved must be provided with a strong institutional framework, an effective organisational set-up with a dedicated agency to look after planning, coordination and implementation of UT services, legislation, a resource generation policy and adequacy of skills.

INVESTMENT REQUIREMENT AND FINANCING

The Working group on Urban Transport (NTDPC, 2012) constituted under the NTDPC has made investment requirement projections for the urban transport sector till the year 2030. The estimates have been developed for three scenarios as listed below:

- **Scenario 1:** The Business as usual (BAU) scenario; which assumes that the policies strategies and trends continue as witnessed currently. The WGUT estimated that if current trends continue an investment of Rs 22.78 trillion, will be required over the next 20 years.
- **Scenario 2:** The intermediate scenario is a scenario which has been estimated by the WGUT to be in between the desired sustainable scenario and the business as usual scenario. Investment needed will be Rs 17 trillion.
- **Scenario 3:** Desired scenario; is the scenario which will be closest to the sustainable urban transport scenario, the WGUT has worked out that, the estimated investment requirement in this scenario will be Rs 15 trillion.

Average annual outlays are in the range of Rs 750 billion to Rs 1 trillion across scenarios.

Given the distribution of taxation powers between the Centre, states and local bodies, currently the only viable method of financing the large scale investments required in urban transport including the establishment of new mass rapid transit infrastructure would be through capital funding support from the Centre (or state) to the cities for new projects, even if such funding can then be serviced over time through user charges and local imports.

The strategy proposed for funding capital cost and operation and maintenance expenses of urban transport projects is based on a two pronged approach. It consists on developing and promoting a **consortium approach** in which Centre, state and city, along with various agencies and the private sector, participate in co-financing new investments and simultaneously creating robust **urban transport funds at the national, state and city levels**. This will ensure that a diversity of funding instruments are used to create sustainable financial structures that can add the requisite level of predictability and confidence to the urban transport sector. Financing of the investment needed for consortium funding will come from six key funding sources; (i) user charges, (ii) support from national Government, (iii) tax concessions and dedicated levies, (iv) Land Monetisation, (v) recovery from non-user beneficiaries and (vi) Debt and PPP.

The NTDPC recommends that new innovative financing mechanisms are put in place. Learning from the global examples, dedicated (non lapsable and non-fungible) Urban Transport Funds (UTF) should be set up at the National, State and City levels. The UTFs, apart from meeting capital needs, may also be required to cater support to certain systems during the operations stage. The UTFs should be funded in a robust manner as per the suggestions below:

- **A Green Surcharge of Rs 2 on petrol sold across the country:** The rationale behind the fact that petrol is consumed exclusively by personalised vehicles.
- **A Green Cess on existing Personalised Vehicles:** At the rate of 4 per cent of the annual insured value both for car and two wheelers.
- **Urban Transport Tax on Purchase of New Cars and Two Wheelers:** At 7.5 per cent of the total cost of the petrol vehicles and 20 per cent in case of personalised diesel cars.

A fixed proportion (say, 70 per cent or as presented in Annex B) of the resources generated by the above levies, as decided by the central government, should be earmarked for urban transport, and the remaining may be utilised for developing infrastructure for rural transport. The total estimated yield from these three sources is Rs 400 billion in the first year, Rs 1860 billion in the first four years and reaches Rs 22 trillion in 20 years.

This report has argued that responsibility for urban transport should essentially rest at the state and city levels. Consistent with this general proposition of decentralisation of responsibilities for urban transport, arrangements would need to be made so that urban transport funds thus collected devolve appropriately to state and city levels. This devolution of resources to the state and city level transport funds should be on an entitlement basis and not at the dis-

cretion of the central government. This proposal could be examined by the Finance Commission, perhaps beginning with the 14th Finance Commission.

ANNEXES

ANNEX A: EXTRACTS FROM MGI AND HPEC REPORTS

MGI basis for suggesting high investment in Mass Transit are as follows:

- Transportation demand model was developed using a three stage process to estimate total transportation volume, splitting this volume into different modes and consequently forecasting the capacity required to meet the generated demand. The MGI Report also states that target share of public transportation was determined based on global benchmarks or as residual of increase in private transportation (Pg. 195).
- The report defines three scenarios (Pg.196)
 - Private Sprawl (Scenario-1): Mono-centric city structure with FAR values in line with current trends and little investment in PT.
 - Public Sprawl (Scenario-2): Mono-centric city structure with FAR values in line with current trends and high investment in PT.
 - Public Compact (Scenario-3): Poly-centric city structure with high FAR values and high investment in PT.
- In scenario 2 and 3, the report fixed a target for public and NMT transport modal share and treated the private modal share as a residual.
- It has been assumed that rail-based mass transit infrastructure will be provided in each of the top 35 cities in India. For top 13 cities, requirement is immediate, while for the rest, infrastructure may be phased over the next 20 years. The report further assumes that public bus transport is applicable to all cities and that BRTS is provided in all cities above the population of 1 million (Pg.198).
- MGI analysis reveals that more than half of the amount needs to be devoted to capital expenditure. Within capital expenditure, almost half the amount is necessary to erase India's existing infrastructure backlog in its cities and to their future needs (Pg. 63).

Report On Indian Urban Infrastructure And Services By HPEC

Local and sub-local roads are included in the definition of roads for this exercise(Pg.75, Article 3.3.2.) In many other estimates (11th FYP) for roads, only collector and major roads are included.

The large share for urban roads is on account for two factors. First, the service backlog for this sector is higher than those for other sectors' services. The backlog for this sector is very large ranging from 50 to 80 per cent across all Indian cities. Second, unlike sectors such as water where efficiency gains can be quantified, for example, by lowering the proportion of non-revenue water, in urban roads this is difficult. The efficiency gains in roads and transport are more external in nature (like better productivity through greater mobility or reduction in negative externalities of pollution and congestion) and do not necessarily translate into financial gains for the sector itself (Pg. 76, Article 3.3.3 & 3.3.4.)

A sensitivity analysis with respect to population densities, assuming other variables remain constant, highlights the possibility of reducing investment costs in urban roads and urban transport sectors. For example, an increase in population density by 2,500 per sq. km across all city size classes could reduce the investment requirement for urban roads and urban transport by about Rs 4 trillion, while a decrease in population density by 2500 per sq. km could increase the investment requirement by about Rs 6.5 trillion.

ANNEX D: URBAN TRANSPORT PLANNING IN SELECT INDIAN METROS

BANGALORE

Bangalore's urban transport system is a joint product of a number of agencies. The Municipal Corporation (Bruhat Bangalore Mahanagara Palike-BBMP), Bangalore Metrorail Corporation (a joint venture between national and state government departments), two agencies accountable to the state government (Bangalore Development Authority (BDA) and the Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC), and South Western zone of the national Indian Railways contribute to the physical network. The Bangalore International Airport Limited (BIAL), a joint venture between the Ministry of Civil Aviation, Karnataka Industrial Investment and Development Corporation (a state agency), and private promoters, developed the city's airport. The Bangalore Metropolitan Transport Corporation (BMTCL), Bangalore Metrorail Corporation (BMRC) supply services on this network, competing with private cars, taxis, rickshaws, and other means of transport. Traffic laws, environmental regulations determined by the national and state Pollution Control Boards (PCB), 'road furniture' according to guidelines established by the Indian Roads Congress (IRC), and licenses

issued by the Regional Transport Offices (RTO) influence the operating environment for transport services and vehicle owners.

The state has setup the Bangalore Metropolitan Land Transport Authority (BMLTA) through an executive order, which is primarily a high-powered committee involving most of the senior bureaucracy and two experts. This is anchored by the Directorate of Urban Land Transport, a state-level agency under the Urban Development Department that was technically setup also through an executive order one day prior to setting up of BMLTA. The DULT is supposed to be the coordinating agency for most aspects concerning urban transport in all cities of Karnataka.

Bangalore is also home to several prominent citizen initiatives to provide citizens with more information about transport options and thus (probably) influencing ridership, usage, and public pressure for

transport investment and service provision. Mapunity's Transport Information System (www.btis.in), for example, helps consumers plan multimodal trips, creating an observable demand for further integration of ticketing, physical connections, and other parts of the system⁴⁵ for moving people.

The city and metropolitan region's transport system is effectively determined by decisions taken at the state level, with limited institutionalised input from city elected or civic leaders. The Directorate of Urban Land Transport (DULT) under the Urban Development Department is institutionally positioned as a coordinating body for most of the system. It, and especially its parent Organisation (the State Urban Development Department-UDD) have some levers with which to execute this role: the UDD role in allocation of state funding as well as direction of national funds from programmes like JNNURM, con-

Annex B

Financing Urban Transport: National Urban Transport Fund

[Rs billion]

SOURCES	2012 UPTO 2015		UPTO 2022	UPTO 2032
Green Cess on Existing Vehicles (Urban Settlements)	180	832	3,277	10,588
Urban Transport Tax on New Registration (Urban Settlements)	188	888	3,458	10,548
Green Surcharge on Petrol (Urban Settlements in)	31	141	516	1,491
Total of three sources (Urban Settlements)	399	1,861	7,251	22,626

Detailed calculations are summarised as follows:

Annex B:

1 A. Vehicle Population (in '000)

YEAR (AS ON 31 ST MARCH)	ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
1951	306	27	159	34	82	4
1956	426	41	203	47	119	16
1961	665	88	310	57	168	42
1966	1,099	226	456	73	259	85

⁴⁵ The South Western Railway reports directly to national railways, complicating efforts to take advantage of rail infrastructure and rail lands for the public transport network. Although there are a number of cooperative agreements between BIAL and state/national agencies, disputes between BIAL and other agencies sometimes require the intervention of the Chief Secretary to resolve.

YEAR (AS ON 31 ST MARCH)	ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
1971	1,865	576	682	94	343	170
1976	2,700	1,057	779	115	351	398
1981	5,391	2,618	1,160	162	554	897
1986	10,577	6,245	1,780	227	863	1,462
1991	21,374	14,200	2,954	331	1,356	2,533
1996	33,786	23,252	4,204	449	2,031	3,850
2001	54,991	38,556	7,058	634	2,948	5,795
2002	58,924	41,581	7,613	635	2,974	6,121
2003	67,007	47,519	8,599	721	3,492	6,676
2004	72,718	51,922	9,451	768	3,749	6,828
2005	81,501	58,799	10,320	892	4,031	7,459
2006	89,618	64,743	11,526	992	4,436	7,921
2007	96,707	69,129	12,649	1,350	5,119	8,460
2008	105,353	75,336	13,950	1,427	5,601	9,039
2009	114,951	82,402	15,313	1,486	6,041	9,709

Source: March 2011, Road Transport Year Book (2007-2009), Volume I, Table 1.1 Total Number of Registered Motor Vehicles in India - 1951-2009, Ministry of Road Transport & Highways

Annex B:

1 B. New Vehicle Registration (in '000)

YEAR (AS ON 31 ST MARCH)	ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
1951						
1956	126	15	47	14	39	12
1961	248	48	111	11	51	26
1966	447	140	152	17	94	44
1971	788	355	235	22	89	87
1976	872	493	111	23	15	231
1981	2,745	1,582	397	49	210	507
1986	5,294	3,679	643	68	320	583
1991	11,009	8,080	1,210	109	510	1,100
1996	12,839	9,336	1,309	125	702	1,368
2001	21,881	15,769	2,938	194	958	2,022
2002	5,033	3,796	696	14	85	442
2003	9,261	6,770	1,138	99	577	677
2004	7,051	5,353	1,024	61	327	286
2005	10,237	7,915	1,058	139	357	768

YEAR (AS ON 31 ST MARCH)	ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
2006	9,747	7,120	1,412	118	486	611
2007	8,881	5,681	1,354	378	772	697
2008	10,580	7,590	1,554	104	584	748
2009	11,705	8,573	1,642	88	552	851

Source: Figures are derived from Table 1.a: (New Vehicle Registration = Year 2 - Year 1*98% (assuming 2% scrap))

Annex B

1 C. Vehicle Population Growth (Per cent)

YEAR (AS ON 31 ST MARCH)		ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
5 Year Growth Rates	1951 - 56	39	52	28	38	45	300
	1956 - 61	56	115	53	21	41	163
	1961 - 66	65	157	47	28	54	102
	1966 - 71	70	155	50	29	32	100
	1971 - 76	45	84	14	22	2	134
	1976 - 81	100	148	49	41	58	125
	1981 - 86	96	139	53	40	56	63
	1986 - 91	102	127	66	46	57	73
	1991 - 96	58	64	42	36	50	52
	1996 - 01	63	66	68	41	45	51
Annual Growth Rates	2001 - 06	63	68	63	56	50	37
	2001-02	7	8	8	0	1	6
	2002-03	14	14	13	14	17	9
	2003-04	9	9	10	7	7	2
	2004-05	12	13	9	16	8	9
	2005-06	10	10	12	11	10	6
	2006-07	8	7	10	36	15	7
	2007-08	9	9	10	6	9	7
	2008-09	9	9	10	4	8	7
	Average Last 5 Years	10	10	10	15	10	7

Source: Figures are derived from Table 1.a,
Vehicle Population Growth Rate = (Year 2 Vehicles - Year 1 Vehicles)/Year 1 Vehicles

Annex B

1 D. Growth in Registration of New Vehicles (Per cent)

YEAR (AS ON 31 ST MARCH)		ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
5 Year Growth Rates	1951 - 56						
	1956 - 61	96	229	135	-20	33	118
	1961 - 66	81	192	37	57	84	67
	1966 - 71	76	154	54	31	-5	98
	1971 - 76	11	39	-53	2	-83	167
	1976 - 81	215	221	258	115	1313	119
	1981 - 86	93	133	62	38	52	15
	1986 - 91	108	120	88	59	59	89
	1991 - 96	17	16	8	15	38	24
	1996 - 01	70	69	124	56	36	48
Annual Growth Rates	2001 - 06	65	70	65	58	52	39
	2001-02						
	2002-03	84	78	64	621	580	53
	2003-04	-24	-21	-10	-38	-43	-58
	2004-05	45	48	3	127	9	169
	2005-06	-5	-10	33	-15	36	-20
	2006-07	-9	-20	-4	221	59	14
	2007-08	19	34	15	-72	-24	7
	2008-09	11	13	6	-16	-6	14
	Average Last 5 Years	12	13	11	49	15	37

Source: Figures are derived from Table 1.b.

New Vehicles Registration Growth Rate = (Year 2 Registrations - Year 1 Registrations)/Year 1 Registrations

Note: The above table illustrates the year on year incremental growth in the number of vehicles in various categories and not the growth of total vehicle population. The above table is derived based on the year on year registration of new vehicles in various categories.

Annex B:

1 E. Vehicular Composition (Per cent)

YEAR (AS ON 31 ST MARCH)	ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
1956	100.0	9.6	47.7	11.0	27.9	3.8
1961	100.0	13.2	46.6	8.6	25.3	6.3
1966	100.0	20.6	41.5	6.6	23.6	7.7
1971	100.0	30.9	36.6	5.0	18.4	9.1
1976	100.0	39.1	28.9	4.3	13.0	14.7

YEAR (AS ON 31 ST MARCH)	ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
1981	100.0	48.6	21.5	3.0	10.3	16.6
1986	100.0	59.0	16.8	2.1	8.2	13.8
1991	100.0	66.4	13.8	1.5	6.3	11.9
1996	100.0	68.8	12.4	1.3	6.0	11.4
2001	100.0	70.1	12.8	1.2	5.4	10.5
2002	100.0	70.6	12.9	1.1	5.0	10.4
2003	100.0	70.9	12.8	1.1	5.2	10.0
2004	100.0	71.4	13.0	1.1	5.2	9.4
2005	100.0	72.1	12.7	1.1	4.9	9.2
2006	100.0	72.2	12.9	1.1	4.9	8.8
2007	100.0	71.5	13.1	1.4	5.3	8.7
2008	100.0	71.5	13.2	1.4	5.3	8.6
2009	100.0	71.7	13.3	1.3	5.3	8.4
Average Last 5 Years	100.0	71.8	13.0	1.2	5.2	8.8

Source: Figures are derived from Table1.a,
Composition of Vehicle in Year I = (Total Vehicle in the category/Total Vehicle Population)

Annex B

2. Fuel Consumption

	2004	2005	2006	2007	2008	2009	2010
High Speed Diesel Oil (in '000 tonnes)	37,074	39,651	40,191	42,896	47,669	51,710	55,699
Motor Spirit (in '000 tonnes)	7,897	8,251	8,647	9,285	10,332	11,258	12,731
High Speed Diesel Oil (in million litres)	38,557	41,237	41,799	44,612	49,576	53,778	57,927
Motor Spirit (in million litres)	8,213	8,581	8,993	9,656	10,745	11,708	13,240
Growth Rates (per cent)							
High Speed Diesel Oil		6.95	1.36	6.73	11.13	8.48	7.71
Motor Spirit		4.48	4.80	7.38	11.28	8.96	13.08

Source: Basic Statistics on Indian Petroleum & Natural Gas, MoPNG (<http://petroleum.nic.in/petstat.pdf>)

Annex B

3. Cess Calculations

a. Green Surcharge on Petrol (Pan India)

YEAR	GROWTH IN MOTOR SPIRIT CONSUMPTION (PER CENT)	CONSUMPTION OF MOTOR SPIRIT (IN LITRES)	GREEN SURCHARGE ON MOTOR SPIRIT (IN RS BILLION) @ RS 2/LITRE	CUMULATIVE GREEN CESS ON PETROL (IN RS BILLION)
2012	8.33	15,538	31	31
2013	8.33	16,832	34	65
2014	8.13	18,200	36	101
2015	8.13	19,680	39	141
2016	7.93	21,241	42	183
2017	7.93	22,925	46	229
2018	7.73	24,697	49	278
2019	7.73	26,606	53	331
2020	7.53	28,610	57	389
2021	7.53	30,764	62	450
2022	7.33	33,019	66	516
2023	7.33	35,439	71	587
2024	7.13	37,966	76	663
2025	7.13	40,673	81	744
2026	6.93	43,492	87	831
2027	6.93	46,506	93	924
2028	6.73	49,635	99	1,024
2029	6.732	52,976	106	1,130
2030	6.53	56,435	113	1,242
2031	6.53	60,121	120	1,363
2032	6.33	63,926	128	1,491

Annex B

3. Cess Calculations

b. Green Cess on Existing Vehicles (Pan India)

YEAR	VEHICULAR GROWTH ASSUMED (PER CENT)	RATIO OF CARS/ JEEPS/TAXIS	RATIO OF TWO WHEELERS	TOTAL VEHICLES ('000)	CARS/JEEPS/ TAXIS ('000)	TWO WHEELERS ('000)
2012	9.60	13.03	71.81	151,336	19,724	108,678
2013	9.60	13.03	71.81	165,863	21,617	119,111
2014	9.40	13.23	71.31	181,454	24,012	129,400
2015	9.40	13.23	71.31	198,510	26,269	141,563
2016	9.20	13.43	70.81	216,772	29,119	153,503
2017	9.20	13.43	70.81	236,715	31,798	167,624
2018	9.00	13.63	70.31	258,019	35,176	181,420
2019	9.00	13.63	70.31	281,239	38,342	197,747
2020	8.80	13.83	69.81	305,988	42,328	213,619
2021	8.80	13.83	69.81	332,914	46,053	232,416
2022	8.60	14.03	69.81	361,543	50,736	250,596
2023	8.60	14.03	69.81	392,635	55,099	272,146
2024	8.40	14.23	68.81	425,615	60,579	292,878
2025	8.40	14.23	68.81	461,365	65,667	317,478
2026	8.20	14.43	68.31	499,196	72,050	341,015
2027	8.20	14.43	68.31	540,129	77,958	368,977
2028	8.00	14.63	67.81	583,337	85,361	395,577
2029	8.00	14.63	67.81	630,003	92,189	427,222
2030	7.80	14.83	67.31	679,141	100,738	457,149
2031	7.80	14.83	67.31	732,112	108,596	492,805
2032	7.60	15.03	66.81	787,750	118,424	526,318

Annex B

3. Cess Calculations

c. Assumptions regarding Life of Vehicle and Its Insured Values:

LIFE OF A VEHICLE	NEW & UP TO 1 Y OLD	2 Y OLD	3 Y OLD	4 Y OLD	5 Y OLD	6 Y OLD	7 Y OLD	8 Y OLD	9 Y OLD	10 Y OLD	MORE THAN 10 Y OLD
Value of Vehicle (per cent)	100	95	90	85	80	75	70	65	60	55	50
Percentage of Vehicles (per cent)	8.10	8.10	8.10	8.10	8.10	8.10	8.10	8.10	8.10	8.10	19.0
Weighted Average Insured Value of Vehicles	72 per cent										
Leakage in Insurance	50 per cent										

*Y – Year

Annex B

3. Cess Calculations

d. Calculation of Net Insured Values of Vehicles (Category Wise and Total)

YEAR	BELOW RS 300,000 (AVERAGE RS 250,000)	RS 3-700,000 (AVERAGE RS 500,000)	RS 700,000-1,200,000 (AVERAGE RS 950,000)	RS 1.2-2 MILLION (AVERAGE RS 1.6 MILLION)	ABOVE RS 2 MILLION (AVERAGE RS 3 MILLION)	TOTAL INSURED VALUE OF CAR (RS BILLION)	TOTAL INSURED VALUE OF TWO (RS BILLION)	NET INSURED VALUE OF CAR EXCLUDING LEAKAGE (IN RS BILLION)	NET INSURED VALUE OF TW EXCLUDING LEAKAGE (IN RS BILLION)
2012	71,277	320,747	270,853	228,086	213,831	11,048	3,927	5,524	1,964
2013	78,119	351,537	296,854	249,982	234,358	12,109	4,304	6,054	2,152
2014	86,774	390,482	329,741	277,676	260,322	13,450	4,676	6,725	2,338
2015	94,930	427,187	360,735	303,777	284,791	14,714	5,116	7,357	2,558
2016	105,230	473,537	399,875	336,737	315,691	16,311	5,547	8,155	2,774
2017	114,911	517,101	436,663	367,716	344,734	17,811	6,058	8,906	3,029
2018	127,118	572,030	483,048	406,777	381,353	19,703	6,556	9,852	3,278
2019	138,558	623,511	526,520	443,386	415,674	21,476	7,146	10,738	3,573
2020	166,422	748,901	632,405	532,552	499,267	25,795	7,720	12,898	4,199
2021	166,422	748,901	632,405	532,552	499,267	25,795	8,399	12,898	4,199
2022	183,347	825,063	696,720	586,711	550,042	28,419	9,056	14,209	4,528
2023	199,115	896,016	756,636	637,167	597,344	30,863	9,835	15,431	4,917
2024	218,916	985,121	831,880	700,531	656,747	33,932	10,584	16,966	5,292
2025	237,304	1,067,868	901,756	759,373	711,912	36,782	11,473	18,391	5,736
2026	260,370	1,171,666	989,407	833,185	781,111	40,357	12,323	20,179	6,162
2027	281,720	1,267,739	1,070,536	901,504	845,160	43,667	13,334	21,833	6,667
2028	308,473	1,388,127	1,172,196	987,113	925,418	47,813	14,295	23,907	7,148
2029	333,150	1,499,173	1,265,969	1,066,079	999,449	51,638	15,439	25,819	7,719
2030	364,043	1,638,193	1,383,363	1,164,937	1,092,128	56,427	16,520	28,213	8,260
2031	392,437	1,765,967	1,491,261	1,255,799	1,177,311	60,828	17,809	30,414	8,904
2032	427,955	1,925,796	1,626,227	1,369,455	1,283,864	66,333	19,020	33,166	9,510

Net Insured Value = Total Insured Value *(1-percentage Leakage)

Annex B

3. Cess Calculations

e. Calculation of Green Cess @4 Per cent of Net Insured Value of Vehicles

YEAR	CARS (IN RS BILLION)	TWO WHEELERS (IN RS BILLION)	TOTAL GREEN CESS (IN RS BILLION)	CUMULATIVE GREEN CESS (IN RS BILLION)
2012	221	79	300	300
2013	242	86	328	628
2014	269	94	363	990
2015	294	102	397	1,387
2016	326	111	437	1,824
2017	356	121	477	2,301
2018	394	131	525	2,827
2019	430	143	572	3,399
2020	474	154	629	4,028
2021	516	168	684	4,712
2022	568	181	749	5,461
2023	617	197	814	6,275
2024	679	212	890	7,165
2025	736	229	965	8,130
2026	807	246	1,054	9,184
2027	873	267	1,140	10,324
2028	956	286	1,242	11,566
2029	1,033	309	1,342	12,908
2030	1,129	330	1,459	14,367
2031	1,217	356	1,573	15,939
2032	1,327	380	1,707	17,646

Annex B

4. Urban Transport Tax on New Registration (Pan India)

a. Calculation of New Vehicle Registration (in '000)

YEAR	CARS ASSUMING 1 PER CENT SCRAP	BELOW RS 300,000 (AVERAGE RS 250,000)	RS 3-700,000 (AVERAGE RS 500,000)	RS 700,000-1,200,000 (AVERAGE RS 950,000)	RS 1.2-2 MILLION (AVERAGE RS 1.6 MILLION)	ABOVE RS 2 MILLION (AVERAGE RS 3 MILLION)	TWO WHEELERS ASSUMING 2 PER CENT SCRAP
2012	1,908	382	859	382	191	95	11,502
2013	2,091	418	941	418	209	105	12,606
2014	2,611	522	1,175	522	261	131	12,671
2015	2,497	499	1,124	499	250	125	14,751
2016	3,113	623	1,401	623	311	156	14,771
2017	2,970	594	1,337	594	297	149	17,192

YEAR	CARS ASSUMING 1 PER CENT SCRAP	BELOW RS 300,000 (AVERAGE RS 250,000)	RS 3-700,000 (AVERAGE RS 500,000)	RS 700,000-1,200,000 (AVERAGE RS 950,000)	RS 1.2-2 MILLION (AVERAGE RS 1.6 MILLION)	ABOVE RS 2 MILLION (AVERAGE RS 3 MILLION)	TWO WHEELERS ASSUMING 2 PER CENT SCRAP
2018	3,696	739	1,663	739	370	185	17,148
2019	3,518	704	1,583	704	352	176	19,956
2020	4,369	874	1,966	874	437	218	19,826
2021	4,148	830	1,867	830	415	207	23,070
2022	5,144	1,029	2,315	1,029	514	257	22,828
2023	4,871	974	2,192	974	487	244	26,562
2024	6,030	1,206	2,714	1,206	603	302	26,174
2025	5,694	1,139	2,562	1,139	569	285	30,458
2026	7,040	1,408	3,168	1,408	704	352	29,886
2027	6,628	1,326	2,983	1,326	663	331	34,783
2028	8,183	1,637	3,682	1,637	818	409	33,980
2029	7,682	1,536	3,457	1,536	768	384	39,557
2030	9,471	1,894	4,262	1,894	947	474	38,471
2031	8,865	1,773	3,989	1,773	887	443	44,799
2032	10,914	2,183	4,911	2,183	1,091	546	43,369

Annex B:

4.Urban Transport Tax on New Registration (Pan India)

b. Calculation of Category Wise Newly Registered Petrol & Diesel Cars (70 per cent Petrol & 30 per cent Diesel Cars) (in '000)

YEAR	PETROL CARS	BELOW 0.3 MN	0.3-0.7 MN	0.7-1.2 MN	1.2-2 MN	ABOVE 2 MN	DIESEL CARS	BELOW 0.3 MN	0.3-0.7 MN	0.7-1.2 MN	1.2-2 MN	ABOVE 2 MN
2012	1,336	267	601	267	134	67	573	115	258	115	57	28
2013	1,465	293	659	293	146	74	626	125	282	125	63	31
2014	1,828	365	823	365	183	92	783	157	352	157	78	39
2015	1,748	349	787	349	175	88	749	150	337	150	75	37
2016	2,180	436	981	436	218	109	934	187	420	187	93	47
2017	2,080	416	936	416	208	104	891	178	401	178	89	45
2018	2,587	517	1,164	517	259	130	1,109	222	499	222	111	55
2019	2,463	493	1,108	493	246	123	1,056	211	475	211	106	53
2020	3,059	612	1,376	612	306	153	1,310	262	590	262	131	65
2021	2,905	581	1,307	581	291	145	1,244	249	560	249	124	62
2022	3,601	720	1,621	720	360	180	1,543	309	694	309	154	77
2023	3,410	682	1,534	682	341	171	1,461	292	658	292	146	73
2024	4,221	844	1,900	844	422	211	1,810	362	814	362	181	91

YEAR	PETROL CARS	BELOW 0.3 MN	0.3-0.7 MN	0.7-1.2 MN	1.2-2 MN	ABOVE 2 MN	DIESEL CARS	BELOW 0.3 MN	0.3-0.7 MN	0.7-1.2 MN	1.2-2 MN	ABOVE 2 MN
2025	3,985	797	1,793	797	398	200	1,709	342	769	342	171	85
2026	4,929	986	2,218	986	493	246	2,111	422	950	422	211	106
2027	4,640	928	2,088	928	464	232	1,989	398	895	398	199	99
2028	5,728	1,146	2,577	1,146	573	286	2,455	491	1,105	491	245	123
2029	5,377	1,075	2,420	1,075	538	269	2,304	461	1,037	461	230	115
2030	6,630	1,326	2,983	1,326	663	332	2,841	568	1,279	568	284	142
2031	6,205	1,241	2,792	1,241	621	310	2,660	532	1,197	532	266	133
2032	7,640	1,528	3,438	1,528	764	382	3,274	655	1,473	655	327	164

Annex B :

4.Urban Transport Tax on New Registration (Pan India)

c. Urban Transport Tax Rates and Estimated Collections

YEAR	UT TAX RATE ON PETROL CARS (PER CENT)	UT TAX RATE ON DIESEL CARS (PER CENT)	UT TAX RATE ON TWO WHEELERS (PER CENT)	COLLECTIONS FROM CARS (IN RS BILLION)	COLLECTIONS FROM TWO WHEELERS (IN RS BILLION)	TOTAL URBAN TRANSPORT CESS (IN RS BILLION)	CUMULATIVE URBAN TRANSPORT CESS (IN RS BILLION)
2012	7.5	20	7.5	166	43	209	209
2013	7.5	20	7.5	182	47	229	439
2014	7.5	20	7.5	228	48	275	714
2015	7.5	20	7.5	218	55	273	987
2016	7.5	20	7.5	272	55	327	1,314
2017	7.5	20	7.5	259	64	324	1,637
2018	7.5	20	7.5	322	64	384	2,024
2019	7.5	20	7.5	307	75	382	2,406
2020	7.5	20	7.5	381	74	455	2,861
2021	7.5	20	7.5	361	87	448	3,309
2022	7.5	20	7.5	448	86	534	3,843
2023	7.5	20	7.5	425	100	524	4,367
2024	7.5	20	7.5	526	98	624	4,991
2025	7.5	20	7.5	496	114	611	5,602
2026	7.5	20	7.5	614	112	726	6,328
2027	7.5	20	7.5	578	130	708	7,036
2028	7.5	20	7.5	713	127	841	7,877
2029	7.5	20	7.5	670	148	818	8,695
2030	7.5	20	7.5	826	144	970	9,665
2031	7.5	20	7.5	773	168	974	10,606
2032	7.5	20	7.5	952	163	1,114	11,720

Annex B:

5. Summary of Accruals to National Urban Transport Fund (In Rs Billion)

							NATIONAL URBAN TRANSPORT FUND (NUTF)				
YEAR	GREEN SURCHARGE ON PETROL	GREEN CESS ON EXISTING VEHICLES (PAN INDIA)	URBAN TRANSPORT TAX ON NEW REGISTRATION (PAN INDIA)	TOTAL ACCRUALS TO UTF (PAN INDIA)	TOTAL CUMULATIVE ACCRUALS TO UTF (INDIA)	GREEN SURCHARGE ON PETROL (100 PER CENT IN URBAN SETTLEMENTS)	GREEN CESS ON EXISTING VEHICLES (60 PER CENT IN URBAN SETTLEMENTS)	URBAN TRANSPORT TAX ON NEW REGISTRATION (90 PER CENT IN URBAN SETTLEMENTS)	TOTAL ACCRUALS TO UTF	TOTAL CUMULATIVE ACCRUALS TO UTF	
2012	31	300	209	509	509	31	180	188	399	399	
2013	34	328	229	558	1,067	34	197	207	437	836	
2014	36	363	275	638	1,704	36	218	248	502	1,338	
2015	39	397	273	670	2,374	39	238	246	523	1,861	
2016	42	437	327	764	3,138	42	262	294	599	2,460	
2017	46	477	324	801	3,939	46	286	291	624	3,083	
2018	49	525	387	912	4,851	49	315	348	712	3,796	
2019	53	572	382	954	5,805	53	343	344	740	4,536	
2020	57	629	455	1,084	6,888	57	377	409	844	5,380	
2021	62	684	448	1,132	8,020	62	410	403	875	6,255	
2022	66	749	534	1,283	9,304	66	450	481	996	7,251	
2023	71	814	524	1,338	10,642	71	488	472	1,031	8,282	
2024	76	890	624	1,515	12,157	76	534	562	1,172	9,454	
2025	81	965	611	1,576	13,732	81	579	550	1,210	10,664	
2026	87	1,054	726	1,780	15,512	87	632	653	1,372	12,037	
2027	93	1,140	708	1,848	17,360	93	684	637	1,414	13,451	
2028	99	1,242	841	2,083	19,443	99	745	757	1,601	15,053	
2029	106	1,342	818	2,159	21,602	106	805	736	1,647	16,700	
2030	113	1,459	970	2,429	24,031	113	875	873	1,861	18,561	
2031	120	1,573	941	2,514	26,545	120	944	847	1,911	20,472	
2032	128	1,707	1,114	2,821	29,366	128	1,024	1,003	2,155	22,626	

Annex C :
Rolling Programme Upto 2030
 Calculation as Per Service Level Bench Mark Guidelines

DESCRIPTION	2015	2020	2025	2030
LEVEL OF SERVICE	4	3	2	1
PUBLIC TRANSPORT				
Rail Transit, Bus Rapid Transit on Exclusive Row as Per Cent of Total Road Cum Rail Length	<10	10-20	20-30	>=30
No. of Buses /1000 Population	<0.2	0.2-0.4	0.4-0.6	>= 0.6
IPT (Intermediate public transport) In All Cities	Organise	Upgrade		
NMT (NON MOTORISED TRANSPORT) AND ACCESS				
Footpaths/Road Length as Percentage	< 25	25-50	50-75	>= 75
Street Lighting (Lux Level)	<4	4-6	6-8	>= 8
Bicycle Lanes; Network Length as Percentage of Length of Road Network	<15	25-15	50-25	>= 50
Parking Facilities for NMT as Percentage of Major Terminals	<25	25-50	50-75	>= 75
TRAFFIC MANAGEMENT TRAVEL SPEED KMPH				
Personal Vehicles	<15	15-25	25-30	>= 30
Public Transport	<10	10-15	15-20	>= 20
ROADS AND LINKED INFRASTRUCTURE				
Percentage of Area Under Roads	<10	10-12	12-15	>=15
Parking Spaces Paid as Percentage of Total	<25	25-50	50-75	>= 75
TERMINALS				
Intermodal	Plan	Implement		
Bus	Plan	Implement		
Truck	Plan	Implement		
ITS (INTELLIGENT TRANSPORT SYSTEMS)				
Surveillance; CCTV Provided as Per Cent of Needed	<25	25-50	50-75	>= 75
PIS (Passenger Information System) As Per Cent Of Needed	<25	25-50	50-75	>= 75
GPS/GRPS as Per Cent of Total No. of PT Vehicles	<25	25-50	50-75	>= 75
Signal Synchronisation as Per Cent of Needed	<25	25-50	50-75	>= 75
Modes In Integrated Ticketing as Percentage of Total Modes	<25	25-50	50-75	>= 75
TDM (TRANSPORT DEMAND MANAGEMENT)				
INTEGRATED LANDUSE TRANSPORT PLAN				

DESCRIPTION	2015	2020	2025	2030
LEVEL OF SERVICE	4	3	2	1
Persons Per Hectare	<125	125-150	150-175	>= 175
Mixed Land Use On Major Transit Corridors (Percentage Area Under Non-Residential Use)	<5	5-15	15-30	<= 30
Intensity Of Development City Wide	<1	1.0-1.5	1.5-2.0	<= 2.0
Intensity of Development Along Transit Corridor- Ratio of FSI on Transit Corridor To City FSI	<1-5	1.5-2.0	2.0-3.0	<= 3.0
SAFETY				
Fatality Rate Per Million Population	> 0.6 Persons	0.4-0.6 Persons	0.2-0.4 Persons	<= 0.2 Persons
Fatality Rate For NMT as Per Cent of Total	>60	40-60	20-40	<=20
Security	Ongoing			
Safety Audit	Ongoing			
INSTITUTIONAL FRAMEWORK				
Legislation	Enact			
ENVIRONMENT				
Energy Efficiency	Implement			
Low Carbon Path	Implement			
Pollution	14-16	10-13	6-9	<= 5
GHG (Greenhouse gases) Emissions	Implement			
Capacity Building (As Percentage of Present Planning)				
Training	60 per cent	40 per cent	Ongoing	Ongoing
Education	60 per cent	40 per cent	Ongoing	Ongoing
R&D	60 per cent	40 per cent	Ongoing	Ongoing
Database	60 per cent	40 per cent	Ongoing	Ongoing
INVESTMENT NEED FINANCIAL SUSTAINABILITY OF BUS TRANSPORT				
Extent of Non Fare Revenue as Percentage of Total Revenue	<=10	10-20	20-40	>40
Staff Per Bus Ratio	<10	8-10	5.5-8	<= 5.5
Operating Ratio	>= 1.5	1-0-1.5	0.7-1.0	<0.7
Investment (Sc. 2)	Rs 2 Trillion	Rs 4 Trillion	Rs 5 Trillion	Rs 6 Trillion

vening of meetings, and oversight of departments' functioning.

Decision-making about land use and transport infrastructure across modes intersect also intersect in the KUIDFC, particularly in projects such as the proposed cluster cities development around Bangalore. KUIDFC had commissioned the preparation of Comprehensive Traffic and Transportation Plan (CTTP) for Bangalore in 2007, a report that considerably influ-

enced transport infrastructure development projects taken up by BBMP, BDA, BMRCL, BMTC, KSRTC and Traffic Police including the road widening projects by BBMP, next phases of Metro lines including High Speed Rail to Airport, Monorail / light rail corridors, construction of numerous underpasses and flyovers by BBMP and BDA, and TTMCs by BMTC. Although the KUIDFC is not integrated as a subordinate agency of UDD⁴⁶ (or its sub-agencies DULT and BMLTA), a sub-committee under BMLTA was

46 It reports to UDD, but it also has an independent budget and a direct reporting relationship to other agencies at the same administrative level as UDD.

constituted to ensure timely implementation of the projects identified under CTPP. However, during late 2008, owing to a jurisdictional issue, BMLTA directed BMRDA to prepare a revised CTPP for Bangalore Metropolitan Region (comprising about 8,000 sq. km) that should take the CTPP prepared by KUIDFC into account. As it stands, the revised CTPP has been prepared for Bangalore Metropolitan Region.

There are many regular, repeated circumstances in which the various agencies must interact in Bangalore and other evolving cities – decisions about land use, for example, or planning points of interchange and intermodal connection services, ensuring that new developments are adequately connected to the rest of the city, or assessing the impact of new developments and transport infrastructure on air quality via anticipated traffic – but there are few institutionalised channels through which this can take place.

Horizontal coordination between the various agencies takes place on a project basis and generally by specific MOU. Informal coordination amongst different agencies can work well. It worked well just before the inauguration of the new International Airport at Devanahalli, for example, when the State Government constituted a High Level Task Force to Airport Connectivity chaired under an officer of Additional Chief Secretary to the Government with members from heads of various line departments including BBMP, BDA, NHAI, BIAL, Traffic Police, PWD, BMRDA, and others during January – June 2008. In this case, all agencies met almost once a fortnight to take stock of various aspects to ensure there was better connectivity to the new international airport from city centre. It also happens at lower levels: the Bangalore Metrorail Corporation and the Bangalore Metropolitan Transport Corporation, for example, signed an MoU for Common Day Metro-Bus transit passes in February 2011, and BMTC introduced a metro feeder bus service in October 2011, when the first line of the Metro was inaugurated.

Nevertheless, coordination by MOU does not resolve all of the challenges, particularly coordination problems that extend across state and national governments. The BMRCL and Indian Railways have sparred over land use for points where the two rail networks converge. The Metro's North-South Corridor is stalled because the South West Railways is asking for additional compensation for Railways land to be used by Metro.⁴⁷ There have been extended delays over transfer of land to Metro by KSRTC and vice-versa for construction of Central Station at Majestic by Metro and Intermodal Bus Terminal at Peenya by KSRTC respectively. The matter had appeared in at least two meetings of the BMLTA

and has been finally resolved. In the current state of affairs, the State Government has resorted to SPVs to ensure various projects proposed under CTPP.⁴⁸ The Bangalore Metropolitan Land Transport Agency (BMLTA), Bangalore's answer to the national mandate to establish Metropolitan Transport Authorities to coordinate urban transport planning and investment, is currently a convening body consisting of the heads of all agencies relevant for transport infrastructure, land use planning, and transport services and chaired by the Commissioner of DULT. It met regularly in the first three years after establishment to discuss coordination, but this frequency has reduced in 2012. It does not have any formal powers to influence investment or expenditure. At the time of writing, the DULT had commissioned a consultant report on the statutory aspects of empowering the body and was reportedly considering a new Bill that would strengthen the BMLTA.

CHENNAI ⁴⁹

Responsibility for managing the various components of transportation in Chennai falls under various agencies and departments of central, state and city government. The suburban train, the operations of Mass Rapid Transit System (MRTS) and the ownership of the rolling stock comes under the Indian Railways. The rest of MRTS including air-rights – the ability build, operate and commercialise areas above the metro if necessary – is owned by Chennai Metropolitan Development Authority (CMDA).

Land use and transportation planning is under the purview of CMDA, an agency under the Housing and Urban Development Department of the Government of Tamil Nadu (GoTN). Certain key roads in the city are the responsibility of Highways Department (HD). Legally, only Metropolitan Transport Corporation (MTC) under the Department of Transport of GoTN is allowed to operate stage carriages – buses, share autos and the like – for public purposes. Private parties are allowed only usage of 'tourist' vehicles – auto, taxis, maxicabs – which offer point to point journeys to ferry passengers. The regulation of all of these vehicles is the responsibility of the Commissionerate of Transport under the Home Department – and its Regional Transport Offices (RTOs). Chennai Metro Rail Limited (CMRL) was created by GoTN as a Special Purpose Vehicle (SPV) to build and manage the upcoming metro rail system. CMRL is partly funded by the Central Government and GoTN.

The Corporation of Chennai (CoC) manages many of the bus routes and residential roads, parking and other road infrastructure. The Mayor of Chennai is elected by popular vote and the head of the city bureaucracy – the Commissioner and his team – is appointed by GoTN and reports to the Depart-

47 http://articles.timesofindia.indiatimes.com/2012-04-18/Bengaluru/31361004_1_railway-land-swr-metro-workers. Accessed May 2, 2012

48 The Bengaluru Airport Rail Link Limited, another SPV under the Infrastructure Development Department was set to study the feasibility for high speed rail to airport, monorail / light rail as proposed in CTPP and then take on its construction similar to the relationship between BMRCL and the Metro. In a more recent move, the State Government has established Hubli-Dharwad BRTS Company Limited (registered during first week of May 2012) for taking up the BRTS between Hubli-Dharwad in northern Karnataka.

49 This text box was contributed by Raj Cherubal, Director-Projects, Chennai City Connect

ment of Municipal Administration and Water Supply (MAWS). Traffic is managed by Chennai Traffic Police, which also reports to the Home Department.

Some civil society organisations including the Institute for Transportation and Development Policy (ITDP), Embarq, Chennai City Connect (CCC), Transparent Chennai, SUSTAIN and various passenger associations have been engaging with government agencies to advise and improve planning and transportation infrastructure and services.

GoTN has formed the Chennai Unified Metropolitan Transport Authority (CUMTA), headed by the Minister for Transport as Chair, Chief Secretary (CS) as Vice-Chair and all relevant departments and agencies as members. The bill was modeled on the Hyderabad and Mumbai MTAs and gives the UMTA the authority to 'recommend' and 'advise' city and state governments on transport as well as the civil powers to initiate a suit.

While awaiting notification of the bill, the state government has also appointed a 14 member executive committee various working groups on Inter-modal Integration (IMI) headed by the MD of CMRL; Finance headed by Secretary of Finance; Non-motorised Transport headed by the Commissioner of CoC. These working groups have senior engineering and planning staff from CMDA, HD, CoC, CTP, MTC, MRTS and other relevant departments. Civil society organisations and experts from CCC, ITDP, Anna University are members of these working groups. The CUMTA Executive Committee, chaired by the CS, and the working groups have the authority to engage experts and relevant organisations as they see fit.

CUMTA has been meeting and discussing complex projects that require a fair degree of cooperation among the members. Most of the projects and policy initiatives are in the early stages. For example policy on parking management mentioned below is a new initiative. While area planning of CMRL stations is an ongoing project, area planning for MRTS was initiated and is being monitored in the IMI working group. Similarly Common Ticketing is being coordinated and monitored by the IMI working group and involves staff from CMRL and MTC.

CMRL initiated area planning and generation of related projects for various agencies. It has created projects for Corporation of Chennai (CoC), HD, MTC, and the CMDA. This project could have profound impact in not only planning orderly and accessible Metro Rail stations by providing safe pedestrian crossing around stations, proper footpaths; pick up and drop off area for private and para-transit; proper bus stops for easy and safe interchange; feeder service with few kilometer radius to avoid use of private vehicles to access Metro Rail; safe public space

around stations with vending, public amenities like public toilets, etc.

Joint studies were done by CMRL and other agencies and budgets are being prepared by the agencies for implementation. CoC and HD have also taken up re-designing of roads with modern planning and designs due to this process. CMDA is preparing similar areas plans for the MRTS.

CUMTA is playing a vital role in coordination among these agencies. Since CUMTA does not yet have its own secretariat and planning staff much of this is done by its member agencies. Also, for example, since CMRL is an older and already functional agency and has a strong interest in implementing a vibrant area plan, CMRL officials have taken the initiatives in CUMTA working group to coordinate plans with other agencies. As mentioned earlier, regarding some new issues like city wide parking management and common ticketing policy and technical specifications CUMTA is helping coordinate among the various agencies. The exact nature and responsibility of planning is expected to evolve as CUMTA is staffed with managerial and engineering personnel.

Important transport hubs like the airport and its vicinities are being reconsidered from IMI perspective – integration of various modes; providing due space and design for public transportation; physical and IT integration; evolving a common plan and physical design across various agencies. This reconsideration is being initiated by agencies like CMRL and organisations like CCC and ITDP.

Currently agencies including the Airport Authority of India (AAI), which owns and operates the airport, do not consider the impact of other modes of transportation on the airport. No specific provision is made to integrate the suburban train, future Metro Rail, buses, para-transit, etc. with the airport to make public transport friendlier for airport passengers. Using the same IMI principles and opportunity, vicinity of the airport is being relooked and redesigned by AAI. But this process gets complicated since various public spaces belong to different agencies. For example while the airport is owned and operated by AAI, the road in front of the airport belongs to the HD, suburban station to Indian Railways, metro stations to CMRL and so on. Issues of budgets for improvements and integration, payment for competent consultants and so on become a matter of protracted discussions. Ideally, CUMTA should initiate and fund the studies and prepare common plans, while its member agencies raise funds to improve their respective infrastructure and services. Since CUMTA does not yet have funds and staff of its own these activities are being initiated by the Department of Transportation, CMRL, ITDP, CCC and others on their own initiative.

CUMTA is preparing initiatives to establish its secretariat, employ professional staff and has already begun to develop various policies for adoption. It developed a parking policy based on market based pricing, with SPV to manage city parking, for example, which the Corporation of Chennai has agreed to implement via a SPV with Chennai Traffic Police (CTP) and others as co-owners. This model is based on cities like Budapest where they have implemented highly effective parking management systems.

CUMTA has also engaged organisations like ITDP to advise and help implement benchmarks, standards, processes and other tools to make transportation in Chennai more sustainable and modern. CUMTA is also exploring formal and informal tie-ups with international sister organisations who have considerable expertise and experience in managing urban, citywide transport systems.

The CoC via the NMT working group is studying creation of semi or fully pedestrianised areas in important locations in the city. Modeled along Time Squares (NY) and other successful efforts, this could not only create vibrant and safe public spaces but also improve shopping, cultural and leisure experience of visitors.

As part of their efforts to improve pedestrian facilities on roads, CoC and HD have initiated re-design studies of all major roads – which add up to 100s of KM of roads in the city. Here some fundamental decision such as rethinking of carriage way size are being made. Additionally facilities for easy access to all citizens, including disabled, elderly, are being incorporated into the design. The city is now rethinking the standards being used currently along with beginning to undertake more serious coordination with other agencies to ensure trouble free pedestrian flow and smoother traffic flow.

City agencies including CUMTA has enlisted various organisations like Chennai City Connect, Transparent Chennai, SUSTAIN, Care Earth and so on to help in these discussions and rethink. Additionally, MTC and other organisations have initiated studies and pilots to make the system more public transport and citizens friendly. For example, MTC is studying its routes and existing infrastructure and processes to optimise its routes; increase frequency; improve fuel efficiency; improve communication with passengers and so on.

While considerable progress has been made by the city, considerable hurdles still remain and needs to be dealt with. One of the many hurdles is that planning in many areas – like road improvement for dealing with congestion is dealt by HD and CoC with very little input from MTC and other public transport agencies.

This means that while the GoTN has set ambitious and progressive goals to shift 70 per cent of motorised trips in Chennai to public transport by 2026, agencies like HD and CoC still see flyovers, road widening and elevated roads as solutions to easing congestion. This would be counter to plans in an advanced city, with superior planning and coordination capabilities, where emphasis would be on increasing the public transportation infrastructure and services while at the same time restricting ownership and usage of private vehicles. Such complex plans requires sophisticated coordination of vision, goals, policy, plans, designs, standards and so on among various agencies – which is what CUMTA is expected to do when fully functional.

Many more governance initiatives, tools and processes need to be adopted. There is still a huge dearth of IT and communication systems to engage public participation; ensuring adherence to proper standards and designs; transparent contracting and monitoring; active maintenance and upgrade. All these will require substantial work by CUMTA and all its agencies.

MUMBAI

Mumbai's transport system is overseen by a combination of municipal/metropolitan authorities, state agencies, and national government entities. The road system is planned and developed by Municipal Corporation of Greater Mumbai

(MCGM), the Mumbai Metropolitan Development Authority (MMRDA), and the Maharashtra State Road Development Corporation (MSRDC). Local and neighbourhood roads tend to be the responsibility of the Municipal Corporation, while the MMRDA and MSRDC invest in the larger urban arteries such as the proposed elevated coast road from Sewri to Worli (MMRDA) and the Mumbai Trans Harbor Link (MSRDC). Sidewalks, footpaths, and skyways are similarly shared across the corporation and metropolitan agencies, with MCGM responsible for much of the legacy network while MMRDA has developed the system of skywalks more recently.

Several national highways developed by the National Highways Authority of India also run through the city and connect it to other urban areas in its economic catchment area (e.g. Pune and Nashik). Construction of roads in coastal areas also come under the purview of the Government of India Ministry of Environment and Forests' national regulations on coastal zones.

The MCGM, also known as the Brihanmumbai Municipal Corporation (BMC) also has primary responsibility for streetlights, clearing encroachments, and maintaining utilities under roads. It is also responsible for traffic management, in keeping with national guidelines for road standards and traf-

50 Rishi Aggarwal, Observer Research Foundation, contributed significantly to this text box.

fic furniture. An independent Traffic Management Unit was set up under the MCGM in 1999 as part of an effort to strengthen overall urban transport planning. It has the authority to coordinate traffic signals and routing, but its ability to coordinate investments in the road system and public bus services and, even more broadly investments in alternatives to road transport are not clear.

The bus system comprises three municipal-level services: the largest, the Brihanmumbai Electric Supply & Transport Undertaking (BEST), an autonomous agency formed when the BEST Company was 'municipalised' under the MCGM, operates buses through the metropolitan area including Navi Mumbai. The Navi Mumbai Municipal Transport (NMMT) also operates buses within Navi Mumbai as well as on routes connecting Navi Mumbai and Mumbai. The Thane Municipal Transport (TMT) operates its buses from Thane to outlying areas.

The suburban rail system is owned by Indian Railways and operated jointly by two zones (Western and Central). The Mumbai Railway Vikas Corporation Ltd. (MRVC), a joint venture of Ministry of Railways and Govt. of Maharashtra, was also formed in 1999 as part of the Mumbai Urban Transport Project for implementation of rail related projects to reduce congestion.

The MMRDA, chaired by the Urban Development Minister of Maharashtra, is the planning and nodal agency for Mumbai Metro project, although some aspects of development such as dispute resolution or cancellation of PPP contracts are under the purview of the Maharashtra State Government. The Metro is being developed in part as public-private partnership – the Mumbai Metro Transport Private Ltd (MMTPL), though more recent expansions may be under the engineering-procurement-construction (EPC) route. The metro will be operated by Mumbai Metro One Pvt Ltd (MMOPL), a joint venture company formed by Reliance Infrastructure, Veolia Transport and the Mumbai Metropolitan Region Development Authority (MMRDA).

Mumbai also has a number of NGOs and international non-profits working on transport-related issues that work with the government and citizen groups to provide expertise for particular projects, advocate integration in neighbourhoods and across modes, develop passenger information tools, and otherwise contribute to Mumbai's transport planning. The World Bank has also provided technical assistance on several projects and integrated transport plans.

In principle, the MMRDA has been the central point for coordination of Mumbai's transport strategy for the last decade. The 2002 Mumbai Urban Transport Project (MUTP) was led by MMRDA with support from the World Bank. The Comprehensive Transport

Strategy (CTS) developed under this project envisioned multi-modal coordination for the Mumbai region, so the UMTA was created by Executive Order in 2008 to be the nodal agency for coordination. It operates as a department of the MMRDA and relies on the Development Authority as its administrative and technical Secretariat. As of January 2013, a law was being drafted to establish the UMTA as a separate agency with its own staff.

There UMTA does not appear to have the powers to coordinate with other regional development agencies involved in transport. It is a state-level agency, while the BMC and other bus operators report to the Municipal Corporations. The Additional Chief, UMTA of MMRDA (Mrs. K. Vijaylakshmi) described some of the challenges in detail at a November 2011 public meeting:⁵¹ The metro- and mono-rail projects have been planned keeping in mind links to the suburban railways, but the project has grown significantly. Plans for a multi-modal corridor from Alibag to Virar, have also been generated. However, implementation of the BRTS for the Western and Eastern Express Highways had been deadlocked due to problems with inter-agency coordination: 'MMRDA has already completed the Detailed Engineering Report (DER), but as the BRTS is under the jurisdiction of MSRDC, BEST and BMC, MMRDA is unable to work on it,' she said. Traffic management, a part of the overall transport strategy, is meant to be undertaken by the BMC and other Municipal Corporations. There are also challenges in coordination with other state agencies such as the RDC and the state-national joint venture MVRC concerned with suburban rail.

51 Observer Research Foundation (2012). 'Moving People, Not Cars,' Report on a November 12, 2011 Roundtable organised with EMBARQ. Available at <http://www.observerindia.com/cms/sites/orfonline/modules/report/ReportDetail.html?cmaid=31442&mmacmaid=31443>, accessed June 30, 2012.

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6. **TRANSPORT DEVELOPMENT IN THE NORTH EAST**





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6. TRANSPORT DEVELOPMENT IN THE NORTH EAST

It is now well acknowledged that the economic and human potential of India's North East region (NER) is severely constrained due to its transport infrastructure deficiency. The Central and state governments are now jointly focused to build infrastructure in the region.

Certain key initiatives of the government, such as the 'Look East Policy' and the North East Industrial and Investment Promotion Policy (NEIIPP), 2007, and the NER Vision 2020 released in 2008, are efforts in the right direction but these will have to be shored up by concerted efforts. Despite Plan investments in the past, infrastructure development in the North East has been poor, which has also been noted by the NER Vision document as the single biggest constraint to accelerated growth. The region is characterised by grossly underdeveloped transport linkages that have sequestered and isolated the region not only from the rest of the country and the world, but also within itself.

NTDPC is placing a special focus on transportation in the North East in view of its unique problems of isolation from the rest of the country, which arose as a consequence of the Partition in 1947. Prior to Independence, the North East was organically connected with the rest of India through what is now Bangladesh, and to the East to Burma (now Myanmar). Even then, the state of both road and rail infrastructure left much to be desired, but the situation was much better than it is now, with the land connection with the rest of India only through the slender 27-km wide Siliguri 'chicken's neck' corridor. With the closing of borders, access to Chittagong port also got severed, cutting the region off from sea routes.

In effect, the market and centres of productivity in the North East got separated by a political dividing

line, which has had severe repercussions on the livelihood of people in the whole region.

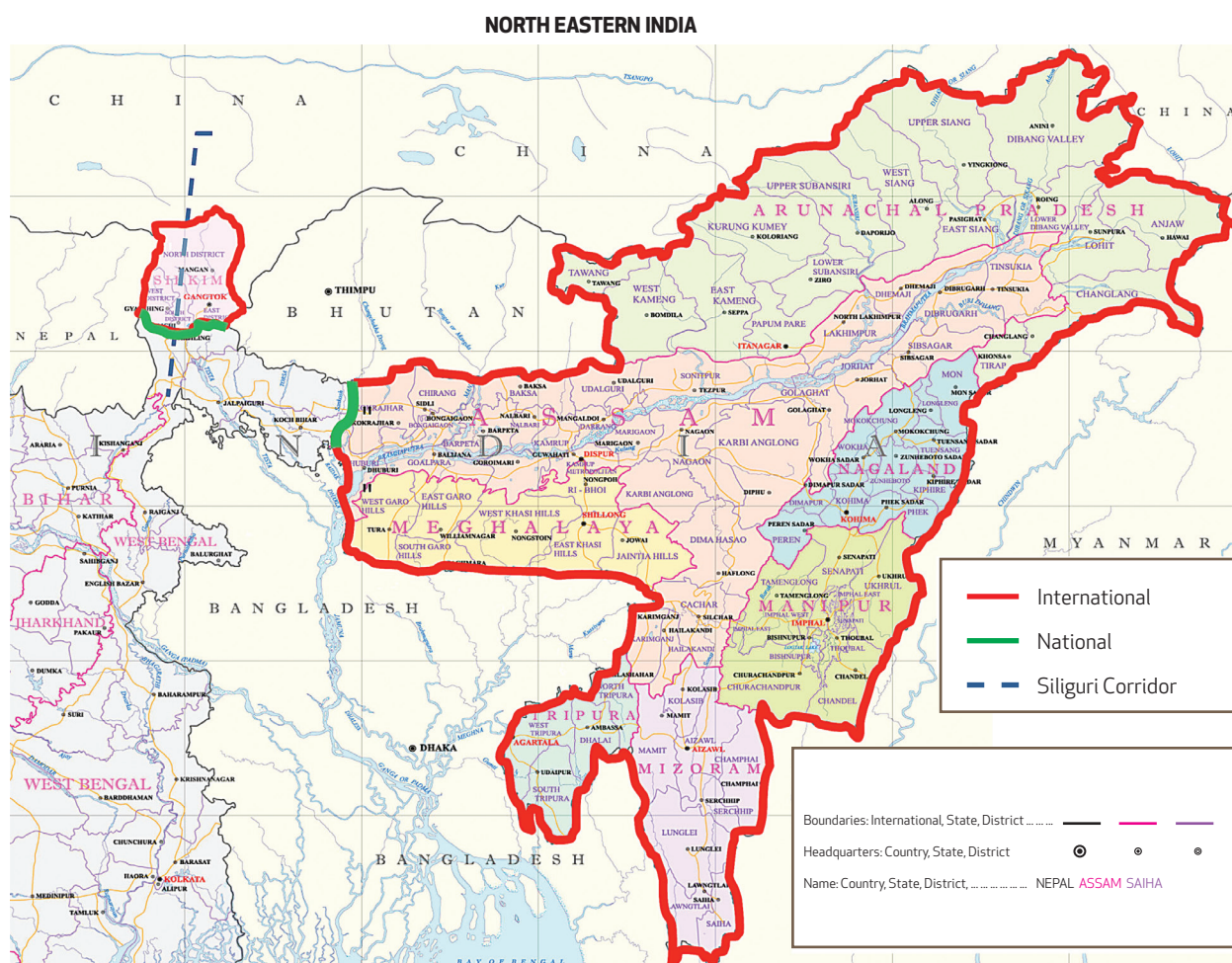
Today, the entire boundary of NER (96 per cent) is an international border shared with China and Bhutan in the north, Myanmar in the east, Bangladesh in the south and west, and Nepal to the west of Sikkim. The geopolitical distancing of the region from its main markets and trade gateways led to economic insulation and caused immense structural damage to the NER economy.

Table 6.1 shows the international boundary that the NER shares with neighbouring countries.

Historically, undivided Bengal and the NER were an integrated market with active roads, railway tracks and waterways crisscrossing the region. Global trade was conducted through the sea route, a network of inland waterways, and land transportation through road and railways. In fact, the network between Dibrugarh and Chittagong was one of the earliest railway projects in India (commenced in 1884) implemented by the British.

Some of the more important commodities were tea and timber. The tea industry in Assam depended on Chittagong port to export its produce and import raw materials such as coal used as fuel to dry tea leaves. As the tea industry grew, these rivers became important carriers of trade. With Partition, the industry was severely hit as Chittagong became a part of

Figure 6.1
The North East



Source: NTDPC (Base Map: Ministry of Development of NER)

East Pakistan. Railway links with places presently in Bangladesh upto Akhaura, Belonia, Mahisashan were also snapped. The lines connecting Siliguri in North Bengal to Kolkata and Assam to Chittagong were severed. The whole Assam Railway was cut off from the rest of the Indian system. These lines carried almost all freight traffic from these regions.

By 1950, India reconnected Assam to the rest of the country's rail network by building a more than 200 km metre-gauge rail link through the Siliguri corridor. However, the tea chests from Assam's gardens were now required to be carried over a much longer distance to reach Kolkata port. Any possible option of exporting tea via nearby Chittagong was completely eliminated after India's 1965 war with Pakistan.

The North East, which has been innately rich in natural resources, was doing well economically till Partition. In fact, on the eve of Independence, per capita income of the state of Assam was higher than the country's average. This remained so even during the 1950s and 1960s, perhaps since India and Pakistan initially agreed to allow cross-border traffic that kept transportation routes alive. The trend started show-

ing a reversal in the 1980s as an after effect of the 1965 Indo-Pak war that completely snapped the links, and the variance has only grown deeper thereafter.

It is for all these reasons that NTDPC decided to commission a special Working Group on the North East as part of its overall strategy for transport development in the country. Moreover, given the terrain of the North East, and the special role of inland waterways, it is essential that a more organised strategic, long term intermodal view be taken for developing transport in the region. Recent political developments leading to the opening of Myanmar, and renewed discussions with Bangladesh, also suggest that a long-term strategic view be taken to intensify international transport linkages from the region. Chapter 13, Volume II, on Promoting International Transport Connectivity between India and the South and South East Asia Regions further emphasises the importance of opening these intra-regional transport connections.

THE NER TODAY: DISTANT AND REMOTE

The NER today is relatively disconnected with the progress made by the country in the last several

Table 6.1
State-wise Length of International Border of NER
[in Km]

STATE	BANGLADESH	BHUTAN	CHINA	MYANMAR	NEPAL	TOTAL
Arunachal Pradesh	0	217	1,080	520	0	1,817
Assam	263	267	0	0	0	530
Manipur	0	0	0	398	0	398
Meghalaya	443	0	0	0	0	443
Mizoram	318	0	0	510	0	828
Nagaland	0	0	0	215	0	215
Sikkim	0	32	220	0	97.80	350
Tripura	856	0	0	0	0	856
Total	1,880	516	1,300	1,643	98	5,437

decades. The region's economy is generally characterised by low per capita income, limited industrialisation, inadequate infrastructure facilities, geographical isolation and communication bottlenecks, lack of private and foreign direct investment and a high unemployment rate among the relatively better educated people. However, the literacy rate in the region at 68.5 per cent, with a female literacy rate at 61.5 per cent, is higher than the country's average of 64.8 per cent and 53.7 per cent, respectively (Census of India, 2011).

Income levels in the region are now lower than the national average by over 30 per cent. A quick comparison between the NER states and India (see Figure 6.2) in terms of compounded annual growth rate of Gross State Domestic Product (GSDP) during 2004-05 to 2010-11, shows that while India grew at greater than 8 per cent, NER grew far less rapidly.

While the economy of the region is a matter of overall concern, its sectoral composition may also need to be examined carefully. As in the rest of India, there has been a decrease in the contribution of the primary sector and its subsectors in NER, which has largely been compensated by an increase in the tertiary sector. The contribution of the secondary sector has remained more or less constant. The region exhibits a trend of transformation where primary is not replaced by the secondary but by the tertiary (see Figure 6.3). Understandably, the region has to depend more on the tertiary (or services) sector due to lack of industrialisation/ manufacturing. One of the important reasons for limited industrialisation is the region's acutely constrained transport linkages which in turn negatively impact market access and trade.

In fact, even for the tertiary sector to continue playing the important role that it plays today, strengthening infrastructure will be vital, as tourism, which is an integral sub-sector, is largely driven by the qual-

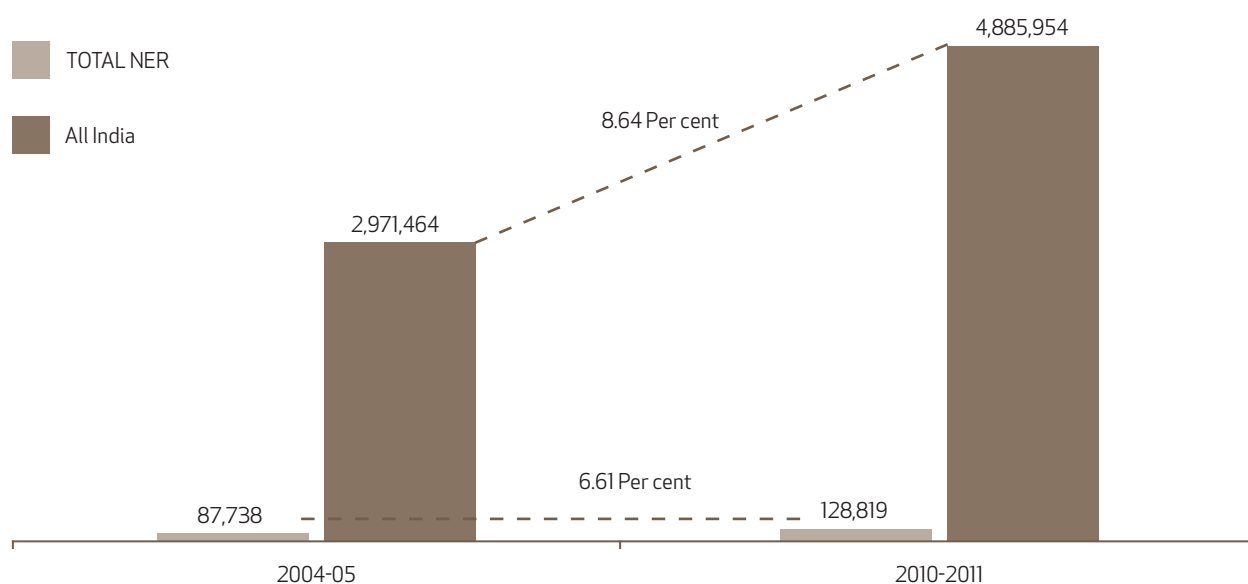
ity of infrastructure. The infrastructure deficit is today one of the biggest constraints to the economic growth of the region. Poor density of road in most states in the NER (Figure 6.4) and scant rail transportation within the region has not only hampered mobility but also hindered the development of markets. The traditional transportation routes through inland waterways have become virtually non-functional after Partition and although the agreement with Bangladesh allows the transportation of goods, these routes have become inactive. The region is also poorly linked by air, and sea routes have been blocked.

Improving intra-regional transport links will promote links with the rest of India, enabling movement of people and commodities. It will establish national reassurance that would help break mental barriers and encourage people from rest of India to travel and invest.

The development strategy for the NER will have to be built specifically around the primary and service sector. Inherent potential for horticulture, floriculture and plantation crops needs to be exploited, while facilitating tourism in the hilly areas can unlock further potential. Undoubtedly, transport infrastructure for faster and efficient evacuation of primary goods such as tea, jute, bamboo, minerals, oil etc is urgently required. Providing this will give the people a sense of participation in the Indian growth story.

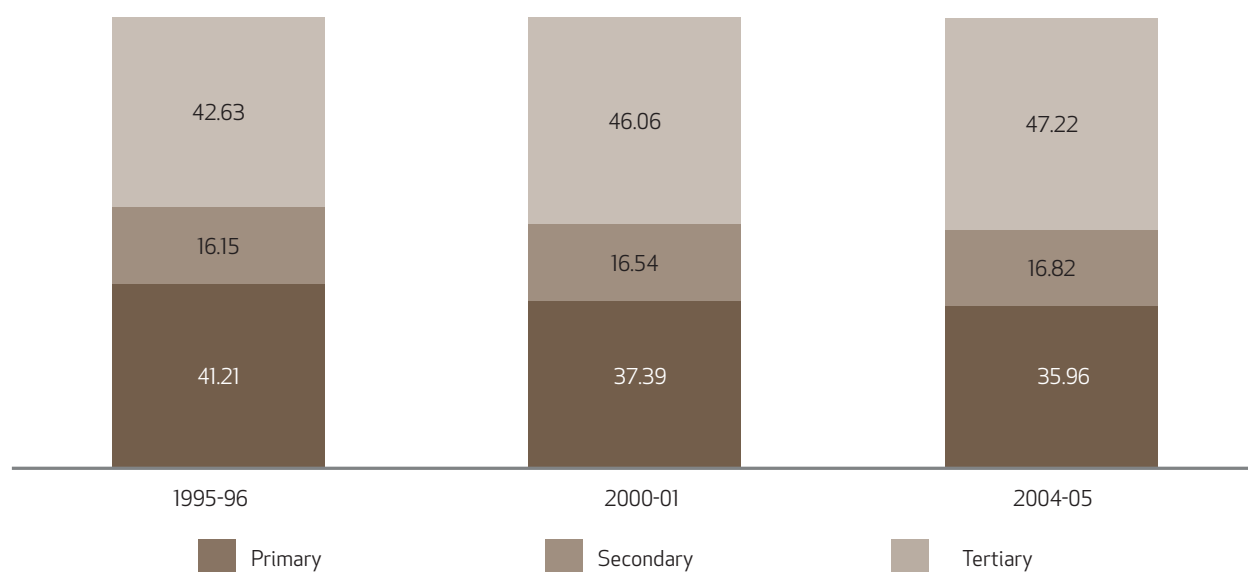
Whereas a series of measures and infrastructure projects have been initiated to improve transport linkages with the NER and to plug it back into the mainland India, the problems of poor governance and limited institutional capacity remain a grave concern. The uneasy relationship with most of the neighbouring countries has also not helped the cause of development of the region. With a large part of the boundary forming difficult international bor-

Figure 6.2
Comparative Economic Growth(GSDP): NER and India (2005-2011)



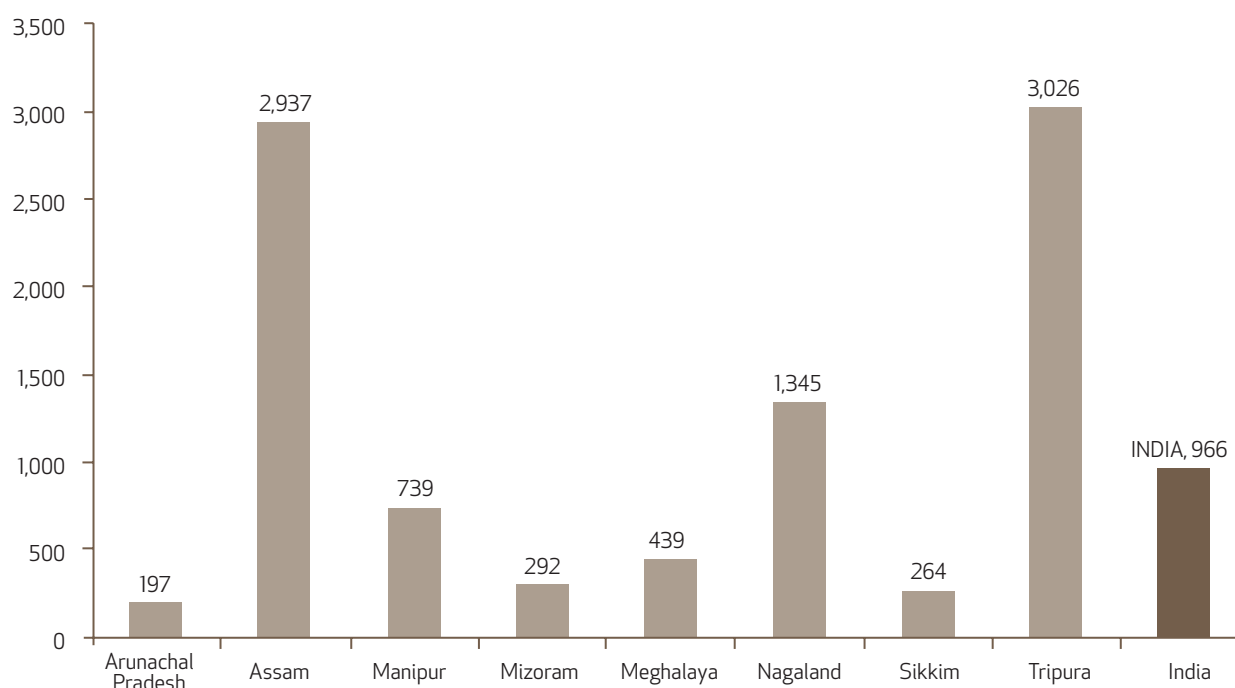
Source: Ministry of Development of NER (MDoNER)

Figure 6.3
Structural Change in the NER Economy- Sectoral Composition of GSDP
 {PER CENT]



Source: NER Vision 2020

Figure 6.4
NER vs National Road Density, 2008
 (Route Km/'000 Sq. Km)



Source: PwC report of Jan. 2013, 'India's North-East Diversifying Growth Opportunities (data provided by TRW, Ministry of Road Transport & Highways)
 * Excludes roads constructed under JRY and PMGSY

ders, private investment has shied away. Further, the quest for ethnic and regional identity led to numerous insurgencies. Needless to say, the long historic turmoil and the consequent socio-economic repercussions have had a deep impact on the psychology of the people of NER.

THE IMPORTANCE OF NER

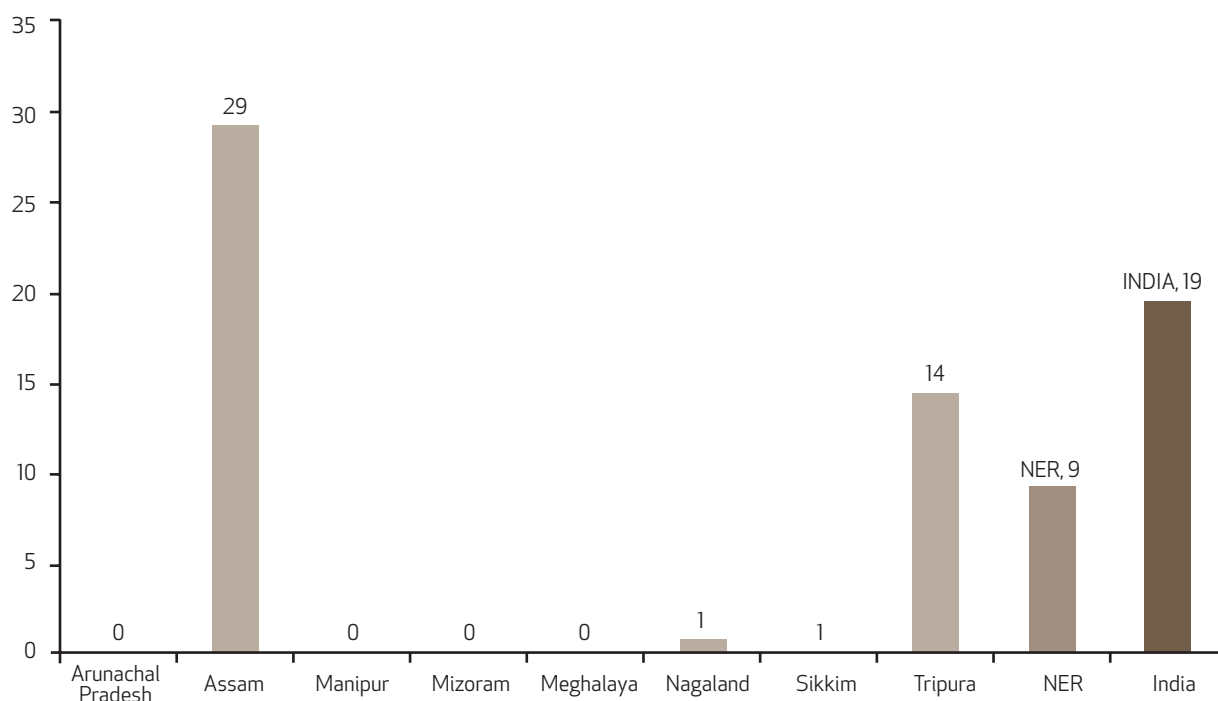
The world is looking to engage with the emerging economic hotspot, the East, and it is in North East India that South-East Asia begins. Most urgent and strategic interventions are required for the NER to play the arrowhead role for India. Transport infrastructure will be vital to strengthen integration within the region, and with the rest of the country, and also for India's increased integration with the South East in the future. Improving transport connectivity shall have to be the foremost priority for social and economic mobility and market integration. Whereas inter-regional, intra-regional and regional connectivity to mainland India is necessary, critical to improving connectivity are issues of diplomacy and an improvement in border infrastructure and trade facilitation with neighbouring countries.

The NER needs to be integrated back to the national mainstream to prepare it for the strategic role it is expected to play going forward and the region has

the potential for generating quick economic returns. Improving connectivity is the most important measure for the resurgence of the NER. Transport links shall help development of markets, reduce exploitation by middlemen, and in the process improve livelihoods of people in remote areas by enabling them to market their products at higher prices, while also promoting awareness and harmony among states. The economy of the region is still primarily agrarian with the industrial sector having mainly grown around tea, petroleum [crude], natural gas, mining and steel fabrication, but not quite close to its full potential. Due to inadequate industrial growth, the vast resource base available remains unexploited and the pressure for employment is on the service sector. Transport links can help ease out the undesirable pressure by promoting more balanced growth.

The contribution of NTDPDC becomes all the more relevant as the NER presents natural characteristics that make it imperative for more organised inter-sectoral planning for transportation in the region. It is remote from the rest of India; several areas feature difficult hilly terrain; it also has many rivers, which can permit significant inland water transport options, but also contribute to difficulties in engineering transport infrastructure; it has a long border with neighbouring countries which increases the importance of transport infrastructure from a

Figure 6.5
State-wise Rail Density in the NER, 2009
 (Route Km/'000 Sq Km)



Source: PwC report of Jan. 2013, 'India's North-East Diversifying Growth Opportunities (Rajya Sabha unstarred Question No. 1467, dated 06.08.2010)

strategic and security viewpoint; and it consists of eight states, each of which has its own requirements and priorities.

THE LOOK EAST POLICY

The broad strategy should be to promote ties of the NER with its immediate neighbours in the short term, while looking beyond its borders to tap into the benefits of India's burgeoning trade with the ASEAN bloc in the longer run. Myanmar, now a member of ASEAN, has become a crucial link between India and ASEAN countries. Political leaders from Bangladesh, USA, South Korea and Britain have already made their forays into Myanmar. India, despite having a geographic advantage, has been rather languid in its approach and certain initiatives have only begun to show recently. The North East, specifically Manipur, and the border town of Moreh in particular, can be the centre of a thriving and integrated economic space linking two dynamic regions with a network of highways, railways, pipelines, and transmission lines crisscrossing the region. Moreh has traditionally been the trading hub with Myanmar and presents vast potential to become a major export centre from India for the South-East Asian region. Another big project already under way is designed to turn the Kaladan River into a shipping route, linking Mizoram to Myanmar's port of Sittwe, which India is helping develop. Expediting the same while systematically creating econom-

ic opportunities by bringing together industry and people in well-planned localised areas, with adequate enabling infrastructure, is the need of the hour.

Bangladesh, again, has to be an integral part of any transport strategy for the NER. Ingress to Chittagong port and opening up of the inland water route could lead to economic resurgence of the region. In fact, Tripura in the NER is just about 75 km from the Chittagong and could therefore become an important gateway for India to East Asian countries. Such unblocking of trade routes would be in mutual interest and boost confidence on either side. The existing high tariffs on Bangladesh imports and the lack of border trade infrastructure that has limited trade to the informal variety could also then potentially convert to formal border trade between the NER and Bangladesh. At the same time, Bangladesh could have access to Indian markets by enabling free trade in the land routes, which would mitigate its unfavourable balance of trade with India considerably.

Similarly, India needs to leverage on the ambitious Trilateral Highway Project which is an example of triangular road diplomacy between India, Myanmar and Thailand; inter-linking the Indian Ocean with the South China Sea. While the Asian Highway is being built along planned routes to cover a wide spectrum of road network in the NER, much more needs to be done by the Indian government to make the road functional. The Asian Highway needs to

be integrated with other critical projects that are envisaged to be completed as part of the Look East Policy such as the Kaladan Multimodal Transit Project and Trans-Asian Railways. *It is with this backdrop, to unlock NER's economic and human potential and make it an integral partner in India's economic development that provision of integrated and robust transport infrastructure within, to and from NER becomes very significant. This coupled with the strategic implications and the need to reduce physical and mental distances, a separate discussion on transportation issues and strategy for the NER becomes indispensable.*

OVERARCHING TRANSPORTATION ISSUES FOR THE NER

Most of the area in the region is hilly and undulating with low population densities except the plains of Assam, parts of Tripura and valley areas of Manipur. Rail connectivity in such terrain is not only time-consuming but would need huge investments. It is road connectivity which would play a dominant role in fulfilling the transportation needs of the public. Air and inland water transport will play a role for a limited segment of people and goods. Before analysing the four transportation sectors, some common issues cutting across different sectors are discussed here.

NORTH EAST IS A COMPACT REGION

Transport planning has to be done at three levels— intra-regional, with the rest of India and connectivity with the international neighbours and beyond for South Asia, South East Asia and China.

MULTI-MODAL TRANSPORT PLANNING

Regional solutions for intra-regional movement of goods and passengers, connectivity with the rest of India and international connectivity have to be planned in an integrated manner. At present, there is hardly any inter-sectoral planning amongst the four transport infrastructure sectors—road, civil aviation, rail and inland waterways. Even at the beginning of the 12th Plan, such an approach has not been undertaken.

INSTITUTIONAL SUPPORT

Institutional support for multimodal planning of transport and to give implementation and technical support, particularly to the road sector, is necessary after discussions with key stakeholders.

CROSSING THE BRAHMAPUTRA

The 890-km length of Brahmaputra from Dhubri to Sadia has at present only three bridges across it to connect areas on its either side. Two more are under construction. The three existing ones are the Saraighat road-cum-rail bridge at Guwahati; the Tezpur-Kolia Bormora Setu, connecting Sonitpur with Nagaon district; and the Jogighopa-Naranarayana rail-cum-road Setu. The two bridges under con-

struction are the Bogibeel rail-cum-road bridge; and the Dholasadia road bridge, both of which will facilitate connectivity between Assam and Arunachal Pradesh. These five bridges are grossly inadequate both from a security standpoint as well as to serve general commutation.

CONNECTIVITY BETWEEN STATE CAPITALS AND THE REST OF INDIA

Various state capitals are at present connected only by one road (rail connectivity for five of them has yet not become operational) which often leads to bottlenecks, both man-made and natural. The land connectivity of the NER with the rest of India is through a 27-km-wide corridor (21 km at its narrowest) often referred to as the Chicken's Neck. This poses serious bottleneck to capacity creation in the region.

INFRASTRUCTURE FOR INFRASTRUCTURE

Investments in infrastructure in the NER has increased exponentially since the 10th Plan and is likely to continue in the 12th Plan. But all construction agencies are beset with problems of accessing construction material, poor quality of roads and unavailability of rail links. A well-thought-out strategy to sort out the problem is imperative.

USE OF APPROPRIATE TECHNOLOGY

building of quality infrastructure has undergone tremendous change across the globe. Better standards of road building to match those in the neighbouring Malay Peninsula which receives equal or even higher volume of rainfall need to be introduced while also exploring/ developing innovative construction techniques.

MAINTENANCE OF TRANSPORT ASSETS

Heavy and incessant rainfall over six to eight months, and lack of generation of resources by state governments cause poor maintenance of assets. Expansion in the road network would further require greater share of states' resources for maintenance.

PUBLIC INITIATIVES FOR THE NER

Public investment in the transport sector has to be seen within the overall perspective of the Union Government with respect to the NER. The North Eastern states receive special consideration in terms of allocation of Plan funds and other facilitating interventions:

SPECIAL CATEGORY STATES

Recognising the special requirements of the region and the need for significant levels of government investment, the North Eastern states have been categorised as Special Category states and Central Plan assistance to these states is provided on liberal terms. For the NER, the per capita level of Central assistance is amongst the highest in the country.

Table 6.2
Flow of Plan Funds to NER: 11th Plan Period
(Rs billion)

(Annual Plan / Revised Estimates)

SOURCE OF FUNDING	2007-08	2008-09	2009-10	2010-11	2011-12	TOTAL
From Planning Commission (State Sector approved outlays of NE States including ACA/SPA)	113	147	177	210	250	897 (49.3)
From NEC	6	6	6	7	7	32(1.78)
From Ministry of DoNER (NLCPR Scheme)	6	6	7	8	8	35 (1.95)
Central Ministries / Departments	129	148	162	198	217	855 (46.98)
Total	254	309	352	423	482	1818

Figures in () are Percentage

10 PER CENT MANDATORY EARMARKING OF FUNDS FOR NER

In order to mobilise financial resources, a policy decision was taken in 1996 to earmark at least 10 per cent of the Plan Budget(s) of the Central ministries/ departments for development of the North Eastern states. Now, 52 ministries/departments earmark 10 per cent of their Gross Budgetary Support (GBS) for the NER.

NON-LAPSABLE CENTRAL POOL OF RESOURCES

The Non-Lapsable Central Pool of Resources (NLCPR) created in 1997-98 (operationalised in 1998-99) is the accrual of the unspent balance of the mandatory 10 per cent budgetary allocation of the ministries/departments. The broad objectives of the NLCPR Scheme is to ensure speedy development of infrastructure by way of filling the existing infra-structural gaps (economic and social) in the region by making funds available from the pool.

LIBERAL PLAN FUNDING NORMS

NER States have a weak financial base and limited scope to raise additional resources due to their small size, remoteness, terrain and internal fund raising constraints. They are, therefore, unable to contribute the states' share as per the norms of the Centrally Sponsored Plan Schemes of the ministries/departments of the Union Government. Hence, funding norms of Centrally Sponsored Schemes have been progressively liberalised for the North Eastern states. The states' contribution to Centrally Sponsored Schemes now range generally between 10 and

20 per cent, whereas for other states it is between 20 and 50 per cent.

LIBERAL NORMS FOR EXTERNALLY AIDED PROJECTS

Being special category states, the loan burden from externally aided projects is shared by the Central Government and Special Category States in the ratio of 90:10.

SETTING UP OF MINISTRY OF DONER

The Department of Development of North Eastern Region (DoNER) was set up in 2001 to coordinate and give impetus to the Centre's development efforts pertaining to socio-economic development of the region. It was converted into a Ministry in 2004.

The North Eastern Council, Shillong, set up in 1971, is under the administrative control of the Ministry of DONER.

SPECIAL PACKAGES FOR NER

The Central Government has also been announcing special packages for socio-economic development of the NER from time to time.

TAX CONCESSION IN NER

Including Direct Tax The Income Tax Act has special concessional provisions for NER.

Apart from these special provisions, heavy public investment is being made in the NER for infrastructure. Table 6.2 provides a snapshot of investments

made in the NER by the Union Government in the 11th Plan period.

Overall, a steady flow of funds and a facilitating infrastructure of policies and schemes have been created for the NER by the Union Government. While these efforts may certainly be praiseworthy and helpful, a broad review of specific transport infrastructure challenges that the region presents is necessary to appreciate the need for still greater and incisive interventions. Detailed sectoral discussion is taken up in the subsequent section.

ROADS

Roadways are the backbone of transport and communication in the NER, primarily due to terrain and sparse distribution of population. In fact, water and road transport have always been the primary modes to move people and freight. Rail and air are rather recent phenomena.

Initially, there were just unmetalled mud roads while the only wheeled means of transport was the bullock cart. People covered distances mostly on foot. Rivers like the Brahmaputra, the Barak, the Gomati, the Haora and the Manu were navigable by boats. Around the 16th century, King Nar Narayana of Koch Bihar got an embanked road constructed from the capital in Koch Bihar to Narayanpur near Lakimpur in Assam which was a distance of nearly 350 miles. Later, reasonably extensive economic infrastructure was built up during the Ahom rule in the forms of embankments around the Brahmaputra and its tributaries. The embanked road built on the south bank of river Brahmaputra linking upper and lower Assam facilitated movement of troops, people and transportation of goods. It also protected rice fields from floods. Unfortunately, many of such vital public works were damaged, and even destroyed during the Burmese invasion in the early 19th century.

Around 1833, an important road was constructed linking Imphal, capital of Manipur, with Silchar in British India. The construction was a joint venture of the British and Manipuri government. The road became the vital channel of flow of goods and movement of people and livestock between Cachar (in Assam) and Manipur. In 1868, the department of Public Works was established. A road board was constituted in 1926-27. By 1929, the length of metallic roads went up to 565 miles while kaccha (earth) roads measured more than 4,000 miles. By 1937-38, the length of metallic roads increased to more than 700 miles while the total road length went beyond 5,000 miles. The construction and maintenance of roads achieved great significance during the Second World War, following the advance of Japanese forces near Assam.

However, a majority of important road links which had become the lifelines for the region were suddenly rendered inactive with Partition in 1947. During the last 60 years of Indian independence, while roads have been built in the region, road transport connectivity is still wanting. The inadequate pace of road development in the NER, exacerbated with even lesser focus on planned development, has been an area of concern for the government. In 2005, a mega road programme, titled Special Accelerated Road Development Programme in North East (SARDP-NE) was initiated. The main objective is to link the state capitals and district headquarters in the NER with double lane National Highways (NH) or State Roads to the existing NH network. The programme thus includes improvement, upgradation or construction of National Highways and State Roads. In order to expedite the process of sanctioning of projects, a fast track procedure through a high powered committee under the chairmanship of Secretary, Road Transport and Highways, has been set up with special powers.

Some of the key projects/schemes initiated for planned development of roads across the NER are discussed below.

MAJOR PROJECTS/ SCHEMES

The political leadership and public have long recognised an increasing need to build adequate and quality roads connecting the NER internally and to mainland India. However, the overall road density of the region still remains below national average.

SPECIAL ACCELERATED ROAD DEVELOPMENT PROGRAMME FOR NORTH EAST (SARDP-NE)

This programme envisages providing road connectivity to all the district headquarters in the NER by minimum two-lane highway standards apart from providing road connectivity to backward and remote areas, areas of strategic importance and neighbouring countries. The programme is planned in two phases, including the Arunachal Package covering about 10,141 km.

This is by far the most ambitious road development programme for the NER. NHAI, state PWDs and the Border Roads Organisation (BRO) are the implementing agencies. The objectives are as follows:

- Upgrade National Highways connecting state capitals to two/four-lane
- To provide connectivity of all 88 district headquarter towns of the NER by at least two-lane road
- Provide road connectivity to backward and remote areas of the NER
- Improve roads of strategic importance in the border area
- Improve connectivity to neighbouring countries

Table 6.3
SARDP-NE

PHASE A	ARUNACHAL PRADESH PACKAGE	PHASE B	TOTAL
4,099 km	2,319 KM	3,723 KM	10,141 Km • National Highways 4,798 Km (47 per cent) • State Roads 5,343 Km (53 per cent)

Table 6.4
Progress of SARDP-NE, February 2013

ITEM	PHASE A	ARUNACHAL PACKAGE	TOTAL
Total Length	4,099 km	2,319 km	6,418 km
Works Sanctioned/ Awarded	3,771 km	1,332 km	5,103 km
Works Under Tendering/ Approval	388 km	79 km	467 km
Works Under Tendering/ Approval	388 km	79 km	467 km
Roads Completed	1,062 km	40km	1,102 km
Target for Completion	March 2015 (for ongoing works)	June 2016 (for awarded length)	

Source: MDoNER

The lengths to be constructed /upgraded and their coverage in phases have repeatedly undergone changes due to intermittent request from state governments and other quarters. Table 6.3 and 6.4 show the components and the progress of SARDP-NE as of February 2013.

The development status as per the most recent update is,

- Detailed Project Reports (DPR) are under preparation for about 13 per cent of the proposed roads for Phase A and the Arunachal Package.
- About 10 per cent (1,102km) of the total length has been completed
- Phase B is approved only for DPR preparation and not investment.
- In 2012-13, 300 km are expected to be constructed and 1,980 km awarded.

Overall progress has been quite slow, with largely pre-construction activities being undertaken as of now. Given the pace, SARDP-NE is expected to be completed not earlier than 2020. Figures 6.6 and 6.7 show roads under SARDP-NE for Arunachal Pradesh and the East West Corridor respectively.

EAST WEST CORRIDOR

Apart from SARDP-NE, the NHAI is implementing the four-laning of 672 km of the East West Corridor from Srirampur (Assam/West Bengal border) to Silchar in Assam, and the two-laning with paved shoulders from Jowai to Rattecherra (104 km) in Meghalaya under NHDP-III. The corridor is estimated to be completed by December 2014.

PRADHAN MANTRI GRAM SADAK YOJANA (PMGSY)

PMGSY, a flagship programme of the government being implemented and monitored by the Ministry of Rural Development, takes care of rural connectivity and has specific provisions to take care of the sparse population and hilly terrain of the NER and border blocks. For the in-between roads, Major District Roads (MDR), Other District Roads (ODR), inter-state roads and other urban roads, there are funding windows through different ministries.

Table 6.5 presents the progress as of February 2013. By February 2013, 11,996 habitations out of the total 17,486 eligible have reportedly been sanctioned, while 9,511 (54 per cent) of the habitations have been

Figure 6.6
Roads Covered for Improvement in Arunachal Pradesh under SARDP-NE

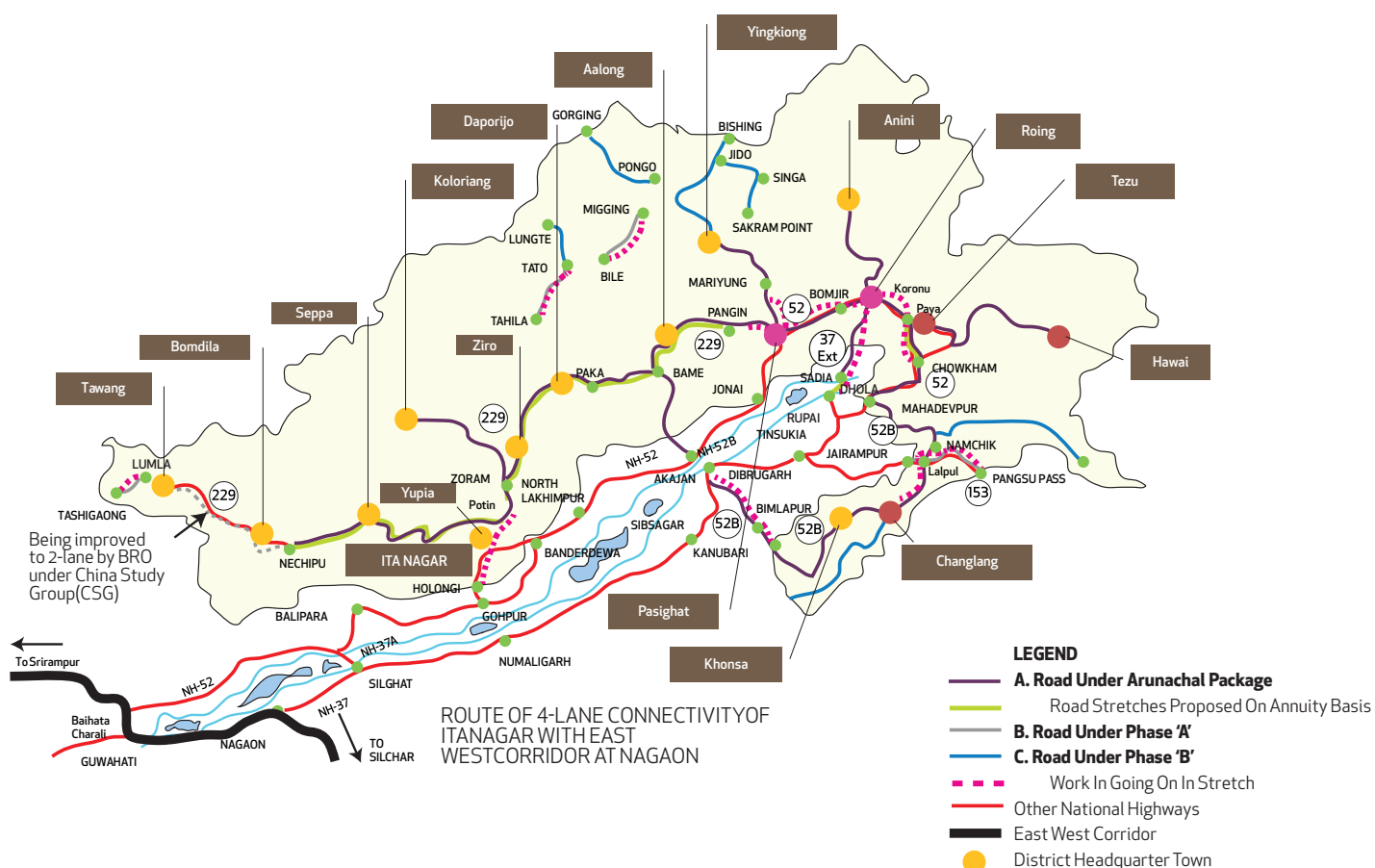


Figure 6.7
East West Corridor: Existing Roads Being Upgraded to 2-Lane or 4-Lane

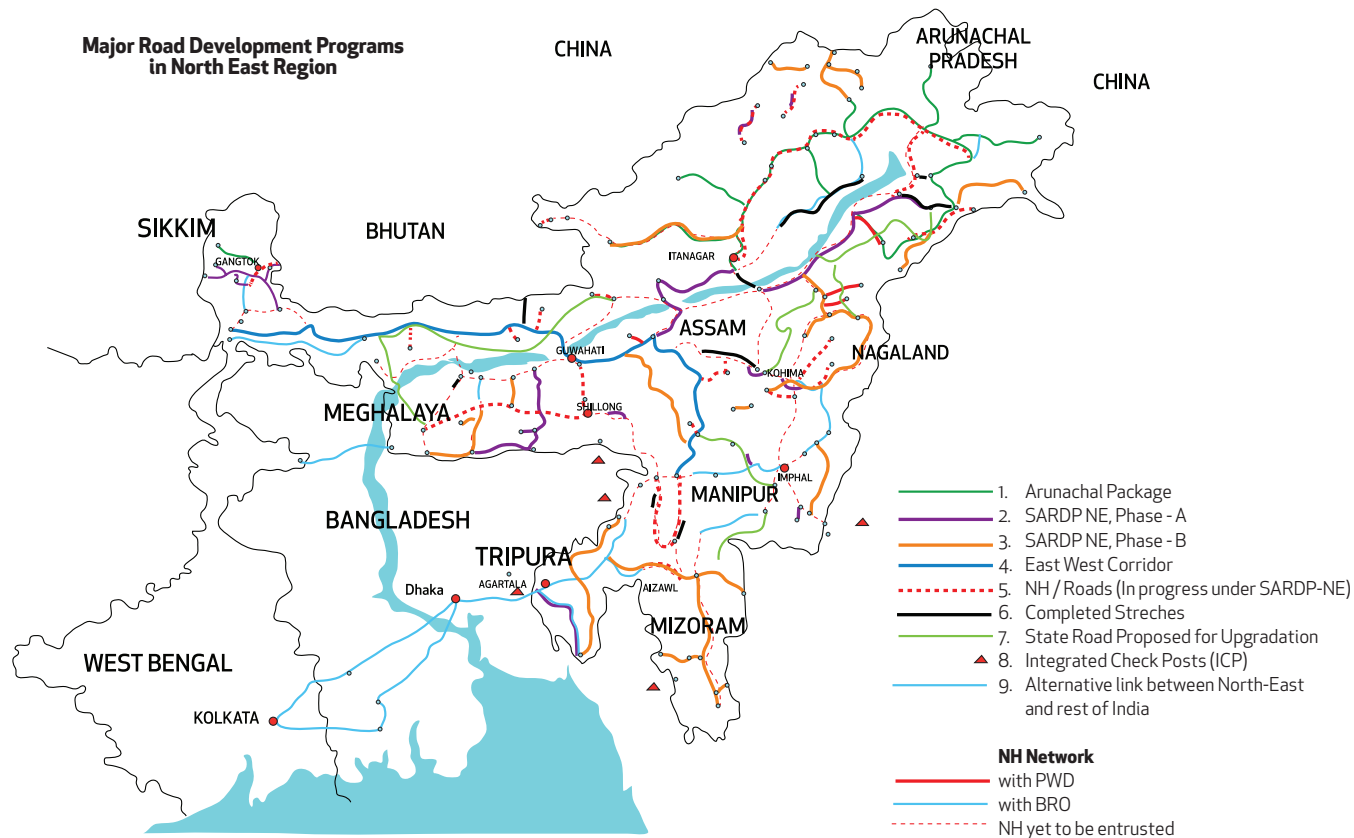


Table 6.5
Pradhan Mantri Gram Sadak Yojana in the North East, February 2013

	ELIGIBLE	DPRs CLEARED	CONNECTED
No. of Habitations	17,486	11,996	9,511 (54 per cent)
		SANCTIONED (UPTO FEB 2013)	COMPLETED (UPTO FEB 2013)
No. of Road Works		9,401	6,679 (71 per cent)
Length of Road Works (in km)		39,674 Km	31,236 Km (79 per cent)

Source: MDoNER

connected. PMGSY is expected to connect all the remaining eligible habitations by 2020.

DEVELOPMENT STATUS

The road network per capita is significantly higher in the NER relative to the rest of the country, given the hilly terrain and the low density of population. However, a more accurate indicator of the ease of movement of passenger and freight traffic, the road length per unit area, is higher only in Assam, Nagaland and Tripura, and not in the other hill states. It is again easy to conclude that road infrastructure is still relatively deficient in the NER states.

NATIONAL HIGHWAYS

While overall road density (km/100 sq km) of the region may be lower than the national average, the length of National Highways in the NER for a given area as well as population, is much better than rest of India (Table 6.6).

The progress and latest available status for some of the major programmes for NH development is placed in Table 6.7.

STATE HIGHWAYS, INTER-STATE ROADS, MDRS & ODRS

These are financed from a wide variety of projects and schemes of different ministries/ departments and the states' Plan funds. Many of these roads are not new alignments but existing roads that have deteriorated, requiring necessary maintenance and upgradation. As availability of funds for maintenance is considerably poor, maintenance being a non-Plan activity, existing roads are improved under Plan funds. This issue has been discussed later in the chapter.

STRATEGIC AND BORDER ROADS BY BRO AND OTHER AGENCIES

The Government of India has also embarked on an ambitious plan to construct strategic roads in border

areas on the Bangladesh, Bhutan, China and Myanmar border in the About 9,302 km of roads are being constructed for strategic reasons by Department of Border Management.

This will greatly add to the stock of roads in the NER and serve the needs of the local population in addition to strategic needs. For obvious reasons, the details are not discussed here. However, it is recommended that the present organisational shortcomings afflicting the Border Roads Organisation which plays a very major role in the NER should be addressed by the Government at the earliest.

Overall, while major road programmes are being undertaken in the NER, the pace is a concern. The completion of these, particularly SARDP-NE and the East West Corridor, will significantly improve the quality of road connectivity. At the same time, PMGSY implementation needs a significant push.

KEY ISSUES

While substantial investments for roads have flowed into the region, issues such as road network planning, maintenance, creation of human capital, augmenting machinery, and process improvement have not received required attention. The emphasis has largely been on sanctioning new roads, neglecting maintenance of the existing ones, an undesirable situation further exacerbated by the languid approach often leading to serious time and cost overruns.

The need to establish a connection with the rest of India following Partition, the Chinese aggression, economic development, and trans-border connectivity are some of the main drivers which have been impelling the Central Government to construct roads in the region since Independence. However, impediments such as terrain and climatic conditions, insurgency, and mismanagement of resources have been key constraints.

Table 6.6
National Highways: The North East and All-India

TOTAL NH LENGTH	76,818 KM	
IN NE STATES	9,525 KM (12.40 PER CENT)	
	ALL INDIA	NE REGION
Km /1000 sq.km	23	39
Km / Million population	75	600

Table 6.7
National Highway Development Programme (NHDP)-I,& III

PROGRAMME	STRETCH	LENGTH	STATUS
NHDP-II (NHAI)	East-West Corridor (only in As-sam, from Shrirampur to Silchar)	670 Km	Completion likely by March, 2014 after many missed deadlines
NHDP-III (NHAI)	Jowai (Meghalaya)/Ratachhera (Assam Border)	102 Km	Work awarded in March, 2012

RECOMMENDATIONS

Road connectivity has to be essentially planned at four levels:

- Connectivity within each state
- Intra-regional connectivity
- Connectivity to rest of India
- Connectivity to neighbouring countries

The section attempts to make recommendations with that broad objective while drawing on the exist-ing gaps and prevalent issues in the NER.

INFRASTRUCTURE

A. Strategic

- With the expectation of continuing contain-erisation in the country, it is advisable to upgrade all district headquarters in the plains areas to become container transport-compat-ible. In addition, all points of international access in Arunachal Pradesh (Pangsau Pass), Manipur (Tamu-Moreh), Mizoram, (new point at Zorinpui), Agartala (Sabroom and Akhau-ra) and Meghalaya (Dawki and Mahendra-ganj) should also become container-compat-ible.
 - Four-lane access to all state capitals in the North East needs to be ensured.
 - Development of an alternative highway alignment linking West Bengal and Bangla-desh through the Hili-Mahendraganj Corri-dor and the Kolkata-Bashirhat-Khulna Cor-ridor needs to be undertaken.

- Development of modern highways using tunneling and bridging techniques to connect Gangtok with Siliguri and Imphal with Kohi-ma and Silchar so as to reduce transit time and minimise environment damage.

B. State Connectivity

- Upgradation of Standards for State Highway and District Headquarter Link Roads

The standard of roads being built to link the district headquarters under the SARDP-NE should be gradually raised so that the contain-er load can be carried in the plains districts of Assam and also to important transit points like Dimapur in Nagaland and Itanagar in Arunachal Pradesh. For these main state highways, standards similar to National High-ways should be prescribed, viz. the formation width of 12 mt with carriageway of 10 mt. and radius of curvature of 12 mt to facilitate movement of large containers.

- Connectivity between State Capitals and the NHDP

As a first step, each of the state capitals needs to be linked to the expanding highway net-work being developed under the NHDP. At present, only Guwahati is linked to the East West Phase-II of the NHDP, and Kohima is being linked by four-lane highway too. It will be built from Daboka, on the East West

Highway as a spur to Dimapur and then upto Kohima. Shillong will have four-laning access only from Barapani while district headquarter Jowai in Meghalaya will have a full four-lane highway linking it to the main National Highway. Similarly, the three southern states of the North East will have problems of last-mile connectivity. The closest four-lane highway for Imphal will be in Aizawl, Kohima and Siliguri. For Mizoram, it is through the proposed four-laning of the Siliguri-Kolasib highway which has not yet been sanctioned. There is no planning for any four-laning in the ghat sections of Mizoram. Similarly, Agartala will have a four-lane highway upto Silchar/Karimganj and thereafter traffic will run on a two-lane highway. Itanagar is being connected by a four-lane spur.

iii. Connectivity to and from the States

Manipur

At the moment, Manipur deserves the highest priority for four-laning since it is a major security area and it has the worst road connectivity on account of frequent blockages on the approaches to the National Highway. Four-laning is necessary to ensure that goods can reach cheaply, quickly and safely and the exorbitant flight tariffs being charged come down to a reasonable level. In view of the special problems of Manipur, we suggest that four-laning be done in two phases; firstly the Kohima-Imphal route () which plies through districts inhabited by Naga tribes and secondly the Silchar-Imphal route. The Silchar-Imphal route involves crossing of six bridges and five valleys and low-altitude hill ridges. In view of the strategic importance of Imphal, we recommend that the MoRTH construct a four-lane highway using the method of tunneling through the ridges and building bridges across the valley. Similarly, a tunnel through the main Kohima peak would ensure spur access from the Dimapur-Kohima highway to the Manipur Valley. The highway from Imphal upto the border at Moreh-Tamualso needs to be four-laned since this is part of the Asian Highway No 1 proposed by UNESCAP and ADB and to which India is a signatory. The Tamu-Moreh border will be the main entry point for all roadborne traffic entering India from the ASEAN countries and we should aim that the goal of the Asian Highway No 1 needs to be an international standard.

Nagaland

While at the present moment international trade through Nagaland might be negligible,

but bearing the latent potential in mind, the MoRTH should prepare project reports for any future border crossing which the Nagaland Government may wish to pursue.

Mizoram

For Mizoram, four-laning upto Aizawl is both commercially and politically necessary. It is also recommended that four-laning of the highway upto the Indo-Myanmar border at Zorinpui is necessary to have seamless linkages to the Kaladan Multimodal Project. This will provide a secondary access to India from the Myanmar side and will enable better utilisation of our existing investment in Kaladan. Mizoram should be considered as being a gateway state along with Manipur as far as international trade is concerned.

Tripura

The third gateway state for the North East could be Tripura which rests upon the success that we can achieve in our negotiations with Bangladesh on access to Chittagong. Four-laning is needed right from Sabroom on the southern tip of Tripura to the main East West Highway in Silchar. Such a strategic link could enable the North East to avail of entry points in Myanmar and Bangladesh depending on prevailing political relations.

Sikkim

Sikkim suffers from relative geographical isolation. We recommend that the main highway from Siliguri to Gangtok be reconstructed on a new alignment using modern method of tunneling and bridging of valleys in contrast to the trans-alignment with hill hugging routes. We should aim to reduce the transit time between Gangtok and Siliguri to about three hours by road. A road built using tunnels and bridges will provide all-weather access

Table 6.8 is a listing of roads essential for inter-state connectivity in the NER.

C. NER-India linkage

i. Importance of proposed NH 31D (Salsalabari-Ghoshpukur near Siliguri)

A discussion on the road network in the North East inevitably requires attention to the delays in constructing National Highway 31D. This alignment is from Salsalabari to Ghoshpukur (near Siliguri) on the Assam-West Bengal border. For a length of 163 km, the new alignment is on the southern side of the North Bengal Corridor. In view of the anticipated growth of trade in the North East, it is possible that this strategic highway will have to be six-laned in

Table 6.8

Roads Essential to Provide Inter-state Connectivity and Connectivity to Backward and Border Areas

STATE ROAD PROPOSED FOR UPGRADE	STATE	LENGTH (KM)
Margherita-Changlang-Khonsa-Hukanjuri-Sibsagar	Arunachal Pradesh and Assam	130
Rowta (NH-52)-Udalgiri-Tamulpur-Jala-Goverdhana-Kajolgaon (NH-31)-Srirampur	Assam	406
Chumukedima-Shedhumi-Niuland-Ralan-Sanis-Bhandari (Merapani) - Longtho-Longehem-Tuli (foothill road)	Nagaland and Assam	250
Tenglong to Sesenpur, via Khongsang and Rengpang	Manipur	133
Churachandpur-Singhat-Sinzawl-Tuivai Road-Mizoram border, via Ngopa	Manipur and Mizoram	340
	Total length	1,804

the near future. As it stands now, it is understood that strong support of the government of West Bengal shall be required for acquiring the land in North Bengal. Since this is a project of national importance which links the entire North East with the rest of the National Highway network, special effort has to be made at the political level to ensure that this vital link is created and maintained.

ii. Alternative link between North East and Rest of India

At the same time, development of alternative routes from the North East to West Bengal should be encouraged so that the NER cannot be isolated during any future hostility or adverse weather conditions. Asian Highway No 1 enters Bangladesh from Dawki on the Meghalaya-Bangladesh border. However, the closest approach from Meghalaya to West Bengal is on the alignment Mahendraganj to Hili which is slightly over 100 km. It is possible that the Bangladesh government might permit India to access this route by linking it to the job of connecting Sylhet with Rangpur in Bangladesh. Such an action will be possible only with a major bridge over Padma (probably Sirajganj) and Brahmaputra. This bridge could simultaneously be used for development of Hili to Mahendraganj route to Meghalaya. The development of the project report for this is strongly recommended.

The third possible route would be through southern Bangladesh from Dhaka to Kolkata. The present trans-border arrangement is a long NH35 through the Benapole-Petrapole border crossing connecting Jessore with Kolkata. However, there have been requests

from Bangladesh Chambers of Commerce for a connection from Khulna to Kolkata on the South Eastern side of Kolkata through the India-Bangladesh border near Bashirhat. Such a connection would also enable industry and commerce to benefit from an alternative port in Mongla, Bangladesh, which lies the south of Khulna. This would help to boost trade in the Greater Kolkata area. Bangladesh might also be persuaded to extend Agartala-Dhaka-Kolkata connectivity through Jessore or Khulna if India undertook major highway construction in the southern part of Bangladesh.

D. Roads for diverse objectives

Development of roadwork for the following purposes needs more attention than is being given:

- For evacuation of agricultural and horticulture products and other natural resources. The economic development of the NER will come from the growth in the agriculture sector (particularly horticulture, floriculture, bamboo), services sector and the natural resources of hydropower, tea, oil, limestone and coal. Evacuation of these products from their source of origin/ manufacture/ cultivation has to be planned by road or rail and inland waterways (air for highly perishable flowers).
- For evacuation of commodities, the development of the railway sector and inland waterways is critical. As there is intense pressure for road development to connect human habitations that are sparsely distributed in the region, agriculture link roads to evacuate agro-products to the nearest market does not

get the required importance.

- iii. It is recommended that serious thought be given to developing network of agriculture link roads to the nearest mandi/ market for movement of agriculture/ horticulture produce. Area under horticulture has increased in the NER due to the interventions made under the Horticulture Mission of the Ministry of Agriculture. Production of cereals has also increased in recent times in the plains areas of Assam. For the creation of a robust market economy, a network of roads to carry agriculture produce is essential. As road projects are generally selected on the basis of pressure from different sections, agriculture link roads do not have any constituency and hence are not pushed.

E. New Technology - bridges, tunnels, geo-textiles, bio-engineering

- i. **Bridges** are numerous in the North East. There is a large requirement for semi-permanent timber bridges to be converted to brick and mortar or iron and steel bridges. Technology for laying bridges quickly and at a low cost has to be promoted. Technology of Bailey bridges has improved recently; this should be used for North East. For interior areas, suspension bridges should be promoted. These are low-cost and can be installed quickly. Steel girder bridges can also be promoted. They are also earthquake resistant.
- ii. **Tunneling:** Emphasis is needed on tunneling to reduce the length of roads. In snow-covered areas, tunneling should be used to reduce the length of the road exposed to the elements. Tunneling will also result in generation of gravel of which there is a shortage in North East. More tunneling will reduce cost and distances, and be environment-friendly.
- iii. **Two-lane roads** In place of four-lane roads, preference may be given for construction of two-lane roads suitably located on either side of the hill slopes. This is preferable because in hilly areas, two-lane roads will involve less earth-cutting and these two roads could be used separately for two directions.
- iv. **New Materials:** The terrain and topography of the North East lends itself to increased use of new material such as geo-textiles and innovative methods to use local material such as bamboo through bio-engineering. The Ministry of Textiles is trying to promote the use of geo-textiles in the NER. The state governments and MoRTH should take up visible pilot projects to promote the use of new materials such as geo-textiles. The World Bank road pro-

ject in Mizoram has effectively displayed use of bio-engineering using bamboo to prevent landslides. These efforts can be expanded in other areas as well. Further, use of appropriate technology for the construction in heavy rainfall area needs to be introduced in the field. The introduction of new technology could involve additional cost than traditional methods therefore decision on financing such technologies needs to be taken at appropriate level.

- v. **Suspension Bridges:** Under PMGSY, there is no provision for rope bridges/ suspension bridges that are suitable for a region with scattered rivulets. We strongly recommend that rope bridges and Bailey bridges be included in PMGSY guidelines for the NER.

F. Maintenance

Maintenance is a major bugbear in the NER. It is cost-intensive due to heavy rainfall and nature of terrain, and availability of non-Plan funds is never sufficient for maintenance. The general tendency is to build – neglect – rebuild in the garb of expansion. Unfortunately, the cost of poor maintenance is borne by the user and the people, reflected in the high rates of accidents and the low user life of vehicles in the NER. Due to poor conditions of roads, buses and trucks are rendered unusable after four years, whereas in the rest of the country, heavy vehicles and trucks can be used for at least 10 years. In short, while maintenance cost of vehicles is high, commercial lives are much shorter. Multi-axle vehicles cannot ply beyond Guwahati due to inadequate road capacity. While these conundrums exist, growth in the number of commercial vehicles in the North East has been much (about 50 per cent) higher than other parts of India even with the current slowdown. Thus, maintenance and improvement of roads acquires immense importance. The following is recommended to address the issue:

- i. Use higher quality standards for construction of roads, so that maintenance needs are lower.
- ii. Much higher allocation for maintenance and professional management of maintenance.
- iii. A policy decision to cover maintenance expenditure under the plan needs to be taken.
- iv. Maintenance by contractors for first five years after the construction should be in-built into the road contracts. Subsequently, the state government should prepare a master plan for maintenance, based on which funds shall be allocated and released by the agencies for blocks of five years. Overall accountability should be with the PWD for general maintenance and they have to be equipped

financially and operationally to do so.

- v. Promote concept of Performance Based Maintenance Contracts for three to five years. Start with roads receiving WB/ ADB or GOI assistance under SARDP-NE programmes.
- vi. Establishment and management of a dedicated Road Maintenance Fund.

INSTITUTIONAL STRENGTHENING

A. New organisation structure

In the hierarchy of roads, National Highways are at the top and PMGSY is at bottom of the pyramid. There are village roads, forest roads, roads in small towns which are the responsibility of the panchayats/ local bodies/ forest department / nagarpalikas etc. In between are a slew of state highways, MDRs, ODRs which form the backbone of the transportation sector. Many of the MDRs are also inter-state and inter-district roads. These are funded by various agencies of the Central Government under different schemes, untied funds and also Special Plan Assistance (SPA)/ Additional Central Assistance (ACA) from the Planning Commission. The implementing agencies are NHAI, BRO and state PWDs and local bodies.

BRO is beset with several organisational issues and its performance on critical roads draws the displeasure of state governments at times. BRO works in the most difficult conditions and has very little autonomy. As BRO is entrusted with many important roads other than strategic GS roads, issues afflicting BRO should be addressed to enable the organisation to perform its role.

There is an urgent need to strengthen the capacity of the state construction agencies. At the same time, the quality of roads in the NER and their timely implementation cannot be allowed to suffer while the capacities of state PWDs and other agencies are built. Roads are the backbone of this region. The whole process of building them right from the stage of conceptualisation to preparation of DPR till maintenance needs overhaul.

In order to address the constraints, a new institutional structure for the road sector for the NER is recommended, which would provide technical support and guidance to the state governments without impinging on the autonomy of the states.

Two models that appear appropriate for such an institution to draw on are:

- a. Pradhan Mantri Gram Sadak Yojana (PMGSY)

The PMGSY implementation model is working well in creating good quality roads in rural and interior areas. Another body to assist the

state governments in the road sector (apart from the PMGSY roads) covering state highways, MDRs, ODRs, inter-state roads, etc, with technical and managerial inputs should be set up whose structure could be drawn on lines of the PMGSY arrangements. The advantage of the PMGSY model is that of clear demarcation of roads under the Centre and state, together with strict standards of DPR preparation, bid documents, bidding transparency and robust MIS.

- b. Joint Assistance to Support Projects in European Regions (JASPERS) in the European Union.

JASPERS provides technical expertise to the 12 Central and Eastern EU Member States: Greece, Croatia, Serbia, Montenegro and former Yugoslav Republic of Macedonia, for any stage of the project cycle from the early stages of project conception through to the final application for EU funding. The assistance is provided free of charge and is geared towards accelerating the absorption of the available funds. A JASPERS-like organisation should be made available for providing technical assistance to the NE States. It will work in close cooperation with the states to produce accomplished project proposals which will meet parameters required for funding by different sources. Manned by technical experts, it will provide assistance for any stage of the project cycle from the early stages of conception through to implementation and maintenance.

Such institutional structure may be established under the administrative control of Ministry of DONER. This model, combined with the GIS database that has also been proposed, has the potential of vastly improving the way roads are conceptualised, designed, plans prepared, bid evaluated and awarded and finally maintained. This organisation can be christened as NER Road Development Authority (NERR-DA).

B. Capacity building

Investments in roads are increasing but there has been no corresponding assessment of the capacities of the PWD, BRO or other agencies to cope with the increasing burden. It is of urgent importance to build capacity of state PWDs, central agencies and contractors.

Training

- **Capacity building of Road Building Organisations** State PWDs possess a wealth of good engineers having local knowledge base. However, their exposure to good nation-

The rainy season in the North East ranges from six to eight months. Engineering and project management strategies have to be created around the difficulties that Nature presents.

al/international practices is weak. DONER, with support from MORTH and Indian Academy of Highway Engineers, has taken some initiatives to provide training to staff at various levels and in various aspects of planning, design, project management, maintenance, dispute resolution, quality assurance. These initiatives need to be strengthened considerably and training programmes be designed to upgrade existing capacity over the next 10 years.

- **Central Research Institutions:** Institutions such as Central Road Research Institute (CRRI) under CSIR and Indian Academy of Highway Engineers should take more interest in the NER and evolve technology and management solutions for the region. They should design a programme for regular interaction with the State PWDs.

Further, the CRRI and CSIR should set up a dedicated road research and development institute in the North East to deal with NER-specific technology issues.

- **Contractors' Associations:** Supporting the contractors' associations in establishment of an academy of construction on the lines of National Academy of Constructions (NAC), Hyderabad, in the NER, for delivery of training to construction workers and equipment operators. Linkage with ITIs and polytechnics should prove helpful for geographic spread in the region.
- **Engineering Colleges:** The capacity of engineering colleges in the region to train civil engineers needs to be enhanced. Besides the IIT at Guwahati, there are two state engineering colleges in Assam (Guwahati and Jorhat), and National Institutes of Technology in Agartala, Silchar and Dimapur. There is also NERIST in Itanagar. In the interest of the region, an assessment of the number of civil engineers that the region needs should be done, and consequent action taken to ensure a quality supply of engineers.
- **Training & capacity building at levels below Junior Engineers.** Start courses on road technology in polytechnics which will create a steady supply of trained manpower.
- **Project development and Bid Process Management**
 - Preparation of DPRs (often project costs have to be enhanced as DPRs are not prepared properly). Ideally, preparation of

quality DPRs can mitigate problems in implementation. If DPRs are made correctly and pre-construction activities duly completed, the project completion time will be certainly reduced.

- There is a need for improvement and standardisation of:
 - Bid documents
 - Evaluation of bids
 - Drawing up of contracts
 - Implementation, supervision
 - Quality control (lack of laboratories for quality control)
 - Transparency

Lack of equipment Presently it appears that there is no major dearth of equipment for bigger road contracts for NHAI or SARDP-NE roads. Big contractors are attracted towards the NER to the large contracts being awarded now on EPC basis by NHAI and MORTH for SARDP-NE and East West Corridor. However, for the lower order roads, even state highways and PMGSY packages, local contractors still do not have adequate equipment available. Big contractors coming from outside into the NER are generally not interested in the smaller packages even if the few roads are bundled together in a single package.

A proposal for an Equipment Bank had been mooted few years ago by North Eastern Development Finance Corporation Ltd (under Ministry of DONER), Guwahati. The proposal could not go far due to lack of land. We suggest that state governments, NEDFi or any other agency (including private players) set up Equipment Banks at different locations in the NER.

C. Strengthen Project management

The rainy season ranges from six to eight months. Project management strategies have to be created around the difficulties that Nature presents. The high incidence of rain in the region is a fact of life, and engineering and project management solutions need to be developed to cope with this problem.

A vicious circle of delays and non-completion of projects is created in the following way:

- Due to large amounts being invested in the road sector, the number of projects being sanctioned by different central agencies and state governments is increasing.
- Owing to the internal weaknesses, projects are not completed in time. Utilisation certificates are not submitted in time. On the other hand, funding agencies sanction new projects more as a means to absorb their allocations rather than on pure merit. States are also happy to get new sanctions which appease various interests which espouse one road or the other. Ultimately, the bunch of incomplete projects

gets inflated with large committed liabilities. Construction of roads is sometimes treated as a means of distributive justice and not as projects that need to be professionally managed. There is little effort to develop contracting capacities. In certain cases, construction of a 30-km road has taken as long as six years, with work having been divided in 25-30 parcels.

Therefore, annual capacity of state governments and implementing agencies should be assessed and combined with strict monitoring such as testing laboratories. Quality control facilities are also, at present, quite poor.

D. Leveraging Information Technology

GIS Database

Creation of centralised database of road assets accessible to the public based on GIS or any other suitable technology is a must. This will prevent duplication of proposals for upgradation/ maintenance of same roads to different agencies, create transparency and help in proper monitoring. All state governments and agencies must participate in the centralised database system. It will involve massive data entry as data is available at Executive Engineer or SDO, PWD level. However, such a database combined with a GIS map will be of immense help in policy planning and monitoring. It can and should be even made open to the public as a stakeholder.

It is recommended that DONER, Department of Information Technology, and MoRTH consider this proposal in right earnest. It might require some time, funding and concerted effort, but the outcome shall be worthwhile.

E-governance in State PWDs

None of the state governments including Assam have embarked on serious use of e-governance, e-tendering, e-procurement and comprehensive computerisation of the PWD to improve their project management. A quick survey of the websites of the state PWDs shows that barring Arunachal Pradesh, Tripura and to some extent Manipur, none of the other states have a functioning up-to-date website. Use of e-governance will expand the purview of contractors taking up projects in the states. Several good models are already available which the NE States can use with their local modifications.

CIVIL AVIATION

Civil aviation plays a greater role in the NER than it does in other parts of the country due to inherent terrain and the physical spread. Civil aviation is more of a necessity than an option for transport needs of the NER given the topography which renders road and rail connectivity to be limited. Except Assam and Tripura, states do not have any rail connectiv-

ity. Even Tripura is too far for rail connectivity to be used for reaching the mainland. Inclusiveness of the NER with the rest of India is physically possible only through air services. Air connectivity can fill in to a significant extent the need for intra-state connectivity and the region's linkage to the mainland.

MAJOR DEVELOPMENT SCHEMES/POLICIES

The NER is dotted with airports. Some airfields are Second World War legacies reminding and reinforcing the strategic aspects of transport planning in the region. After Independence, the Ministry of Civil Aviation (MoCA) and North Eastern Council (NEC) have cooperated to develop a good infrastructure of airports. While more airports are being planned and developed, there are areas that still need infrastructure for air connectivity.

Air connectivity can fill in to a significant extent the need for intra-state connectivity and the region's linkage to the mainland

The NER currently has 12 operational airports and the same number of non-operational airports. Efforts are being made at various levels to improve air penetration in the region. North Eastern Council, Shillong, provided Viability Gap Funding to Alliance Air, a subsidiary of Air India, from 2002 to 2011 to operate ATR-42 aircrafts in the NER to increase intra-NE connectivity, particularly to those stations where commercial services are inadequate. At present, Tezpur, Dimapur and Leelabari only have services of Air India/ Alliance Air. The funding has now been discontinued by North Eastern Council. The NEC has, in August 2013, offered viability gap funding for renewing services to these airports, along with Barapani.

ROUTE DISPERSAL GUIDELINES OF DGCA

The Route Dispersal Guidelines have been an important policy initiative of the Ministry of Civil Aviation that has helped to increase the number of seats available in the North East. Table 6.9 shows the increase in air connectivity in the North East over the last decade after the civil aviation sector was liberalised.

SUPPORT FROM MINISTRY OF HOME AFFAIRS FOR HELICOPTER SERVICES

Ministry of Home Affairs provides assistance to NE state governments for helicopter services to facilitate transportation for general public in remote and hilly areas. It is presently given to all states except Assam and Manipur. The states have to follow a market-based price discovery system. Flying hours per annum are prescribed in the scheme. Not more than 20-25 per cent can be used by state governments for ministers and officials. The rest has to be essentially used for public transportation. MHA subsidises 75

Table 6.9
Traffic Trends in The North East Region

YEAR	AIRCRAFT MOVEMENTS		PASSENGERS		FREIGHT (IN TONNES)	
	NO.	PER CENT CHANGE	NO. (IN MILLION)	PER CENT CHANGE	NO.	PER CENT CHANGE
2004-05	33,019	4.5	1.45	10.8	10,304	13.4
2005-06	34,036	3.1	1.62	12.0	11,006	6.8
2006-07	42,069	23.6	2.27	40.2	9,836	-10.6
2007-08	55,471	31.9	2.86	25.9	11,260	14.5
2008-09	58,843	6.1	2.98	4.1	13,346	18.5
2009-10	62,307	5.9	3.63	21.8	18,947	42.0
2010-11	67,393	8.2	4.51	26.5	24,087	27.1
2011-12 (Provisional)	70,576	4.7	5.45	18.6	23,748	-1.41

Source: DGCA's presentation for PSC, 18.4.12

per cent of the fare and the rest is paid by either the state government or the traveller.

c. New policy aimed at creating international and regional aviation hubs in the country ²

The Government has recently cleared policy aimed at creating international and regional aviation hubs in the country. It has also approved the constitution of an Inter-Ministerial Committee under the leadership of Secretary, Civil Aviation, for suggesting various measures to overcome the bottlenecks in the development of aviation hubs at various airports in India.

The new policy not only focuses on developing global hubs in India but also on establishing domestic regional hubs to cater to the growing air traffic from non-metro destinations in remote areas, including the North East. The government is according high priority to provide air connectivity to remote, difficult and interior areas of the country, and focusing on building and modernising airports in Tier-II and Tier-III cities.

KEY ISSUES AND RECOMMENDATIONS

Air connectivity in the North Eastern States is hampered by difficult terrain and relatively low levels of economic development. Despite the important role that civil aviation can play in reducing the physical exclusion of the NER, certain issues have rendered its effectiveness to be limited. The key concerns have been with respect to:

- Need to for higher public investments for development and maintenance of airports
- Land acquisition

- Technological upgradation
- Lack of trained manpower
- Operational unviability of bigger aircrafts in some airports

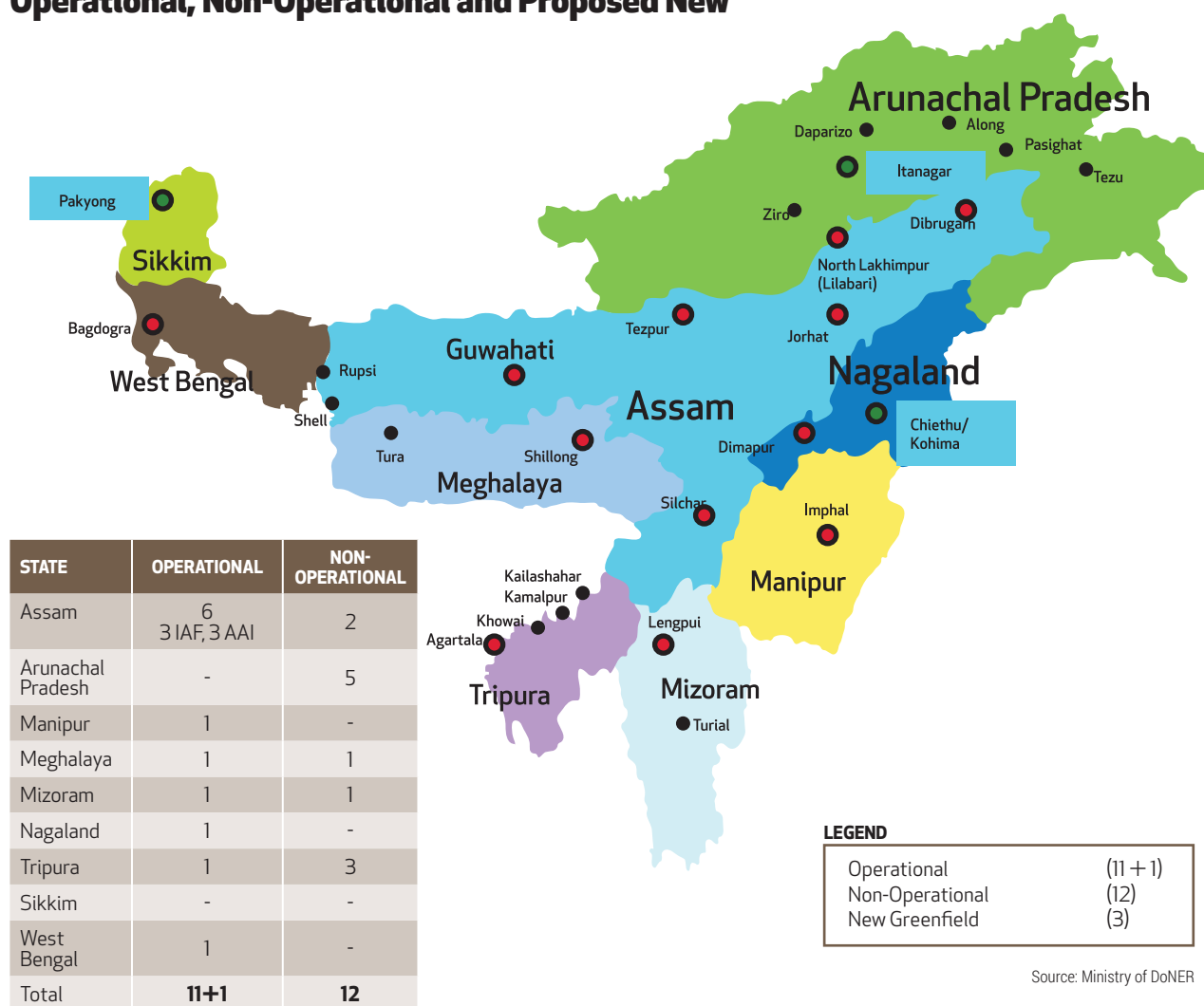
As a function of one or more such issues, only 12 out of a total of 24 existing airports in the NER are operational.

Clearly, with more frequent flights in and out of this geographically difficult region, there may be considerable reduction in its physical exclusion. The development of existing airports and operationalisation of non-operational airports would not only make air links feasible between the state capitals but also with neighbouring countries. Multi-utility-based air services which enable the movement of high value cargo can also be instrumental in improving the economic vitality of the region. Likewise, perishable agro commodities can find markets within and outside the region based on their quick and reliable evacuation through air transport. Similarly, a new policy centred around small aircraft is required to implement a hub-and-spoke model.

Supporting an active civil aviation sector in the NER shall also open up the region internationally, especially to the neighbouring countries and the ASEAN. Guwahati airport should be developed as a potential major gateway to South East Asia, both for passenger and freight traffic. However, in order to achieve the objective of uninterrupted and reliable air services and to prevent accidents, there is a need to develop state-of-art weather and navigation information systems and human resources together with the actual physical airport infrastructure.

² <http://www.thehindu.com/business/Industry/government-clears-new-aviation-policy-to-setup-aviation-hubs/article4702631>. accessed on May 12, 2013

Figure 6.8
Operational, Non-Operational and Proposed New



DEVELOPMENT OF AIRPORTS

For the people of Mizoram or Tripura, travel by road upto Kolkata takes around three days for a one-way journey. Hence, civil aviation services are used more as a necessity than an option, even by common people of the NER. The situation warrants planned public investment in civil aviation to increase its reach, to deploy latest technology as well as to keep it affordable. The road sector has a fully publicly funded special road programme for NER–Special Accelerated Road Development Programme for the North East (SARDP-NE). Similarly, the national projects of the Railways are covered under the Plan funded Non-Lapsable North East Railway Development Fund of the Ministry of Railways. Therefore, it is strongly recommended that a publicly funded programme for the complete development of the airport infrastructure in the region is prepared and implemented in the 12th Plan

COST OF LAND ACQUISITION FOR AIRPORTS

In the case of road and rail sector, the cost of land acquisition is included in the project cost which essentially means that the state governments do not have to bear the cost. In contrast, the Airports

Authority of India (AAI) insists on getting land from the state governments free of cost which imposes undue burden on NE States and affects the development of airports. It is recommended that land acquisition cost for civil aviation infrastructure in the NER should be borne by the Union Government.

PERIPHERAL DEVELOPMENT OF FACILITIES

Unexploited export potential of the NER is in part due to non-availability of warehouses and cold-storage facilities at airports, provision of which will attract more businesses and more traffic by commercial airline operators. Transport infrastructure investment in the North East should thus include provision of infrastructure facilities for movement of goods.

AIRPORT DEVELOPMENT BY AIRPORTS AUTHORITY OF INDIA

Construction is on of airports at Tezu (Arunachal Pradesh) and Pakyong (Gangtok) along with various Advanced Landing Grounds and civilian enclaves. Developmental works in the operational airports are also being undertaken. The North Eastern Council has been assisting the AAI in development of

Helicopter services will play an important role, especially for remote areas. These, however, are expensive. How they can be made viable is a crucial question

airports in the region. This includes expansion of runways to accommodate bigger crafts, provision of night landing and instrument landing system, improvement of passenger terminals, expansion of aprons and development of city side wherever land is available. Figure 6.8 shows the operational, non-operational and new airports in the NER. The details are available in Annex 6.1.

NIGHT LANDING AND INSTRUMENT LANDING SYSTEMS (ILS)

AAI has drawn up a plan for full-scale development of civilian airports in the region. AAI should be assisted to start night landing facilities and Instrument Landing Systems (ILS) wherever technically feasible as it will increase the window of operations for these airports. In the absence of ILS and night landing (presently night landing is operational in Guwahati, Agartala and Imphal), the airports are not optimally utilised. The IAF-owned airports of Tezpur, Silchar, Jorhat and Bagdogra will continue to support Sikkim till aircrafts are not be able to land in Pakyong. Moreover, Pakyong is not an all-weather airport. As Bagdogra airport operates as a civilian enclave, IAF should consider approving night landing with necessary security-related restrictions that it may find appropriate.

The advantage of early daybreak in the NER to start early morning flights is also not utilised as ATC hours are restricted due to non-availability of manpower. It is a chicken and egg situation as ATCs are not intensively manned as only a few flights land. Airlines can operate more flights if ATC hours are increased, and ILS and night landing facilities are made operational.

In the airports at Silchar, Tezpur and Bagdogra, IAF airports with civilian enclaves, the ATC is manned by the IAF. AAI should negotiate with IAF so that night landing facility for civilian aircrafts is allowed in these places with appropriate security restrictions.

HUB AND SPOKE MODEL FOR OPERATION AND USE OF SMALL AIRCRAFTS IN SPOKES

The position taken by operators and MoCA is that operations in the NER are commercially unviable and result in losses. The model presently operating is unsuitable as it does not account for the topography, sparse spread of population, tenuous physical links with the rest of India and huge distances. Given the specific features, a 'Hub and Spoke'

model with Guwahati and also Agartala, Imphal and Dibrugarh as hubs and other destinations as spokes should be more appropriate (Fig. 6.9). Small aircrafts stationed in Guwahati and other hubs could operate early morning (to take advantage of early daybreak in the region) and fly travellers back to Guwahati/Agartala and shift into bigger aircrafts to travel further to Delhi, Kolkata, Mumbai, etc. The transit time should not be more than 30-40 min in the morning and also evening so that travellers are able to reach their destinations outside the region by 10:00-10:30 am and return the same day if possible. At least for Delhi and Kolkata, this model needs to be in place.

In order to get this model going, the following are required:

- Development of physical infrastructure for hubs. This is the easier part as it involves plan investment by AAI with funds from MoCA/DONER/NEC. **Creation of airport hubs with hangars is strongly recommended for Guwahati, Agartala, Imphal and Dibrugarh.**
- To make the airlines to use the facilities of the hubs at Guwahati, Agartala Dibrugarh and Imphal is the difficult part, as there is not enough manpower. Further, locally trained manpower is not available. Trained and deployed people are unwilling to shift to Guwahati.
- For the hub and spoke model to be successful, small aircraft are needed. This requires change in policy and perhaps mindset to promote use of smaller aircrafts in the NER.

Air services within the region will be based on the multi-utilities such as passenger traffic, high value cargo, medical and other emergency services. It addresses the viability issues of air services by operating smaller carriers. Further, this will stimulate the development within the region by bringing together the critical mass required for growth in terms of networking of sparse population, transport of high value commodities like flowers, fruits, medicinal plants, organic products. As horticulture and floriculture grows in the NER, multiple use (passenger and cargo) of aircrafts will be useful in quick transportation of these perishable but high valued commodities to the markets outside the NER. Passenger in peak hours and cargo in non-peak hours can be combined in small-sized dual-use aircraft to carry both passengers and cargo from spokes to the hub. It will also address the viability issue of small aircraft.

PROMOTION OF HELICOPTER SERVICES

Helicopter services will play an important role, especially for remote areas. These, however, are expensive. How they can be made viable is a crucial question. We have discussed the scheme being operated by Ministry of Home Affairs for helicopter services.

Figure 6.9
Indicative schematic of the Hub and Spoke Model proposed



The hub and spoke model can be achieved by three-tier air services:

- Connectivity between regional hubs like Guwahati, Agartala, Imphal, etc. and metros like Delhi and Kolkata: big aircrafts
- Intra-regional connectivity between regional hubs and smaller airports and airfields within the region: small aircrafts
- And finally, helicopter services in remote districts to the smaller airports/ airfields/ regional hubs, which may be operated depending on the daily/ weekly needs.

Such three-tier system would fit into a 'Hub-and-Spoke' model to feed the big carriers to outside of the region and address the viability issues in a systematic manner.

CREATION OF LOCALLY TRAINED MANPOWER TO RUN CIVIL AVIATION INFRASTRUCTURE

Airport facilities in the region are being expanded. However, as there is general reluctance for employees to work in the NER, airports are not adequately manned. Even the IAF acknowledges that they are not able to operate a night landing facility in the civilian enclave for Silchar airport due to lack of manpower. Hence, it is recommended that local youth be trained in different sector of aviation, particularly in ground handling, navigation, logistics.

For creation of a base of adequately trained manpower who would be willing to serve the region, local training facilities have to be developed. Lilabari in Assam could be a potential location for establishing such a training facility. The bigger challenge lies in setting up the facilities (with public investment), developing accredited curriculum and training courses and operating the institute. A practical option would be to have a branch of the National Aviation Academy at Rae Bareilly in Lilabari. Aircraft maintenance courses could be started in polytechnics in the region. The aviation academy will have to be owned and run by the Central Government as private agencies are unlikely to find Lilabari presently attractive nor are the state governments capable of running such institutions. Civil Aviation is in the Union List of the Constitution.

Government-funded training facilities in the NER for pilot or air hostess training are not required as these are available in the private sector in adequate numbers outside the NER also.

UP-TO-DATE WEATHER INFORMATION

State-of-the-art weather information systems are required to prevent accidents and frequent cancellation and delays. As services are not reliable especially in routes that are in the interior, passengers find it safer to depend on roads. This leads to insufficient

NTDPC recommends that Guwahati Airport, which has received full international status in principle, be developed as a gateway to South East and East Asia, consistent with the overall Look East policy of the Government

passenger load that affects commercial viability. As the weather is tricky, regular up-to-date information to the pilot can reduce the number of cancellations and enhance the trust of the public in the regularity and certainty of air services. The Department of Meteorology should develop a plan for effective collection of weather data and broadcasting it in real time to airline operators.

DEVELOPMENT OF GUWAHATI AS AN INTERNATIONAL AIRPORT

Guwahati Airport has now received full international status in principle, but there are no international flights operating from this airport except to Bhutan. NTDPC recommends that this airport be developed as a gateway to South East and East Asia, consistent with the overall Look East policy of the Government, and the increased strategic and business links with Myanmar, Thailand and other ASEAN countries. As the India-ASEAN Comprehensive Economic Cooperation Agreement gathers force, and other initiatives for increasing economic cooperation with neighbouring countries bear fruit, the development of Guwahati airport as the gateway to ASEAN would be very desirable.

The existence of an airport has been used in many places to generate economic activity. Schiphol Airport at Amsterdam is a case in point. It has enabled the development of the Dutch flower industry which supplies flowers to far-flung places. Furthermore, in the reverse direction, it enables the supply of flowers to Europe from Latin America by using the flower markets of the Netherlands.

Thus, the development of Guwahati airport as a full-fledged international airport will do much for the development of the region. This capacity can be further utilised by locating light industries such as food processing, floriculture, sericulture and the like in its proximity, or striking distance. It would also greatly help the development of tourism in both directions.

RAILWAYS

It is surprising to note that the railways entered the remote areas of eastern Assam relatively earlier than the more accessible regions of British India. Assam Railway and Trading Company commissioned a 65-km metre gauge track from Dibrugarh to Margherita in 1881. Commercial interest of the East India Company in trading of tea and coal drove

the technological upgradation in transportation. Discovery of petroleum catalysed the growth, and around 1947, just before Independence, the whole NER, which included the erstwhile East Bengal (now Bangladesh), was buzzing with robust railway connectivity to the mainland as well as with the deep port of Chittagong—the fulcrum of all international trade for the region.

The vivisection of 1947 hit rail connectivity to the NER in the belly, with not only Chittagong getting disconnected, but connectivity to the mainland lost. Immediately after 1947, the task of providing rail connectivity through the Siliguri corridor or the ‘Chicken’s neck’ was taken up earnestly. By 1958, a new railway zone, Northeast Frontier Railway (NFR) with its headquarters at Malegaon, Guwahati, had been carved out of the North Eastern Railway. NF Railway has since become the lifeline of the NER, transporting essential goods like food grains, POL, coal, fertiliser, salt, cement, etc, all over.

Historically, the whole of the NER was served only by a metre gauge railway system with its attendant inadequacies of low speeds, low throughput etc. The ‘Unigauge’ policy of Indian Railways adopted in 1993 metamorphosed rail transport in the NER. The country’s longest train run (Vivek Express) from Dibrugarh to Kanyakumari traverses a distance of 4,273 km across the length and breadth of the country. This has become possible only because Dibrugarh town has come on the broad gauge map of IR.

The rail network (as on April 1, 2012) in the NER comprises 2,661 km out of which 1,601 km (60 per cent) are on BG (all due to gauge conversion). After the gauge conversion projects on hand get completed by December 2014, only 20 km of metre gauge will remain as a rump, reminiscent of an era gone by.

ONGOING PROJECTS

Upgradation of the rail network in the NER has received significant attention of the Ministry of Railways in the last 25 years. Capacity has been augmented manifold leading to introduction of a large number of long distance passenger carrying trains and removal/reduction of transshipment activities which hitherto has been the single biggest bottleneck in smooth movement of traffic.

Seventeen projects comprising new line/gauge conversion/doubling and railway electrification are in progress with a total throwforward of Rs 162 billion (as on 1.4.2012). The category-wise break up of projects is given in Table 6.11.

The physical achievement so far (as of 2011-12) in terms of new lines, gauge conversion and line doubling are tabulated in Table 6.12.

Box 6.1

Incorporating the Specific Requirements of NER in an Aviation Policy for The Region

One of primary reasons for lack of effective civil aviation services in the NER is the application of same policy instruments for the region as well as for the rest of the country. Policies will have to be tailor made, given the peculiar character of the region and the challenges it presents. MoCA has come out with a set of revised regulatory policy changes which is under active consideration.

Recently, the Ministry of Civil Aviation has prepared a report on improving Regional Air Connectivity (Rohit Nandan Committee Report, 2012). Some of the major recommendations are as under:

- Modify Route Dispersal Guidelines to assign more weightage to non-capital stations in the NER. Additional connectivity created should be distributed in the ratio of 40:60 between capital and non-capital stations.
- Airlines should be asked to deploy additional capacity in future in Meghalaya and Nagaland, of course subject to market demand and adequate infrastructure.
- Promote deployment of small aircrafts (See Annex 6.2).
- Setting up Essential Air Services Fund to promote government intervention for connectivity to peripheral remote locations. Such schemes are prevalent in developed countries also—UK (North East England and Wales), USA (Essential Air Services Programme, Small Community Air Service Development Programme), European Union, Caribbean and Pacific countries. This is particularly relevant to the NER and we recommend that MoCA take a positive view.
- As scheduled airlines in India desire to maintain homogenous fleet of aircrafts, the character of non-scheduled operators (NSOP) should be changed to allow them more flexibility as they operate smaller aircrafts (less than 40 seats). They should be allowed to publish their schedule and have joint operations with scheduled airlines. In this way, the hub and spoke model—small aircrafts at the spoke (NSOPs) can work together with scheduled operators at the hub. They can bring passengers in small aircrafts from smaller places to Guwahati or Agartala from where the passengers will be put in larger planes to connect them to the metros.
- Facilitating the promotion of regional airlines.

The Ministry of Civil Aviation needs to take a quick and practical decision on the recommendations of the Rohit Nandan Committee.

Table 6.10

State-Wise Distribution of Rail Network [Kms]

STATE	BROAD GAUGE	METRE GAUGE	NARROW GAUGE	TOTAL
Arunachal Pradesh	14.66	1.26	-	15.92
Assam	1,800.03	845.96	-	2,565.99
Tripura	-	195.40	-	195.40
Nagaland	11.13	1.72	-	12.85
Manipur	-	13.85	-	13.85
Mizoram	-	1.50	-	1.50
Meghalaya	-	-	-	-
Sikkim	-	-	-	-
Total NE Region as on 1.4.2012 (Starting of 12th Plan) in NE Region	1,301	1,060		2,661

Table 6.11
New Railway Projects

PLAN HEAD	NEW LINE	GAUGE CONVERSION	DOUBLING	RAILWAY ELECTRIFICATION	TOTAL
Projects in progress	13	4	1	1	19
Total Cost (Rs billion)	226	75	2.5	8	311
Cumulative Expenditure up to March'12 (Rs billion)	51	53	0	3	107
Throw forward (in Rs Billion as on 1.04.2012)	125	29	0	5.3	204
Length of Ongoing Works (Km)	965	1,510	45	836	3,356

Table 6.12
Physical Achievement in New Railways Projects (km)

YEAR	NEW LINE	GAUGE CONVERSION	DOUBLING
2007-08	20	107	-
2008-09	113	170	-
2009-10	-	110	-
2010-11	58	110	31
2011-12	148	409	-
Total	339	906	31

It can be seen that 57 per cent of gauge conversion has actually materialised in the five-year period from 2007 to 2012.

There is still a little more than 1,000 km of metre gauge track in the region necessitating transshipment at Rangiya for traffic going to destinations north of the Brahmaputra and at Lumding for destinations in the Cachar hills of Assam, Tripura, Manipur and Mizoram. Once this portion also gets converted to broad gauge, it will provide seamless transportation of people and material to every corner of the country. It is expected that these projects shall be completed by 2014. The details are in Table 6.13.

There are, at present, 11 new line projects on hand which shall add 882 km (33 per cent of the existing) of new routes to the rail network in the region upon completion. Table 6.14 gives the details.

As noted earlier, rail density in various states of the NER has been abysmally low. Except Assam and Tripura, no other state can boast of a rail link to its

capital town. The Government of India has sanctioned rail projects which would put each of the state capitals in the NER on the railways map (Table 6.15).

INVESTMENTS

Due to difficult terrain, poor condition of law and order leading to insurgency in certain areas, the target realisations of projects have been quite tardy. However, in the last five years, the Ministry of Railways have put in arduous efforts to deliver on various promises and utilises the funds allotted by the Planning Commission. As a result of the focused attention, the Railways' investment in the NER has steadily been going up and output has also shown significant improvements (Figure 6.10).

KEY ISSUES AND RECOMMENDATIONS

Indian Railways has been a change agent in the NER. The area has benefitted immensely from the 'unigauge' policy. By the end of 2014, when the gauge conversion works get completed, India would be connected seamlessly by rail from its easternmost cor-

Table 6.13
Gauge Conversion Status

PROJECT	STATE	KM.	REMARKS	TARGET DATE FOR COMPLETION
Lumding-Silchar-Jiribam & Badarpur-Kumarghat	Assam, Tripura, Manipur	483	National Project	December 2013
Rangia-Murkongselek alongwith linked fingers	Assam, Arunachal Pradesh	510	National Project	March 2014
Katakhal-Bhairabi	Assam, Mizoram	84		December 2014

Table 6.14
New Lines

NAME OF PROJECT	STATE	LENGTH (KM)	REMARKS	TARGET DATE
Bogibeel Rail cum Road Bridge	Assam	73	National Project	December 2015
New Maynaguri-Jogighopa	Assam, W.Bengal	245.68		March 2014
Murkongselek-Pasighat	Assam	30.61		March 2015
Tetelia-Byrnihat in lieu of Azra-Byrnihat	Meghalaya, Assam	21.5	National Project	March 2014
Dudhnoi-Mendipathar	Meghalaya, Assam	19.75		March 2013
Harmuti-Itanagar	Arunachal, Assam	33		Harmuti-Naharlagun: March 2012
Byrnihat – Shillong	Meghalaya	108	National Project	March 2017
Bhairabi- Sairang (Aizwal)	Mizoram	51.38	National Project	March 2014
Jiribam-Tupul (Imphal)	Manipur	98	National Project	Jiribam-Tupul: March 2014 Tupul-Imphal: March 2016
Dimapur-Zubza (Kohima)	Nagaland	88	National Project	March 2015
Agartala-Sabroom	Tripura	110	National Project	Agartala-Udaipur: December 2012 Udaipur-Sabroom: March 2014

Table 6.15
Status of Connectivity to Capital Cities

STATE	CAPITAL	NAME OF PROJECT	REMARKS & TARGET DATE
Assam	Guwahati (Dispur)	--	Connected
Tripura	Agartala	Kumarghat-Agartala	Connected
Arunachal Pradesh	Itanagar	Harmuti-Itanagar	Harmuti-Naharlagun:Mar-2012
Manipur	Imphal	Jiribam-Tupul	Jiribam-Tupul:Mar-2014 Tupul-Imphal:Mar-2016
Nagaland	Kohima	Dimapur-Zubza	Mar- 2015 (T) Extn. to Kohima will be pro- cessed after detailed survey, Problem in LA.
Mizoram	Aizwal	Bhairabhi-Sairang	Mar-2014 Extn. to Aizwal will be examined during detailed survey
Meghalaya	Shillong	Azra-Byrnihat-Shillong	Tetelia-Byrnihat in lieu of Azra- Byrnihat - Mar-2014 Byrnihat- Shillong not fixed.
Sikkim	Gangtok	Sivok-Rangpo	Sivok-Rangpo - Mar-2015.

ner to the westernmost corner. Completion of the Bogibeel bridge would connect the North of Brahmaputra railway alignment with south of Brahmaputra rail line at the easternmost end, providing an alternate route to Tinsukhia, Tirap, Dimapur etc. If the Railways succeed in bringing to reality its ambitious programme of taking rail to the capitals of every state in the region, it would be a significant achievement.

In order to provide focussed attention to asset creation in the NER, planning should be carried out in two phases.

PHASE I (UPTO 2020)

The Railways' shelf of projects is full to the brim for works upto 2020. Yet, projects in the NER have the ill repute of never getting delivered on time. If the gauge conversion projects get completed by 2014 as planned, concentrated effort on building new lines already sanctioned, can be easily launched. However, even if all these new lines works are completed by 2020, the connectivity by rail for every capital of the NE states will still remain a distant dream. Determined and planned efforts are imperative to achieve rail connectivity to all the capitals by 2020. To this end, following is considered inescapable:

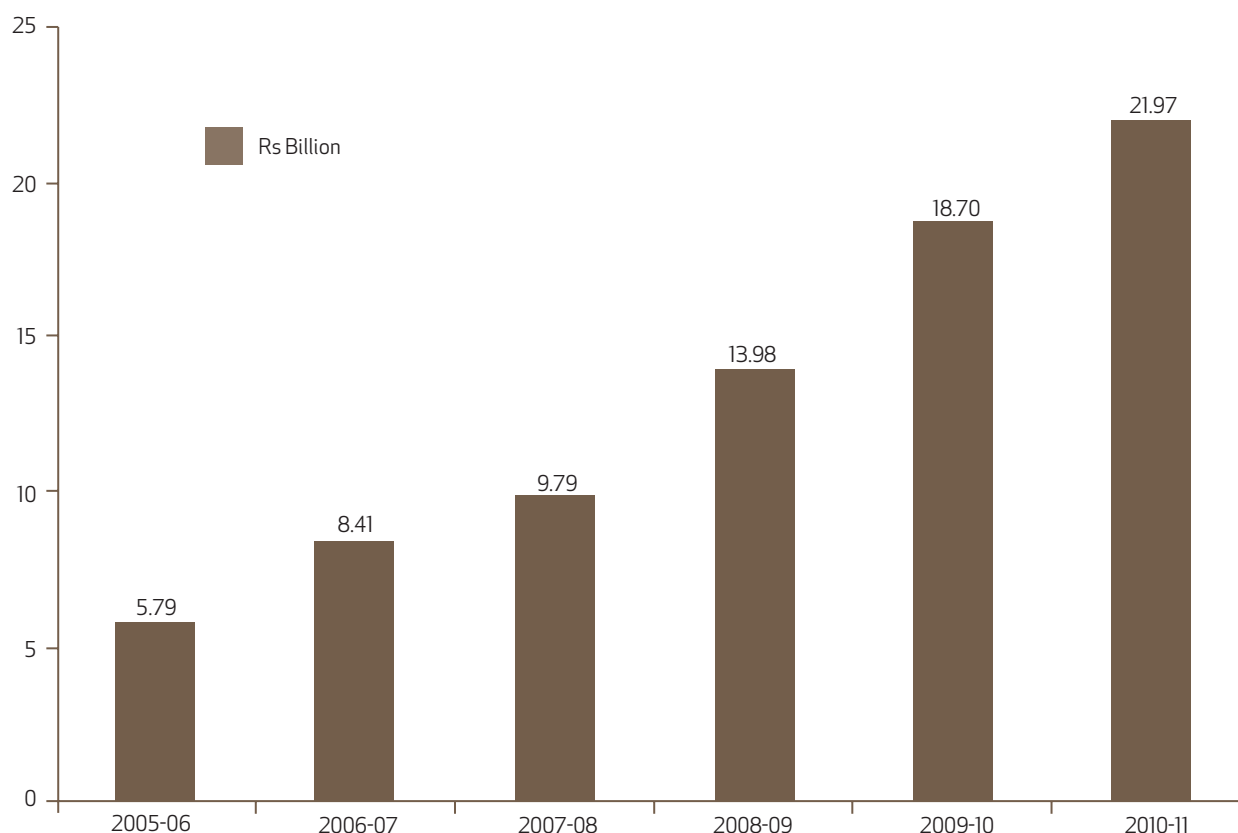
COMPLETION OF SURVEYS AND SANCTIONS BY 2014

All the remaining alignments to each of the capital towns which are yet to be sanctioned either due to surveys not getting completed or sanctions not

received must be taken up post-haste to ensure that works get completed by 2020. At present, only Guwahati and Agartala are connected by rail.

- Arunachal Pradesh: Itanagar has to be joined to the Rangia-Murkongselek route (which is under gauge conversion) at Harmuti. It is a sanctioned work upto Naharlagun which will act as a terminal for Itanagar. The work is expected to be completed by 2014.
- Manipur: The track from Jiribam to Tupul will get commissioned by March 2014. The extension from Tupul to Imphal has been sanctioned at a cost of Rs.44.78 billion in 2013.
- Mizoram: Aizwal, the capital of Mizoram, is to be connected to Badarpur on existing alignment via Bhairabi. The work is being done in two parts. Bhairabi to Sarang is a sanctioned work. The extension from Sarang to Aizawl is awaiting completion of survey. The sanction and resource mobilisation will follow.
- Meghalaya: Shillong is to be linked to Tetelia on the existing rail route but at present only Tetelia to Byrnihat route is under construction. Byrnihat to Shillong portion has been sanctioned at cost of Rs.40.83 billion in 2012-13.
- Nagaland: At present, work is sanctioned only from Dimapur to Zubza. Its extension to Kohima is still getting surveyed.
- Sikkim: Sivok to Rangpo, already sanctioned, is expected to be completed by March 2015. But Rangpo to Gangtok is still being contemplated.

Figure 6.10
Railway Investments in the North East



ed. The survey for extending the railway line not only upto Gangtok but beyond upto Nathu La, should be expedited.

It is apparent from the above picture that the target of connecting all state capitals by rail link cannot be adhered to unless the alignment and cost for connecting Shillong, Kohima, Imphal and Gangtok is speedily finalised and sanctions taken.

TECHNOLOGICAL UPGRADATION

Most of the railway projects have been sanctioned based on old surveys. At that time, IR was daunted by the task of drilling long tunnels especially in the Himalayas. But with the success being experienced in Jammu and Kashmir projects, as well as the fully operational Konkan Railway line, IR should have developed sufficient capacity by now to undertake long and sophisticated tunnel projects even in inhospitable terrain. There is hence an urgent need for technological upgradation as well as updation of all survey reports of the NER. The existing surveys have planned for stations at vertically distant locations. It may be possible to avoid this inconvenience by relying on introduction of more tunnels, not contemplated earlier for maintaining gradients as well as proximity to habitation.

The Committee envisages that once this connectivity is achieved; there will be eight Rajdhani Expresses—

one from each state capital, running to the national capital by 2020.

Electrification upto Agartala

At present, electrification of BG line upto Guwahati has been sanctioned. In order to provide seamless connectivity within the region, electrification of Guwahati-Lumding-Silchar-Agartala line should also be taken up and completed by 2020.

Augmentation of network capacity

The development of the rail network in the area is likely to increase the freight and passenger traffic and therefore augmentation of the network capacity will be needed. At present, the route from New Jalpaiguri to Lumding has double line in parts. With passenger and freight traffic likely to go up considerably in the future, the entire stretch from New Jalpaiguri to Guwahati will need to be doubled. The following routes are expected to be strengthened in due course.

- Doubling of New Jalpaiguri–New Alipurduar route
- Doubling of New Bongaigaon to Guwahati route
- Doubling of Guwahati to Lumding route: This route is the common portion which serves traffic going to Dibrugarh side and towards Silchar. To avoid congestion, this route needs to be doubled. A part of the route between Guwahati and Digaru has already

It is hence proposed that Badarpur and Dhubri should be developed as multi-modal hubs in the NER, where all the four modes of transport –rail, road, air and waterways–converge. These hubs are also strategically so well placed–both geographically and demographically

been completed and commissioned.

PHASE II (2020-2032)

The projects being undertaken in Phase I will provide excellent inter-regional and intra-regional connectivities. Yet, the following two actions will further catalyse trade, commerce, tourism in the region:

MULTI-MODAL HUBS

Badarpur and Dhubri are two locations which are eminently suitable for development as multi-modal hubs, particularly for the following reasons:

- Badarpur is a railway junction situated very close to Silchar. Indian Railways owns large tracts of land on which a suitable yard can be built to serve the needs of a multi-modal rail terminal handling containers of various sizes. The Barak river flows close by, where an Inland waterway port terminal can be planned. A National Highway passes through the town. Silchar (18 km away) has an operational airport.
- Dhubri is another such location. Located in close proximity to the Bangladesh border, it is situated on the banks of the mighty Brahmaputra where the Inland Waterway Authority is already in the process of developing an inland port. Dhubri is already on the railway map and NH-31 passes through the town. An airport at Rupsi (24 km away) is also coming up by 2020.

It is hence proposed that Badarpur and Dhubri should be developed as multi-modal hubs in the NER, where all the four modes of transport–rail, road, air and waterways–converge. These hubs are also strategically so well placed–both geographically and demographically that they may be amenable to be developed through PPP mode.

NEW LINE FROM DHUBRI TO SILCHAR VIA SHILLONG

It is suggested that a new line through Meghalaya connecting Dhubri to Silchar via Tura-Shillong should be surveyed and taken up as an alternate route for Badarpur-Silchar and beyond. This new alignment will link the entry point of Dhubri on the Indo-Bangladesh border to Meghalaya and southern Assam. It would create a link between the two proposed multi-modal hubs at Dhubri and Badarpur (near Silchar, 8 km). At Shillong, it will connect also with the new sanctioned line to Byrnihat (in

Meghalaya on the Guwahati-Shillong road) providing another alternate connection.

TRANS-BORDER CONNECTIVITY

- New line between Imphal-Moreh-Mandalay**
By 2020, the railway should arrive in Imphal. In Phase II, this alignment should be extended to Mandalay in Myanmar via Moreh-Tamu which is emerging as India's gateway on the land route to South East Asia. With the doors of democracy having opened in Myanmar, trade and commerce between India and Myanmar is bound to escalate. A helpful infrastructure will only galvanise this progress. Further, this is bound to give a fillip to the Look East Policy. However, it is suggested that this connectivity should be provided on broad gauge upto Mandalay to ensure seamless movement across borders.

- New Rail Link from Sittwe (Myanmar)**
India has invested heavily in developing Sittwe port in Myanmar in the Rakhine region. The transportation of goods via this port is at present planned by road and inland waterways. Kaladan Multi-modal Project has been undertaken to connect Sittwe port to India which includes development of waterways on Kaladan river and also a road connecting Sittwe port to Mizoram. However, it is felt that without proper rail connectivity, the potential of a major port cannot be exploited fully. It is hence suggested that the Indian government should plan for a rail link (BG) from Sittwe port to Aizwal in consultation with the Myanmar government.

This alignment can be taken up further north from Aizwal to Imphal to Kohima to Tirap on the existing rail route to Tinsukia. This rail link, if constructed, will generate many alternate rail routes for the whole region, thereby precluding any possibility of complete blockage of one state by a rogue group in a neighbouring state. If the Imphal-Moreh-Mandalay line also comes up, it will provide a handy connectivity to every state to take on international trade.

A direct rail link between Aizwal and Agartala will convert the whole alignment as a 'garland' on the neck of the NER adorning its body politic.

- Imphal as a new rail hub (national & international)**

Imphal can become a potential rail hub in future through possible project extensions in the following manner:

Present proposal: Jiribam-Tupul-Imphal (National Project)

- Eastward extension: Imphal-Moreh-Mandalay
- Northward extension: Imphal-Kohima-via Northern Nagaland-Tirap (Arunachal

Pradesh)

- Southern extension: Line coming from Paletwa (on the Kaladan Multi-modal route)-Indo-Myanmar border-Lawngtlai-Aizawl-Churachandpur-Imphal.

It is proposed that Imphal will become a hub for railway connectivity with Myanmar from two sides and also get Nagaland and Arunachal Pradesh.

INSTITUTIONAL CAPACITY BUILDING

There is a handful of sanctioned projects, many termed as 'National Projects' where the funding for the project is met to the extent of 75 per cent by the Central government and 25 per cent by the Ministry of Railways. This special funding arrangement is helping the timely completion of the railway projects. Yet, many projects are languishing purportedly for reasons like difficult terrain, poor condition of law and order bordering on insurgency in certain areas. Though railway administration has worked arduously to complete projects and utilise funds so generously available under National Projects scheme, yet the impression among the local populace is that of perpetual delays caused by willful neglect. In the last five years, the Railways' investment in the NER has steadily been going up and output has also shown considerable improvements.

150-200 KM OF NEW LINE ANNUALLY

To improve its image and visibility on project completion, Indian Railways should unfailingly build 150-200 km of new lines every year in this region. This would involve an expenditure of nearly Rs.35 billion annually. The institutional back up to sustain activity of this level shall have to be provided and strengthened by the Railways.

CLOSE MONITORING

There is a need to spend the allotted funds in a timely manner to cut down delays. Close monitoring of progress of works is essential at both Railway board and Zonal levels.

INLAND WATER TRANSPORT

It may come as a surprise to many to learn that mechanical propulsion was not introduced into India with the arrival of the Railways in 1853, but almost 30 years earlier in 1,823 when the first propelled craft - Diana - weighing 89 tonnes, sailed with passengers from Kulpi Road to Calcutta, a distance of 80 km on the Hooghly. In 1,863, regular steamer service commenced between Calcutta and Assam. As East India Company's interests rested more on enhancement of traffic to and from ports for obvious reasons, 19th century trade and commerce relied heavily on river and canal navigation. At its peak in 1876-77, the country boat traffic registered at Calcutta was about 180,000

cargo boats, 124,000 at Hooghly and about 62,000 at Patna.

However, the advent of the railways in the second half of the 19th century and rapid expansion of its network brought a sea change in the scenario. The decline of river navigation started from 1860 onwards and could not be stemmed thereafter. The phenomenal growth of road transport, particularly during and after World War II drove the last nail in the coffin for IWT. After 1947, the road network made its foray into every nook and corner of India. The country already boasted of one of the largest rail networks in the world. Both these transport modes wrested away the centres of economic activity from the waterways and the survival of IWT as a commercially viable mode of transport became well nigh impossible. Diversion of waters from rivers for irrigation and deforestation of hilly ranges leading to erosion and consequent accumulation of silt in rivers further compounded the problem.

To improve its image and visibility on project completion, Indian Railways should unfailingly build 150-200 km of new lines every year in the region

The IWT report of 1970 summarised the situation, as it existed in 1969, as under:

'11.3.1. The Brahmaputra has been serving for a long time as an important means of communication in Assam and the water route was linked to Calcutta, Bihar and Uttar Pradesh. The trade between Assam and Calcutta gradually flourished as the steamer service provided and economic means of transportation. Assam used to depend largely on inland water transport for its import and exports. The main products of Assam are oil, tea, jute, timber, coal paddy and rice. When the services operated by Joint Steamer Companies were at their peak, about 93 per cent of tea and 90 per cent of jute crop used to move to Calcutta by river. The traffic gradually declined and by 1965, the tea traffic by river to Calcutta was reduced to 65 per cent and jute traffic to 25 per cent only. Large quantities of food grains, sugar, coal, fertilisers, machinery etc. also used to be moved by river route

With the outbreak of hostilities with Pakistan in September 1965, the river route between Calcutta and Assam was closed.'

There was a precipitous fall in traffic within a decade.

The economic advantages of this mode compared to other modes have been emphasised by a number of high powered committees including the National Transport Policy Committee (NTPC) (GOI, 1980) and a number of reports and studies (NCAER 1974, UNDP 1993, Dr. Sriraman Rao and Kumar, 1996).

The North East Region being riverine offers immense scope for development of inland waterway transport. This mode also has a natural fit with the bulk commodities that the NER imports from and exports to the rest of India

Some of these studies also pointed out the role that this mode could perform to take care of the maintenance of ecological balance.

IWT DEVELOPMENT IN THE NER

The Inland Waterways Authority of India (IWAI) was set up under the IWAI Act of 1985, based on recommendations by several committees, the main being NTPC, 1980. The IWAI is responsible to develop and manage National Waterways for navigation.

On 1st September, 1988, 891 km of the river Brahmaputra between the Bangladesh border to Sadiya was declared as National Waterway 2 (NW-2) by an Act of Parliament. At present, the waterway is being used by vessels of the government of Assam, Central Inland Water Transport Corporation (CIWTC), Border Security Force, tourism vessels, and other private operators. The Brahmaputra now has several small river ports. In addition, there are more than 30 pairs of ferry ghats (crossing points) on the Brahmaputra, transporting both passengers and cargo. Long cruise tourist vessels make regular trips between Sivsagar near Dibrugarh and the Manas wild life sanctuary near Joghicha.

Apart from the Brahmaputra system, the other riverine system is that of the Barak (Surma) river. This too had a substantive role to play in transport in the region, again relying on connectivity through (present-day) Bangladesh at Karimganj. This provided good access to commercially active centres like Agartala in Tripura. However, the Barak river system is now effectively navigable only for six months of the year and the through traffic through Bangladesh is again governed by the uncertain protocol arrangements with that country³. IWAI is also working to declare Barak river as National Waterways VI. It is likely to be done in the immediate to near future.

However, IWT still lacks policy focus and investments. Operators with required fleet size of vessels have not emerged either in private or in public sector. This has been a major bottleneck in the promotion. The Brahmaputra and Barak have not been fully commercially exploited for transportation purposes. IWAI is not an operator while the public sector, CIWTC is sick and has squandered away the advantages of fleet strength. The private sector, in both India and Bangladesh, has not emerged due to various policy reasons. Despite the inherent advantage of IWT in general and its natural fit for transportation in the NER, a policy regime needs to be

created that will promote investment in appropriate fleets of vessels in both public and private sectors.

SIGNIFICANCE OF IWT FOR NER

The North East Region being riverine offers immense scope for development of IWT. IWT has a natural fit with the bulk commodities that the NER imports from and exports to the rest of India—tea, oil, cement and coal are exported; foodgrains, fertilisers, petroleum products are imported. All these commodities being non-perishable and high volume are suitable for transportation by IWT. It would be cheaper than road or rail but slower. But fast transportation is not required for these commodities. Investment in waterways can provide alternative routes for movement of bulk cargo for Nagaland and Manipur which would be a cheaper option and will not face blockages and similar exigencies. Plans and investment for IWT have to be anchored within a multimodal transport plan. As multimodal transport planning is yet to take off in the NER, IWT's full potential has not been leveraged.

Optimal use of IWT for transportation of bulk commodities will open up the narrow chicken's neck corridor for transportation of passengers through fast moving rail connections, evacuation of power, telecommunication links etc. Tourism is also a potential user of IWT. Transport of Over Dimensional Cargo (ODC) for hydropower development in the North East essentially requires IWT as there are limitations on hill roads.

Undivided Bengal and the NER were an integrated economic market prior to Independence where the riverine transport system was intensively used for movement of cargo and passengers. The present challenge is to recreate those routes by combining investment with multi-modal planning.

Thus, development of IWT requires active and positive participation by Bangladesh. India's relationship with Bangladesh is dependent upon the political climate. IWT arrangements should be devised in such a manner that stakeholders, both in India and Bangladesh, derive value from developing and using IWT.

Optimal development of IWT will happen when there is commonality of purposes among:

- Stakeholders such as the Food Corporation of India and the oil companies, tea industry, cement industry.
- Owners of fleet of vessels of the right size
- The goodwill of Bangladesh and its participation
- Multi-modal transport planning

The objective is to integrate IWT within intermodal transport systems to provide door-to-door services

3 Viability of Inland Water Transport in India, N. Rangaraj, G. Raghuram, 2005

for the movement of domestic and international cargo traffic, thereby responding to market demand for convenient and competitive service while optimising the economic, financial, environmental and social benefits that can be derived from each mode in the entire transport chain in the North East.

SCHEMES / PROJECTS UNDERWAY

Indo-Bangladesh Inland Waterways Protocol

An inland water transit and trade protocol exists between India and Bangladesh under which inland vessels of one country can transit through specified routes of the other country. The existing protocol routes are

- i Kolkata-Pandu-Kolkata
- ii Kolkata-Karimganj-Kolkata
- iii Rajshahi-Dhulian-Rajshahi
- iv Pandu-Karimganj-Pandu

For inter-country trade, five ports of call have been designated in each country: Haldia, Kolkata, Pandu, Karimganj and Silghat in India, and Narayanganj, Khulna, Mongla, Sirajganj and Ashuganj in Bangladesh. Under the Protocol, 50:50 cargo sharing by Indian and Bangladeshi vessels is permitted both for transit and inter-country trade.

KALADAN MULTIMODAL TRANSIT TRANSPORT PROJECT

The Project envisages development of an alternate connectivity to Mizoram through Myanmar. The project is piloted and funded by the Ministry of External Affairs. Following are the various components of the project:

- Port & IWT: Construction of a Port at Sittwe in Myanmar and development of inland navigation along river Kaladan from Sittwe to Paletwa (158 km) including supply of six 300 tonne capacity cargo barges. IWT terminals are to be constructed at Sittwe and Paletwa.
- Highway (Myanmar): Construction of a road from Paletwa to the Indo-Myanmar border with Mizoram (125 km)
- Road section in India: Construction of a road from the Indo-Myanmar border till NH-54 at Lunglei in Mizoram (100 km)

Terminal facilities

Terminal facilities for loading and unloading of cargo are being maintained by IWAI at strategic locations like Dhubri, Jogighopa, Pandu, Silghat, Neamati and Dibrugarh. Dhubri is the first important terminal on the Brahmaputra. Pandu (Guwahati) is being developed as a multi-modal transport hub which can serve the entire NER. The existing temporary IWT terminal at Jogighopa is proposed to be upgraded to a bulk cargo handling terminal for products like Meghalaya coal, with rail connectivity up to the terminal.

DEVELOPMENT STATUS

Details of terminals at 11 locations being maintained on NW-2 for handling cargo vessels and passenger ferries are given in Table 6.16.

Encouraging infrastructure has been built on the Brahmaputra by IWAI. Fixed terminals are proposed at Dhubri and Hathsinghimari on both banks of the river with RO-RO services.

The Barak also has small ports at Karimganj, Badarpur, and Silchar and ferry services at several places across it. In Arunachal Pradesh, the rivers Lohit, Subansiri, Burhi Dihing, Noa Dihing, and Tirap are used for navigation by small country boats in stretches where there are no rapids.

POTENTIAL BUSINESS OPPORTUNITY

The largest expected cargo movements in the NER shall arise from the ambitious power projects being implemented by various private sector companies along with the National Hydroelectric Power Corporation (NHPC), North Eastern Electric Power Corporation (NEEPCO), and National Thermal Power Corporation (NTPC) on various tributaries of the Brahmaputra, particularly in Arunachal Pradesh. These developments are expected to generate cargo movements of about 50-100 million metric tonnes over a period of 20 years (2.5 to 5.0 million metric tonnes per year). Accordingly, the infrastructure requirements for the same will be substantial. IWT can play the most momentous role in catering to needs of such an immense scale.

As regards specific projects, the proposed transportation of coal from Haldia through the Indo-Bangladesh Protocol Waterway to Jogighopa and onwards to the NTPC power plant at Bongaigaon is a PPP project undertaken between NTPC, IWAI and a private operator, that has the potential of proving the utility of waterways for commercial operations. Other projects that have great potential for movement of waterways in NER are:

- Transportation of foodgrains of FCI from Kolkata to Tripura through Ashuganj (in Bangladesh) and within NW-2.
- Transportation of food grains and fertilisers between mainland and NER, especially Assam and Tripura
- Transportation of containers on the Kolkata-Pandu-Kolkata route, and the Kolkata-Patna-Kolkata route.
- Transportation of pipes and other cargoes of Oil and Natural Gas Corporation (ONGC) and Oil India Ltd. from Kolkata to Dibrugarh/Jorhat/ Karimganj/ Agartala via Ashuganj.
- Transportation of perishable cargo produced in Meghalaya and consumable goods for West Garo Hills between Phulwari, Dhubri and at other locations by Ro-Ro vessels.
- Proposed terminals on the Brahmaputra

Figure 6.11
Brahmaputra River System Along With Indo-Bangladesh Protocol Route



Source: Inland Waterways Authority of India (IWA)

at Dhubri and Hathsinghimari to facilitate transportation between Phulbari and Dhubri.

RECOMMENDATIONS

IWT traffic in the NER on the mighty Brahmaputra has to be seen in two segments:

- Traffic across the boundary on international waters in Bangladesh i.e. from Sadia to Kolkata/Haldia
- Traffic entirely within the national boundary i.e. from Sadia to Dhubri/Jogighopa

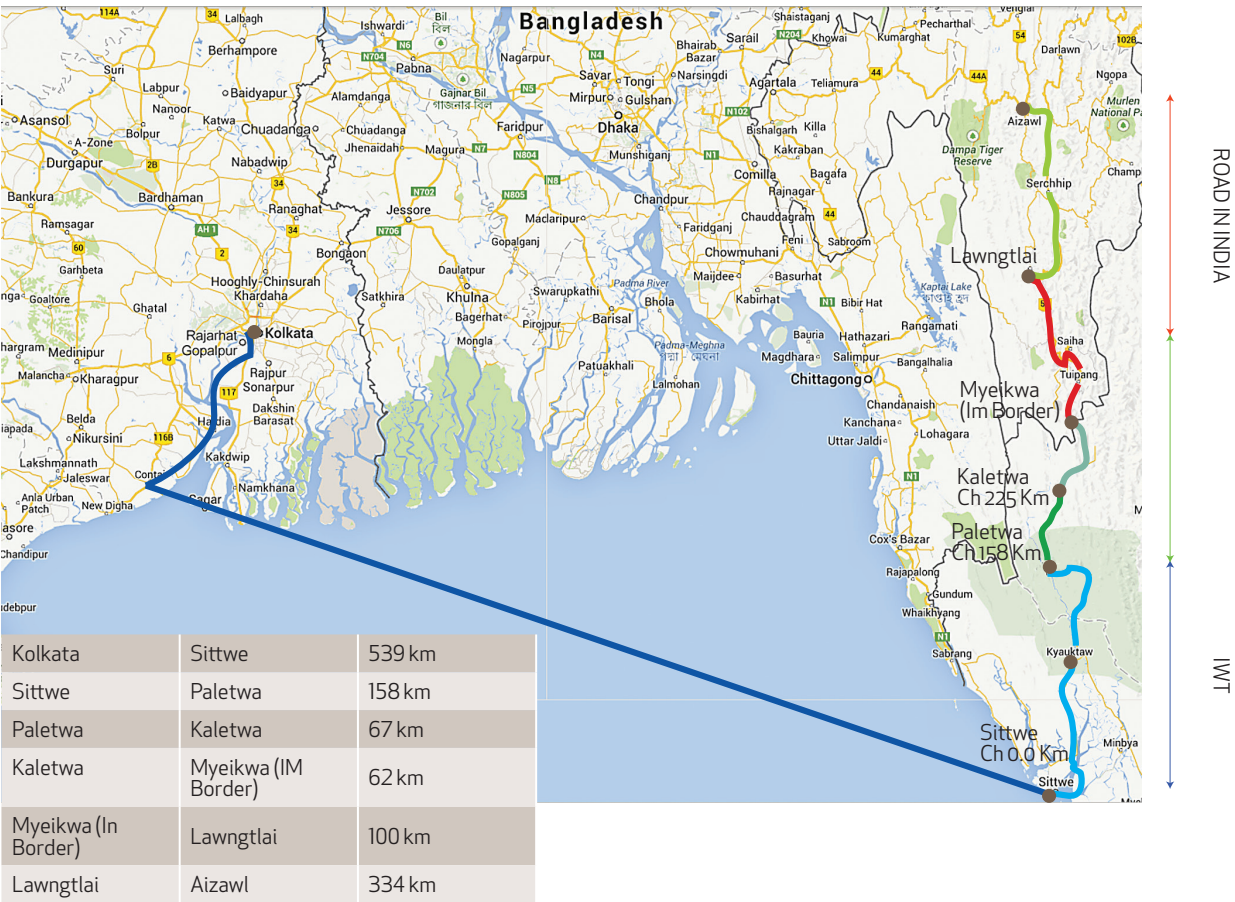
The first segment, movement across Bangladesh, has exciting prospects for both countries, but its estimated potential could never be exploited due to

short-term extensions of Indo-Bangladesh Inland Waterways Protocol.

From 2001 to 2012, the protocol has been renewed about 26 times. The existing protocol is valid upto 31st March 2015.

If the protocol could be extended in one go for at least 20 to 25 years, it would spur private players into action to provide investments both in capital in the form of modern mechanically propelled boats as well as in operations and marketing. This would provide stability to the trading environment with a concomitant confidence building in both public and private sectors to join hands for possible PPP projects. As it is in mutual interest of both India and Bangladesh to keep this protocol route navigable, the Indian gov-

Figure 6.12
Kaladan Multimodal Transit Transport Project



ernment should consider assisting Bangladesh not only in maintaining the channels navigable, but also for upgrading the system to ensure night navigation smoothly.

In case a long duration protocol is not forthcoming from Bangladesh, we should concentrate on developing IWT on the Sadia to Dhubri segment. NTPC, 1980, had delved into the financial aspect of IWT at quite elaborate length. What it did not perceive at that time was the way inter-modal traffic would gain acceptance in the next 20-25 years. The NER is devoid of large scale industry. It cannot generate a 'block rake load' for finding acceptance on rail. Hence, this report suggests developing inter-modal hubs at Badarpur and Dhubri. IWT can be very conveniently as well as gainfully utilised for bringing containers (40 ft or 20 ft) by barges/boats to these hubs for aggregation and subsequent transport by rail from these to the rest of India. For smooth transfer of goods from one mode of water to the other, the integration point i.e. the inter-modal hub should necessarily have facilities for:

- Permanent berths
- Handling gear like shore cranes and gantries (for containers)
- Mobile cranes, forklift trucks and trailers

- Storage sheds, warehouses and open stacking yards
- Reliable power supply and sufficient lighting (for shore connections to vessels etc)
- Water supply
- Bunker supply
- Rail yard adjacent to the riverside berth
- Proper road connectivity

Once adequate infrastructure is put in place, IWT is bound to get a fillip. This would auger well for the growth of small scale industry in the region.

Government should also survey the possibility of constructing a navigable canal from the Brahmaputra to Ganga via the Siliguri neck to ensure round-the-year IWT traffic from the NER to Kolkata/ Haldia. Inland Waterways Authority and Central Rail Warehousing Corporation (a subsidiary of Central Warehousing Corporation) are proposing to jointly develop a multi-modal logistic hub at Jogighopa with a rail siding.

CREATION OF BARAK RIVER NATIONAL WATERWAY

In the pre-Independence era, the Barak river was used for IWT quite intensively. After 1947, this traf-

Table 6.16
National Waterway 2 Terminals

LOCATION	TYPE OF TERMINAL (FIXED/FLOATING)	PURPOSE
Hatsinghimari	Ro-Ro	For cargo cum passenger berthing facility – presently dropped due to severe erosion
Dhubri	Ro-Ro terminal under construction	For completion of customs and immigration both for incoming and outgoing vessels on Protocol route in addition to handling of cargo vessels and passenger ferries.
Jogighopa	Floating terminal with a steel crane pontoon.	For transportation of Meghalaya coal through waterway.
Pandu	Fixed/permanent terminal with two go-downs and RCC jetty	Pandu is the major location on NW-2 as an entry point to NE States.
Tejpur	Floating terminal with a steel crane pontoon.	For handling of cargo vessels, local ferry service. ODC cargo is also expected at this terminal in view of upcoming hydro power project.
Biswnath Ghat	Floating Terminal	For handling of PDS cargo by FCI.
Silghat	Floating terminal with a steel pontoon.	For movement of POL of Numaligarh Refinery.
Neamati	Floating terminal with a crane pontoon	For handling of cargo vessels, local ferry service. ODC cargo is also expected at this terminal in view of upcoming hydro power project.
Dibrugarh	Floating terminal with a steel pontoon	For handling of cargo vessels, local ferry service. ODC cargo is also expected at this terminal in view of upcoming hydro power project.
Opp. Dibrugarh	Floating terminal with steel pontoon.	For handling of FCI cargo.
Sengajan/ Panbari	Floating terminal with a crane pontoon	Considered in view of regular movement of Indian army IWT fleet.
Oriumghat	Floating steel pontoon	To facilitate vessels going to Arunachal Pradesh and BSF / Army

fic ebbed and vanished altogether by 1965. There is now a need to develop the Barak river as a national waterway, preferably for connecting Manipur and Nagaland to Chittagong port. In case that does not fructify due to political issues with Bangladesh, the river can still provide a connection between the proposed inter-modal hub at Badarpur and the hinterland served by the river.

CREATION, MAINTENANCE AND REPAIR FACILITIES FOR VESSELS

Right from its inception in the 19th century, IWT was developed with its focus at Kolkata. It was hence natural that the maintenance facilities for the mechanised boats engaged in this movement were developed around the city. But to make the move-

ment from Sadia to Dhubri independent of the rest of the segment, it is imperative that maintenance and repair facilities for these boats are developed at Pandu (near Guwahati) without any delay. This will also make strategic sense.

DEVELOPMENT OF A GIS-BASED STATISTICAL INFORMATION SYSTEMS

GIS-based statistical information systems should be developed to support policy, management and operational decision-making.

STIMULATING INVESTMENTS

If an enabling policy and planning framework is put in place, investments can then be stimulated in areas such as:

- Ships, ferry services and transport enterprises
- Modern material handling facilities on the Brahmaputra river at key nodes, e.g. for coal in Jogighopa for the Bongaigaon NTPC thermal power plant
- Appropriately designed barges that can promote containerised traffic on the Brahmaputra and Barak rivers
- Creation of multi-modal hub facilities at appropriate points such as Badarpur
- Facilitation of cargo transshipment between seagoing ships and inland vessels for onward distribution
- Small scale inland water transport for both passengers and cargo: Passengers and cargo are moved via inland water transport both in the organised sector and in the unorganised sector. In the unorganised sector, the fleet consists of wooden boats equipped with agricultural pumps. At present, there are no data regarding the transport volumes within this sector. However, this mode of transport is essential to small or remote communities for the transport of agricultural and commercial products to and from regional markets and growth centres, especially during the monsoon and flooding season. Therefore, relatively small investments in transport facilities for private or small-scale transport services would increase the strategic connectivity of rural communities through ferry services and small goods transport. An analysis should be undertaken to identify strategic nodal points through which increased access to markets, education, or health services might bring benefits to the region. Modernisation of country craft development should be taken in hand to extend services to the feeder route.

For such investments to become feasible, they would have to pass the test of economic and financial viability. This will be facilitated by the clear announcement of public investment programmes related to the strengthening of IWAI for undertaking the creation of waterways infrastructure, and a stable policy framework that results from international arrangements referred to above.

The desired development of IWT cannot be achieved through public investment alone; the private sector has a crucial role to play. As brought out by Dr Sriraman in his paper Long term perspectives on IWT in India, the 9th Plan has clearly recognised and envisaged the role of private sector in IWT, particularly in:

- Ownership and operation of vessels for cargo and passenger movement
- Fairway development and maintenance
- Construction and operation of terminals and river ports

- Provision of mechanised handling systems, maintenance of navigational facilities etc.
- Pilotage facilities
- Setting up and operating IWT training institutions

Apart from permitting Foreign Direct Investment upto 100 per cent of equity, government support has been outlined as conduct of pre-feasibility, preparation of DPRs by IWAI, land acquisition, long-term cargo assurance, equity participation etc. While the private sector response has so far been lukewarm, there are indications of some private investments being planned, particularly for vessel acquisition and construction of barges/ jetties. Greater participation by the private sector shall be ensured through favourable policy framework and viable traffic volumes.

CROSSING THE BRAHMAPUTRA

As mentioned before, the 890 km length of Brahmaputra from Dhubri to Sadia has three existing bridges, and two more are under construction. Both for security and general communication, this is grossly insufficient. Safe, modern and regular ferry services with RO-RO facilities should be operational at proper intervals. Currently, more than 70 ferry services are operational in Assam, out of which 50 services are being operated by the IWT department of the government of Assam.

IWAI is working on building terminals and RO-RO connectivity between Dhubri and Hathsingimari. A study should be conducted to locate more points where quality ferry services and RO-RO services should be introduced.

CONNECTIVITY WITH NEIGHBOURING COUNTRIES

LOOK EAST POLICY

The Look East Policy (LEP) was launched in 1992 just after the cessation of the Cold War and around the time when India was embarking on its first, and effective, dose of liberalisation. It was a strategic policy decision taken by the government and to quote Prime Minister Dr. Manmohan Singh, 'it was also a strategic shift in India's vision of the world and India's place in the evolving Indian economy'.

As a result, gradually but surely, India has begun to figure in the strategic thinking of Southeast Asia and there has been increasing cooperation on many fronts. ASEAN too began considering closer ties with India. India also started recognising the growing influence of ASEAN in the region while the LEP provided the right backbone to support domestic and public consensus in desirability of forging closer engagement with Southeast Asia. ASEAN has indeed emerged as a strong group of nations whose

In October 2007, a closed-door meeting of the Chief Ministers of the NE states, the External Affairs Minister and other senior Ministers saw the first formal articulation of the connectivity needs of the NER with neighbouring countries

economy has been constantly looking up. There is hence a major potential in ASEAN-India cooperation on infrastructure. The Comprehensive Asian Development Plan (CADP) and the Master Plan on ASEAN connectivity (MPAC) emphasise the importance of ASEAN connectivity with neighbouring countries in South East and East Asia. ASEAN-India connectivity is the main theme of the CADP Phase II report. Development of the transport infrastructure in the NER and its simultaneous integration with ASEAN will not only shore up the Indian economy but also enhance India's reputation in the South East Asian region. (See Chapter 13, Volume II on Promoting International Transport Connectivity) between India and the South and South East Asia Regions.

NER TO PLAY THE ARROWHEAD

In October 2007, a closed-door meeting of the Chief Ministers of the NE states, the External Affairs Minister and other senior Ministers saw the first formal articulation of the connectivity needs of the NER with neighbouring countries. Fortunately, the following years have seen growing closeness of relationships between India on the one hand and Bangladesh and Myanmar on the other. As rightly expressed in NER Vision 2020, North East India is India's gateway to South East Asia. The Look East Policy also envisages increasing commercial interchanges between NER, our international neighbourhood and beyond to South East Asia. At present, however, India's international transport linkages with the East are highly underdeveloped, as are its linkages with Bangladesh. However, with the increasing realisation to develop such international linkages, a couple of transport projects are being undertaken while certain others are contemplated. These projects have been outlined here in addition to the Committee's recommendations. The ongoing activities and recommendations have been discussed country-wise and not sector-wise.

IMPROVING LAND CONNECTIVITY

Land connectivity is the most effective and essential form of linkage across the international borders. Before considering country-specific external linkages, it is important that the complementary internal transport infrastructure develops as adequate integration to market places and centres of production alone will ensure equitable spread of benefits accruing from such investments. Due to the history of close cultural, commercial and economic linkages, there has been a free flow of informal trade across

these borders. To formalise these linkages, we have to initiate operation of Land Custom Stations (LCSs) and the proposed Integrated Check Posts (ICPs) at suitable locations where sizable volumes of traffic is anticipated.

Of the total 5,437 km of international border of the NER, 1,880 km is with Bangladesh and 1,643 km is with Myanmar. (Table 6.1)

There are 38 LCSs notified under section 7 of the Customs Act, 1962, in the NER. But even today, most of these notified LCSs have very poor road connectivity. The government of India is working to upgrade the following five LCS to Integrated Check Posts at an approximate investment of Rs 120 million each:

- A. With Bangladesh
 - i. Dawki in Meghalaya
 - ii. Agartala in Tripura
 - iii. Satarkandi in Assam
 - iv. Kharpuchia in Mizoram
- B. With Myanmar
 - v. Moreh in Manipur

A new statutory authority, the Land Ports Authority of India, has been created under an eponymous Act recently. The ICPs will function under this authority, though sovereign functions will continue to be provided by the designated departments. This initiative is worthwhile. However, certain issues still need to be addressed.

- i. The LCSs which are not being upgraded to ICPs do not have any single-point administrative control for their management or development. Their development is done by state governments with funds from Assistance to States for Developing Export Infrastructure and Allied Activities (ASIDE) scheme of Commerce Ministry. Hence, their development is bereft of systematic planning and dependent on states' priorities.
- ii. The second drawback is that backward integration in terms of connectivity suffers. As there is tremendous pressure on the state governments for different roads catering to different ethnic/pressure groups, connectivity to LCSs which are perceived as Central Government responsibility remain neglected.

It is, therefore, recommended that a special programme to provide linkages to the Land Custom Stations should be taken up. Along with roads, improvement in the facilities at the LCSs should be taken up in a planned manner.

IMPROVING INTERNATIONAL AIR CONNECTIVITY

While country-specific transport linkages (particularly through road, rail and water) are discussed in detail in the following sections, a possible option

to develop international connectivity through the NER with India's neighbouring countries also becomes relevant and needs consideration. Building on the recommendation made in the section on aviation earlier, the Hub and Spoke model proposed with smaller aircrafts can extend their operations to Dhaka, Thimpu, Myanmar and even further to the commercially active city of Mandalay. As such, certain airports are being made international as part of India's Look East Policy to boost the NER's connectivity and trade with South East Asia. Therefore, exploring viability of the Hub and Spoke model and with certain (Imphal and Agartala are proposed) airports becoming international, the air connectivity between the cities of the NER and Myanmar, Bangladesh and other neighbouring countries would be easier and boost trade, tourism and people-to-people contact.

BANGLADESH

The transport links with Bangladesh that were broken as a result of the Partition and then completely severed after the 1965 Indo-Pak War have been discussed in detail. The resultant damage to the economy of the NER is also well understood. Sincere efforts are needed by both nations to reconstruct and further develop their connectivity links and strengthen bilateral ties. There is a growing realisation that increased economic partnership will bring substantial benefits. While India's foreign policy has seen certain developments to this end during the last couple of years, the traction needs to be sustained and focused on-ground implementation.

ONGOING DEVELOPMENTS

Following high-level interactions between the Prime Ministers of the two countries, there has been an agreement on several important transportation and trade milestones.

- India to gain access to Chittagong and Mongla Ports in Bangladesh
- Agartala-Akhaura Railway line, which will provide rail connectivity between Tripura and Bangladesh
- Development of border haats on the Indo-Bangladesh border which will promote trade and connectivity
- Bridge over river Feni between India and Bangladesh at Sabroom, Tripura. It is recommended that this should be a rail-cum-road bridge to link the under-construction Agartala-Sabroom railway line to Chittagong
- Development of Sabroom-Ramgarh and Dhemagiri-Tegamukh border points which will provide new connectivity between Bangladesh, Tripura and Mizoram. It may be stated here that Mizoram, prior to Independence, had exchange of commodities through the

Dhemagiri-Tegamukh route via the Karna-phuli river. Presently, Mizoram has no connectivity to Bangladesh.

- Reviving the Kulaura-Mahisashan rail link

EXTENSION OF THE INDO-BANGLADESH PROTOCOL

The Indo-Bangladesh Protocol on Inland Water Transit and Trade has been applicable since 1972. Four routes are specified with five ports of call in each country. The protocol permits inland vessels of one country to transit through the specified routes of the other country. The existing protocol routes are:

- Kolkata-Pandu-Kolkata
- Kolkata-Karimganj - Kolkata
- Rajshahi-Dhulian-Rajshahi
- Pandu-Karimganj-Pandu

For inter-country trade, following five ports of call have been designated in each country:

Ports of Call at India

- Haldia (West Bengal), Kolkata (West Bengal), Pandu (Assam), Karimganj (Assam) and Silghat (Assam).

Ports of Call at Bangladesh

- Narayanganj, Khulna, Mongla, Sirajganj and Ashuganj.

A point earlier made needs reiteration. The IWT Protocol should be extended for 20 years so that both India and Bangladesh's business can make informed long term investment choices and benefit.

REGIONAL MOTOR VEHICLE AGREEMENT

A draft Regional Motor Vehicle Agreement expected to provide an enabling legal framework for seamless travel across SAARC borders has been on the drawing board for several years now. North Eastern states would be largely benefited by such an agreement.

NEW BUS SERVICES

An Agartala-Dhaka bus service has been in operation since 2003, underscoring the close bonds on both sides. Bus services on both sides linking Sylhet to Shillong and Dawki, Dhaka and Shillong, and Dhaka and Guwahati should also be started.

CONNECTING MEGHALAYA AND TRIPURA WITH BANGLADESH

Connecting Meghalaya with Bangladesh at Dawki, Shella, Baghmara, Burengapara and Mahendra-

There is a growing realisation that increased economic partnership with Bangladesh will bring substantial benefits. While India's foreign policy has seen certain developments to this end during the last couple of years, the traction needs to be sustained

ganj and similarly Tripura at Kalkalighat, Kamalpur, Khowai, Ranir Bazar and Sabrum will develop international linkages with Bangladesh. This will facilitate alternate routes between these two states, with rest of the country, access to the Asian Highway network and connectivity with major cities in Bangladesh.

By linking Mizoram at Tlabung with Bangladesh, a much shorter route between Mizoram and Tripura (at Sabroom) could be developed. Apart from this, alternate routes between Mizoram and Meghalaya can be developed through Bangladesh (via Chittagong and Dhaka).

INDO-BANGLADESH RAIL CONNECTIVITY

A prestigious project has already been taken in by the Government of India by providing funds for connecting Akhaura (Bangladesh) and Agartala (India). This will provide access to Dhaka as well as Chittagong. However, this will remain on metre gauge which would need transshipment at Agartala. Possibility should be explored for mobilising fund for conversion of line from Agartala to Dhaka-Chittagong from MG to BG to have seamless freight operations on this route. When India and Bangladesh finally agree for opening of Chittagong, this seamless connectivity will unlock value for both India and Bangladesh. It will also provide a unifying connectivity from Kolkata to the NER and beyond via Dhaka-Agartala. There is already a proposal for surveying a rail connection from Belonia (India) to Chittagong (Bangladesh) which may also be pursued.

MYANMAR

There has been a series of high-level visits between India and Myanmar in 2010, 2011 and 2012. With the advent of democracy in Myanmar, relations are on an upswing. The main gateway between Myanmar and India is at Moreh (Manipur)-Tamu (Myanmar). Arunachal Pradesh, Nagaland, Manipur and Mizoram share a 1600 km border with Myanmar along with strong cultural and ethnic links. Due to difficult terrain and insurgency on both sides, transportation linkages have not adequately developed.

India has built the Moreh-Tamu-Kalemyo-Kalewa (TKK) Friendship Road in Myanmar. Apart from Moreh, the only other connecting links are at Pangsau Pass in Arunachal Pradesh and Zawkhathar in Mizoram. Recently, it has been decided to develop Pangsau Pass as a first formal border haat between India and Myanmar on the lines of the Indo-Bangladesh border haat on the Meghalaya border. At Zawkhathar, India has a well-developed LCS but hardly any trade takes place as links between Zawkhathar and Rih and beyond in Myanmar are very poor. **India is now developing the Rih-Tiddim Road with grant assistance to Myanmar.**

The proposed Trilateral Highway between India, Myanmar and Thailand as part of the Asian Highway project can be a game changer for the NER as it will provide direct road connectivity to the markets of South East Asia. It is expected to be completed by 2016. The known status of this road beginning from Moreh in Manipur to Mae Sot in Thailand is shown in Table 6.17.

Along with the initiated transport projects, certain others are recommended:

IMPHAL-MANDALAY BUS SERVICE

A bus service between Imphal and Mandalay has been a persistent demand from Manipur. Though it was expected that a protocol would be signed between the two countries during the recent visit of Prime Minister, Dr Manmohan Singh, to Myanmar in May 2012, due to certain technical reason it could not materialise. It is understood that the Myanmar Government is positive on the idea. **It is recommended that the bus service should be started without waiting for a perfect road as the road from Tamu to Mandalay is not good in some parts.**

INDO-MYANMAR RAIL CONNECTIVITY

The railway link to Imphal is expected to be completed by 2016. While this line is under construction, the survey for extending the line from Imphal to Moreh and from Moreh to Mandalay should be completed. A railway link (BG) upto Mandalay will open great opportunities for trade and travel between India, Myanmar and South East Asia. It is also suggested that the Kaladan transport project (discussed below) also should have rail connectivity from Sittwe port to a suitable point in India (Mizoram)—either Sabroom or Lawngtlai.

KALADAN MULTI-MODAL TRANSIT TRANSPORT PROJECT

It is a strategically important project for India providing link from Indian ports on the East Coast to Sittwe in Myanmar and onwards to the waterway on the Kaladan river. It will link South Mizoram to Myanmar providing an alternate connectivity to the NER, the others being the Chicken's Neck and the Indo-Bangladesh Protocol waterway route. Getting transit right to Bangladesh for NER is uncertain. Hence, the strategic importance of the Kaladan project cannot be over-emphasised. It is recommended that a draft transit protocol between India and Myanmar be worked out soon and discussions undertaken. To strengthen the connectivity through Sittwe and to make Imphal a railway hub for the region, the following routes are recommended:

- i **Rail link from Sittwe (Myanmar):** The Kaladan Multi-modal Project is providing link from Sittwe through a waterway and road link in Myanmar. The Government of India has decided to provide funds for development of

Table 6.17
The Trilateral Highway

S.NO.	STRETCH	REMARKS
1.	Tamu-Kalewa	Part of the Friendship Road. Good condition.
2.	Kalewa-Yagyi	India is constructing this stretch
3.	Yagyi-Chaungma-Monywa	Myanmar is constructing this stretch.
4.	Monywa-Mandalay	Monywa-Mandalay stretch is already developed.
5.	Mandalay-Meiktila Bypass	This stretch is part of Mandalay-Yangon expressway. It is well developed.
6.	Meiktila bypass Taungoo-Oktwin-Payagyi	This stretch is part of Mandalay-Yangon Express Way. It is well developed.
7.	Payagyi-Theinzayat-Thaton	It is in good condition.
8.*	Thaton-Mawlamyine-Kawkareik	It is in good condition.
9.*	Kawkareik-Myawaddy	It is understood that Thailand is looking for funding from ADB to develop this stretch
10.*	Myawaddy-Mae Sot	It is in good condition

* Stretches from 8 to 10 are being developed by Thailand though the stretches are in Myanmar.

Sittwe port. However, the port does not have rail connectivity. It is recommended that rail connectivity from Sittwe to Aizawl should be conceptualised as it would help us exploit the investment in Sittwe port properly. Proper arrangements for handling containers on this route also have to be ensured. The line from Sittwe port can join Silchar which in turn is proposed to be connected to Meghalaya (proposed Dhubri-Silchar-Badarpur).

ii **Connectivity from Sittwe through Mizoram-Manipur:** It is suggested that a railway line be built from Paletwa (Myanmar)-Indo Myanmar border-Lawngtlai (Mizoram)-Aizawl-Churachandpur-Imphal. This could be a long term projection. Due to the low draft of Sittwe port, it cannot carry ships beyond 10,000 tonnes. A new deep sea port is being built in Myanmar at Kyaukpyu which can take vessels bigger than what Sittwe can take. To enable larger ships from mainland India to be able to dock in Myanmar and transport goods northward to the NER by land, India can consider a railway line starting from Kyaukpyu instead of Sittwe.

iii **Imphal as new rail hub (national and international):** Through these new railway projects, Imphal too can become a rail hub in future in the following manner:

- Present proposal: Jiribam-Tupul-Imphal (National Project)
- Eastward extension: Imphal-Moreh-Mandalay
- Northward extension: Imphal-Kohima-via Northern Nagaland-Tirap (Arunachal Pradesh)
- Southern extension: Line coming from Paletwa (on the Kaladan multi-modal route)-Indo-Myanmar border-Lawngtlai-Aizawl-Churachandpur-Imphal.

It is proposed that Imphal be made a hub for railway connectivity with Myanmar from two sides and also get Nagaland and Arunachal Pradesh.

BHUTAN

India partners closely with Bhutan in its development as much as it does to be its biggest trade partner. A free trade regime (under the India-Bhutan Trade and Commerce Agreement) exists between India and Bhutan which is reflective of the strong bilateral ties that concede to mutually beneficial economic linkages between the two countries.

Currently, the major items of exports from Bhutan to India are electricity (from Tala, Chukha and the Kurichhu hydroelectric project), base metals and articles, minerals, vegetable fat and oils, alcoholic

beverages, chemicals, cement, timber and wood products, cardamom, fruit products, potatoes, oranges and apples, raw silk, plastic and rubber products. Major exports from India to Bhutan are petroleum products, mineral products, base metals and articles, machinery, automobiles & spares, vegetable, nuts, spices, processed food and animal products, chemicals, wood, plastic and rubber. The Agreement on Trade and Commerce also provides for duty-free transit of Bhutanese merchandise for trade with third countries. Sixteen exit/entry points in India identified in the Protocol for Bhutan's third country trade are Jaigaon, Chamurchi, Ulta Pani, Hathisar (Gelephu), Darranga, Kolkata, Haldia, Dhubri, Raxaul, Panitanki, Changrabandh, Phulbari, Dawki, New Delhi, Chennai and Mumbai. Of these, Kolkata, Haldia, Mumbai and Chennai are the designated seaports, Dhubri is the riverine route, New Delhi, Chennai, Mumbai and Kolkata are the air routes and Raxaul is the rail route. The others are the designated road routes.

During 2010, imports from India were of the order of Rs 29 billion and constituted 75 per cent of Bhutan's total imports. Bhutan's exports to India in 2010 amounted to Rs 26 billion and constituted 90 per cent of its total exports. Total trade in 2010 grew by about 26 per cent from 2009.

There is an urgent need to improve connectivity between India and Bhutan both by road and rail. By connecting Jashingang Dzong (in Bhutan) with Arunachal Pradesh and Assam three alternate routes will be developed improving inter-state connectivity. These routes are:

Connectivity between Assam and Arunachal Pradesh via Bhutan

- i. Tawang (Arunachal Pradesh)-Jashingang Dzong (Bhutan)-Darranga (Assam). This will provide an alternate route between Arunachal Pradesh and Assam.
- ii. Tawang (Arunachal Pradesh)-Jashingang Dzong-Mongar-Dzong-Kogkha-Tongsa Dzong-Shemgang Dzong-Gelekphu (all in Bhutan)-Rani Khata (Assam). This provides another alternate route between Assam and Arunachal Pradesh.

Connectivity between West Bengal and Arunachal Pradesh via Bhutan (circumventing Assam)

- iii. Tawang (Arunachal Pradesh)-Jashingang Dzong-Mongar-Dzong-Kogkha-Jongsa Dzong-Punakha-Gasa-Dotanang-Pokangnag-Thimphu-Kyapcha-Chanakha (all in Bhutan)-Jaigaon (West Bengal).

Rail Connectivity between India and Bhutan

- iv. There are on-going surveys for rail connectivity to Bhutan with three alignments

under consideration at present. It is suggested that a possibility be explored, reaching right upto Thimpu, the capital of Bhutan, in one of these alignments. Alternatively, Thimpu may be connected to Itanagar via Tawang via rail.

SUMMARY

It is for the first time that while formulating the National Transport Policy, special and specific attention has been paid to the transport needs of the North Eastern Region. The Committee decided to look at the situation under three categories:

1. Intra-Regional transport connectivity
2. Inter-Regional transport connectivity
3. Trans Border Movement

It was considered necessary by the Committee that the development of transport in the North Eastern Region should be ahead of the transportation links to be developed with the neighbouring countries so that the NER can exploit fully the connectivity with neighbouring countries by way of enhanced trade and commercial activities. In a nutshell, recommendations for the NER are:

ROADS

Roads are going to be the mainstay for bringing transformational changes in infrastructure of the region.

- i. It is necessary to form a separate body under the aegis of MODONER to monitor the construction activities in the sector.
- ii. Road maintenance is a huge challenge for the NER. It is recommended that a policy decision be taken to cover maintenance expenditure under the Plan. All road contracts should have in-built provision of periodic maintenance and its reporting by the contractor for a period of initial five years. Subsequently, the state governments should be responsible for drawing a master maintenance plan, preferably in blocks of five years. This master maintenance plan shall then form the basis on which the funding agencies will release funds.
- iii. It is imperative to have a GIS mapping of roads in this region for which MoRTH should provide funds to the states and undertake the responsibility without any delay.
- iv. There is a need for changing the technology being used for construction of roads to improve their longevity.
- v. There is a need to have training institutions to develop skills in the local population for good maintenance of roads constructed both with the present technology and the superior technology whenever adopted.

- vi. There is a need for foot suspension bridges in abundance.
- vii. While four-laning of many routes has been recommended and many of them have already been sanctioned, the Committee feels that it would be prudent to have an additional two lane constructed on the other side of the hill so that in case of landslides, the whole route does not get blocked/and suspended. It may also help in meeting the environmental considerations.

RAIL

- i. New railway lines, one connecting Sittwe in Myanmar to Tirap in Arunachal Pradesh across Mizoram, Manipur and Nagaland and another line connecting Dhubri to Silchar via Meghalaya is considered essential to improve transportation in the region.
- ii. The railway has now extensive knowhow of tunnel construction. They should reduce distances by making prudent use of tunnels.

CIVIL AVIATION

Civil aviation holds the key to not only linking the region to the rest of India, but also catalysing trade and commerce with the neighbouring countries.

Guwahati Airport must be developed as a major international airport as a gateway to ASEAN countries.

It would be financially desirable to make a model for bringing in PPP as suggested in the report to develop a viable civil aviation network in the region.

It is felt that bringing in private operators may change the scenario so much that cheap air travel may become possible through induction of smaller aircrafts with better technology for which onetime capital cost may be met by the Government and the private operators may be asked to operate the services without any dependence from subsidy for day-to-day operations.

In keeping with the geographical contours of the region and the thin spread of population, we are of the view that a hub and spoke model with hubs at Guwahati, Imphal and Agartala should be developed for the region.

DONER should catalyse development of meteorological forecasting network in the region to make civil aviation predictable and safe. The necessary investments for that may be provided by the Government through DONER.

Development of skills among the local population not only for operations of aircrafts but also for maintenance needs to be undertaken. This can be done

by bringing in an institute not only for developing aeronautical engineers but also for subordinate maintenance staff. This would facilitate night halt of aircrafts at various locations and provide connections in early morning so that local population may be in a position to reach Kolkata/Delhi/Mumbai in the morning hours to attend meetings and return in the evening.

There is a vast network of airports in the region due to the war effort during World War II, but many of them are lying dormant. It has been suggested that a few of these airports should be made operative within a time frame for civilian use to provide better connectivity not only for men but also for cargo.

These would help establish connectivity required for horticulture / floriculture / aquaculture common in the region.

INLAND WATERWAYS

- i. Large paraphernalia already exists for inland water transport in the river Brahmaputra. Proper usage of this capital is necessary, which can be achieved by entering into a long time treaty with Bangladesh Government to provide access from West Bengal through Assam to their river system. This can be possible if the Indo-Bangladesh Protocol on Inland Water Transit & Trade is extended for at least 10 years at a time to attract investment.
- ii. Maintenance of barges and other supporting equipment must be developed near Guwahati without any further delay. This would make the barges available for the longer duration for transportation.
- iii. Inland water transport should be utilised for movement of over dimensional consignments to avoid congestion on roads especially in the Chicken's Neck area of the corridor between North Bengal area and Assam.
- iv. Barak River should be utilised for inland water transport in the North Eastern Region and also connecting it to Bangladesh by taking up this project as a National Project on similar lines as has been done for river Brahmaputra.
- v. The optimal use of the waterways in the North East requires investment in vessels and their regular operations. Apart from the policy regime of an extended period of the Indo-Bangladesh Protocol, an agency either in the public sector or with introduction of private players has to be found.
- vi. Infusion of PPP in inland water transport.

DEVELOPMENT OF MULTI-MODAL HUBS

The geography and demography of the region is spread in such a manner in the North Eastern Region

that the committee feels that development of multi-modal hubs at two stations will facilitate smooth transportation in the region in times of calamity as well as insurgency. These hubs have to be developed at following stations:

- Dhubri
- Badarpur

At both stations, it is possible to have connectivity from rail, road, inland water transport as well as civil aviation. These multi-modal hubs can be later on given to private players for operation or may be run by a corporation developed for the purpose.

CONNECTIVITY WITH SOUTH EAST ASIA

The Look East Policy envisages increasing commercial interchanges between NER, our international neighbourhood and beyond to South East Asia. At present, however, India's international transport linkages with the East are highly underdeveloped, as are its linkages with Bangladesh. India could not

leverage the shared colonial experience, cultural affinities and an incredible historical baggage to build relations with Southeast Asia. The Committee recommends that it is an opportune time for India to develop strategic long term view on intensifying international transport linkages from the north east region to its neighbours like Bhutan and Bangladesh as also the ASEAN countries, Myanmar in particular. For such international linkages to be productive there has to be even better transport integration of the region internally, and with the rest of India.

Annex 6.1

State-wise Airports/Advanced Landing Grounds

[Updated as of April, 2012]

AIRPORT AIRFIELD/ ADVANCED LANDING GROUNDS (DISTRICT)	OWNERSHIP	STATUS	PLANS
ARUNACHAL PRADESH			
Aalo (West Siang)	Ministry of Defence (Indian Air Force)	Being developed for dual use (military & civil) depending on availability of land for civilian conclave. Indian Air Force and Airports Authority of India are developing the military and civil enclave respectively.	State government to inform whether 7 acres for civil enclave will be available. Defence portion will be completed by March, 2014.
Pasighat (East Siang)	Being transferred to Indian Air Force by AAI.	-do-	AAI will construct civil enclave on 5 acres to be retained by it. Lease agreement for transfer of Pasighat airport from AAI to IAF is being finalised.
Ziro (Lower Subansiri)	Ministry of Defence (Indian Air Force)	-do-	State government to inform whether 10 acres for civil enclave will be available. Defence portion will be completed by March, 2014.
Daporijo (Upper Subansiri)	Airports Authority of India	Will be developed by AAI depending upon the availability of land from the State Government.	State government to inform whether land for civil enclave will be available. Daparizo Aerodrome to be developed and opera- tionalised by AAI for ATR-42 operations. Additional 34.3 acres requested from State Govt. Development works can be taken up after provision of additional Land and fund.
Mechuka (West Siang)	Ministry of Defence (Indian Air Force)	Being developed as Advanced Landing Ground	Will be completed by March, 2014.
Tawang (Tawang)	-do-	-do-	
Tuting (Upper Siang)	-do-	-do-	
Vijaynagar (Changlang)	-do-	-do-	
Walong (Anjaw)	-do-	-do-	
Tezu (Lohit)	Airports Authority of India	Being developed for ATR-72 type of aircraft with VFR	Being developed with funds with NEC. Will be ready by December, 2013. The State government has transferred Tezu Aero- drome along with additional 108 acres of land to AAI in Sept. 2010 for upgradation / development for ATR-72 type of operation. NEC has sanctioned Rs.0.8 billion in 2009-10 to AAI.
Itanagar (Papum Pare)	Proposed Greenfield - The site of the proposed airport is under discussion.		
ASSAM			
Guwahati (Kamrup) (DGCA licensed as Public Use Category as on 31.12.2011)	Airports Authority of India	Operational International Airport. Being de- veloped as Inter-Regional Hub.	Runway extension by 360 metres already completed and commissioned. Apron expansion to accommodate 11 additional park- ing stands completed and commissioned. Construction of Parallel Taxi Track subject to avail- ability of land from IAF planned. Installation of Cat-I Approach Lights for Runway 02 will be taken up subject to availability of land from IAF. Construction of new integrated terminal building subject to availability of land for city side develop- ment.
Dibrugarh (Dibrugarh) (DGCA licensed as Public Use Category as on 31.12.2011)	-do-	Operational	Extension of runway from 1829 to 2286 metres and allied works. Construction of aircraft maintenance hangars and apron for A-321 hangar.

AIRPORT AIRFIELD/ ADVANCED LANDING GROUNDS (DISTRICT)	OWNERSHIP	STATUS	PLANS
Lilabari (Lakhimpur) (DGCA licensed as Public Use Category as on 31.12.2011)	-do-	Operational	Night Landing Facilities – being planned, requires provision of additional land from State Govt.
Jorhat (Jorhat)	Indian Air Force (civilian enclave)	Operational	Expansion of Civil apron at a cost of Rs 0.08 billion. Construction of new terminal building subject to provision of 9 acres of land as requested from State Govt. for City side development.
Tezpur (Sonitpur)	-do-	Operational	--
Silchar (Cachar)	-do-	Operational	New Domestic Terminal Building subject to land availability.
Rupsi (Dhubri)	Being transferred to Indian Air Force. To be developed for dual use.	Non-Operational	AAI Aerodrome being transferred to IAF for its de- velopment and operationalisation of ATR-72 type of aircraft. AAI will construct and manage a civil enclave.
MANIPUR			
Imphal (Imphal) (DGCA licensed as Public Use Category as on 31.12.2011)	Airports Authority of India	Operational	Night Landing facilities have been installed and com- missioned on 21 st May, 2010. Additional 640 acres approximately provided by State Govt. for future airport development for bigger size aircraft like Boeing 747-400. Construction of aircraft maintenance hangars for A-321 hangar. Runway extension by 350 metres in phase-I for wide bodied 'D' category aircraft is in planning stage.
MEGHALAYA			
Shillong (Barapani) (East Khasi Hills) (DGCA licensed as Public Use Category as on 31.12.2011)	Airports Authority of India	Operational	Construction of boundary wall around newly acquired land.- DPR for safety and security infrastructure including perimeter wall etc. Runway extension Expansion of apron for A-321 type of aircraft. Construction of new ATC tower and technical block Construction of new Fire Station Construction of Isolation Bay. Installation of Night Landing Facilities and ILS.
Tura (West Garo Hills)	Government of Meghalaya	Though the airport is operation- al, there are no regular flights.	Aerodrome belongs to state government. of Meghalaya. On the request from state government, AAI has submitted a DPR for expansion of existing airport for operationalisation of ATR-72 aircraft to Ministry of Civil Aviation and State Govt along with the request to provide approximately 56.5 acres of additional land. State government is yet to respond.
MIZORAM			
Lengpui (Aizawl) (DGCA licensed as Public Use. Category as on 31.12.2011)	Government of Mizoram	Operational	--
Tural (Aizawl)	Airports Authority of India	Non-operational	

AIRPORT AIRFIELD/ ADVANCED LANDING GROUNDS (DISTRICT)	OWNERSHIP	STATUS	PLANS
NAGALAND			
Dimapur (Dimapur) (DGCA licensed as Public Use Category as on 31.12.2011)	Airports Authority of India	Operational	
Cheithu (Kohima)	Proposed Greenfield – under discussion		
SIKKIM			
Pakyong (East Sikkim) Greenfield Airport	Airports Authority of India	Under construction Proposed date of Completion – June, 2014 Actual operationalisation may take another six months.	
TRIPURA			
Agartala (West Tripura) (DGCA licensed as Public Use Category as on 31.12.2011)	Airports Authority of India	Operational	Construction of new control tower in progress - Near- ing completion Construction of aircraft maintenance hangars for A-321 hangar. State government has been requested to provide 303 acres for expansion and airport development, which includes: (i) 31 acres for shifting of Glide Path – required for full landing distance available on runway; (ii) 26 acres for runway strip – for DGCA license;
Khowai (Khowai)	Airports Authority of India	Non-operational	As per study, cannot be developed
Kailashahar (North Tripura)	-do-	-do-	Cannot be developed for ATR-72 operations due to one side bandh and other side highway.
Kamalpur (North Tripura)	-do-	-do-	AAI conducted feasibility study for its operationali- sation for ATR-72 which requires provision of 50.5 acres of land which has already been requested from State Govt. State Govt. is vet to respond.

(Source: Airports Authority of India)

ANNEX 6.2

SMALL AIRCRAFTS FOR INTRA-REGIONAL CONNECTIVITY: ANALYTICAL MODEL

An analytical model to assess the viability of operating aircrafts to provide intra-NER connectivity is presented below to illustrate that operating small aircrafts can make business sense.

Considering the significance of the development of the civil aviation industry in the NER, an exercise has been carried out to examine the typical economics of airline operations. The main objective of this exercise is to identify a workable option for providing regular and reliable air service in the North East Region.

METHODOLOGY AND RESULTS

Owing to the absence of data on operation of air services, the committee has relied upon the data provided by one of the private airline operators. This data has been modified keeping in view the Indian conditions in discussion with the aviation experts. Liberal norms have been adopted to work out the cost. Accordingly, the cost of operations worked out could perhaps be on the higher side.

The cost per available seat kms has been computed for 3 different scenarios - 2,000, 2,500 and 3,000 flying hours over a distance of 100 nm, 200 nm, 300 nm. (Model calculation on viability with 2000 flying hours is placed at Annex 6.4)

Table 1
Computation of Revenue per Passenger Kilometre

ORIGIN-DESTINATION	REVENUE PER PASSENGER (INR)	AIR DISTANCE BETWEEN O-D (KM)	REVENUE PER PASSENGER KM (INR/KM)
Aizwal-Imphal	2,395	172	13.92
Guwahati-Agartala	2,495	267	9.34
Aizwal- Guwahati	2,675	288	9.29

Table2
Computation of Revenue per Passenger kilometre

ORIGIN-DESTINATION	REVENUE PER PASSENGER (INR)	AIR DISTANCE BETWEEN O-D (KM)	REVENUE PER PASSENGER KM (INR/KM)
Aizwal-Imphal	3,439	172	20
Guwahati-Agartala	3,439	267	12.88
Aizwal-Guwahati	4,429	288	15.38

The identification and classification of cost elements was based on the data provided for running a Dornier 328 Jet aircraft. For a typical 32 seater aircraft, the study indicated that the operating cost per ASKm (available seat Km) for all the different scenarios were in the range of Rs 8.96 to Rs 11.73. Assuming a load factor of 75 per cent under the various scenarios, the operating cost per RPKms turns out to be in the range of Rs 11.95 to Rs 15.64. This cost is further subjected to reduction since the above calculation has not taken into account the aspect of exploring air based freight transportation of:

- i Floriculture, horticulture and spices
- ii Express Mail and Postal Services

Since tourism is at its nascent stage in the NER, scheduling of hopping flights during the day hours is another possibility to promote inter-regional, intra-regional as well as international connectivity in the NER.

Table 6.1 provides existing system of pricing of air tickets by Air India in the NER. The figures have been extracted from the airline's official webpage and the calculation thus involves some level of judgment and empiricism due to lack of sound database.

The above air fares are prevalent in a time lag of two months from the day of booking an air ticket. Table 6.2 shows the price structure between the cities on a very short notice period, say a day or two.

The results show that on a liberal basis, the simple average RPKms, ranges between Rs.10.85 to Rs.16.09 depending on the ticketing scenario. Since the data of foot count of passengers travelling between O-D was not available, weighted average method could not be adopted.

It is observed that the simple average cost of airline operations for all the different scenarios, turns out to be Rs 13.40 at a load factor of 75 per cent while the simple average revenue charge per passenger from Air India for above three flights is Rs 13.49. Figuratively, this implies that on varying the load factor, the differential between the operating cost per ASKm and the Revenue per passenger km would diverge distinctly. This value would also differ on taking into account the revenue earned for movement of cargo by airline operators. For a load factor of 60 per cent, the operating cost turns out to be Rs 16.75 while it is Rs 14.36 at a load factor of 70 per cent. Thus, it provides a unique vantage point to call firsthand that there requires a shift in the paradigm of providing capital subsidy for airline operators in the NER once the available resources are allocated efficiently.

This calls for introducing a new and innovative policy based on operating smaller aircrafts. Airlines shall be required to focus on operationalising the existing smaller airports/airfields based on hub-and-spoke model which hinges on small aircraft-centric operations without locking up huge capital. This approach shall not only be cost-effective, but will also meet the local requirement and yield potential returns as unutilized and idle assets available in the region are put to productive use.

Annex 6.3

On-Going Surveys (Railways)

PROJECT	REMARKS	KMS	COST (RS BILLION.)
ARUNACHAL PRADESH			
New Line from Lekhapani to Kharsang	Survey completed. Report under examination	31	3
New Line from North Lakhimpur to Shilapathar via Along	Survey completed and Report under examination.	248	112
New Line from Jagun to Nampong via Jairampur.	Survey not yet sanctioned.		
New Line from Miao via Jagun and Kharsang.	Survey not yet sanctioned.		
New Line from Pasighat-Tezu-Parsuramkund.	Survey in progress	130	
New line from Rowta to Twang via Udalgiri-Shikardanga-Kalaktang-Shergaon-Tenga.	Not yet sanctioned.		
New Line from Misamari-Tawang	Survey in progress	329	
ASSAM			
New Line from Silghat to Tezpur along with construction of bridge river across River Brahmaputra	Survey in progress sanctioned in 2011-12	33	
New Line from Salona to Khumtai	Survey completed, Report under examination.	99	29
New Line from Jorhat to Sibsagar. This part of Chaparmukh-Dibrugarh. To be done under PMRVY	Survey completed, 2010-11 and examined.	344	35
2 nd Railway Bridge at Saraighat across River Brahmaputra	Survey completed, Report under examination.		3
New Line from Tirap – Lekhapani	Survey completed, Report under examination	6	0.5
New Line from Pancharatna to Silchar	Shelved by Board	437	182
Doubling of New Bongaigaon to Kamakhya via Goalpara	Survey in progress	178	
Doubling of New Bongaigaon to Kamakhya via Rangiya	Survey completed	150	
Doubling of Digarua to Dibrugarh	Survey completed	520	32
Railway Electrification from Guwahati to Dibrugarh	RE from Katihar to Guwahati is sanctioned and work is in progress.		
MANIPUR			
New Line between Imphal-Moreh (Myanmar)	Survey to be sanctioned.		
MEGHALAYA			
New Line from Jogighopa (Pancharatna)-Tirikila-Selsella-Zikzak-Baghmara-Ranikor-Shella-Dawki-Silchar.	Shelved by Board	437	1.82
New Line from Jowai-Lokro	Survey in progress	170	
New Line from Shillong to Chandranathpur	Survey sanctioned in 2011-12		
MIZORAM			
New Line from Sairang to Indo-Mayanmar Multi Modal Transit Transport Route at Hruitezwil and lateral extension to Tlabung and Chaphai.	Deferred		
Lalabazar (Assam)-to Vairengte (Mizoram)	-	20.3	3.6
NAGALAND			
New Line from Dimapur to Tizit	Survey is in progress	190	
New Line from Amguri to Naginimora	Survey completed and report under examination	31	3.8
New Line from Tuli-Tuli Town	Shelved	9	1.0

PROJECT	REMARKS	KMS	COST (RS BILLION.)
TRIPURA			
New Line from Agartala-Akhaura BG rail line as a National Project. (Total length on Indian side 5.4 Kms & cost Rs 1.0555 billion)	Survey in progress	10	2.5
New Line from Belonia (Tripura) to Belonia (Bangladesh) and Sabroom- Ramgarh.	Survey not yet sanctioned.		
SIKKIM			
Extension of New Line from Sivok -Rangpo (sanctioned) & Rangpo to Bhusuk (Gangtok)	Sivok – Rangpo sanctioned & being done by IRCON.	69	49
New Line between Mirik-Rangpo	Mirik-Gangtok:-Survey already done. Railways has been asked to explore possibility of connecting this line to Sivok-Rangpo-Gangtok line at some point to save on cost.	163	117

Annex 6.4

Model calculation based on 2000* Flight Hours per Year

NETWORK A/C UTILISATION	
Average Annual Block Hours per A/C	2308 BH per year
Average Annual Flight Hours per A/C	2000 FH per year
Average Annual Flights per A/C	1847 Sectors per year
Average Sector Distance	367 km
Annual Weeks of Operation	52 weeks per year
Flying Hours Per Month	166.67

CALCULATION OF TOTAL COST		
	TOTAL (P.A.) (MILLION)	PER HOUR
Fuel		
Average Fuel Price(Rs 63/ltr for 2000 hours @1050 lt/hr)	132.3	66,150
Ownership		
Ownership Cost per year	29.7	14,850
Insurance per year	4.95	2,475
Interest p.a.	32.30	16,151
Flight Crew		
Captain Salary per year	6	3,000
Co-pilot Salary per year	4.2	2,100
Crew Attendant (2 in nos.) per year	1.08	540
Maintenance, Charges and Handling		
Engineer Cost @ Rs 250,000 per month	3	1,500
Routine Maintenance Spares (excluding TBO)	5.5	2,750
2 technicians and 2 helpers salary @ Rs 200,000 pm	2.4	1,200
Landing gear overhaul reserve(@Rs 1,500/hour)	3	1,500
APU Overhaul Reserve(@Rs 1,000/hr)	2	1,000

CALCULATION OF TOTAL COST		
	TOTAL (P.A.) (MILLION)	PER HOUR
Annual Cost of Labour	0.15	75
Engine Overhaul Reserve(12,000 per hour)	24	12,000
Landing, Parking and Hangarage charges(@Rs 10,000/day)	3.65	1,825
Technical Office and Admin Expenses	13	6,500
Passenger Handling	60	30,000
Transportation and Airport Expenses	30	15,000
Catering	18	9,000
Total Direct Operating Cost	375,23	187,616
Total Cost	375,23	187,616

* Model calculation based on 2,500 and 3,000 flight hours have also been similarly undertaken

SECTOR ECONOMIC DATA				
SECTOR RELATED DATA		CITY A-B	CITY A-B	CITY A-B
Sector Distance	nm	100	200	300
Available Seats Per Flight	Seats	32	32	32
On Board Passengers per flight	pax	24	24	24
Annual Utilisation (Block Hours) Per A/C	BH/Year	2,901	2,531	2,366
Annual Utilisation (Flight Hours) Per A/C	FH/Year	2,000	2,000	2,000
Annual Utilisation (Flights) per A/C	Sectors/Year	5,405	3,183	2,198
Flight Time Per Sector	Min	22.2	37.7	54.6
Block Time Per Sector	Min	32.2	47.7	64.6
Block Fuel Per Sector	Kg	431	677	842

CALCULATION OF DIRECT OPERATING COST				
Interest	Rs/Sector	5,976	10,148	14,696
Ownership Cost	Rs/Sector	5,495	9,331	1,3512
Insurance	Rs/Sector	916	1,555	2,252
Fuel	Rs/Sector	24,477	41,565	60191
Captain Salary	Rs/Sector	1110	1,885	2,730
Co-pilot Salary	Rs/Sector	777	1,320	1,911
Crew Attendant	Rs/Sector	200	339	491
Engineer Cost	Rs/Sector	555	943	1,365
Routine Maintenance Spares (excluding TBO)	Rs/Sector	1,018	1,728	2,502
2 technicians and 2 helpers salary	Rs/Sector	444	754	1,092
Landing gear overhaul reserve	Rs/Sector	555	943	1,365
APU Overhaul Reserve	Rs/Sector	370	628	910
Annual Cost of Labour	Rs/Sector	28	47	68
Engine Overhaul Reserve	Rs/Sector	4,440	7,540	10,919
Landing, Parking and Hangarage charges	Rs/Sector	675	1,147	1,661
Technical Office and Admin Expenses	Rs/Sector	2,405	4,084	5,914
Passenger Handling	Rs/Sector	11,101	18,850	27,298
Transportation and Airport Expenses	Rs/Sector	5,550	9,425	13,649
Catering	Rs/Sector	3,330	5,655	8,189
Direct Operating Cost	Rs/Sector	69,423	117,886	170,715
Direct Operating Cost per ASM	Rs/Sector	22	18	18
Total Operating Cost	Rs/Sector	69,423	117,886	170,715
Total Operating Cost per ASM	Rs/Sector	22	18	18
Total Operating Cost per ASKM	Rs/Sector	12	10	10

OPERATING COST BREAKDOWN PER AIRCRAFT	IN PERCENTAGE		
Fuel Cost	35.26	35.26	35.26
Crew cost	3.01	3.01	3.01
Maintenance Charges and Handling	43.89	43.89	43.89
Ownership	7.92	7.92	7.92
Interest	8.61	8.61	8.61
Insurance	1.32	1.32	1.32
Total	100.00	100	100
Aizwal to Imphal 172 km price charged by Air India	Rs 2,395		
Revenue Per km	Rs 13.92		