



VOLUME I
EXECUTIVE SUMMARY

INDIA TRANSPORT REPORT

MOVING INDIA TO 2032

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DEVELOPMENT
POLICY
COMMITTEE

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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,
New Delhi.

Chairman



[Rakesh Mohan]

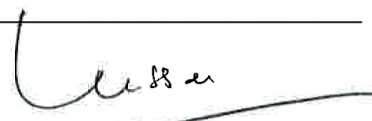
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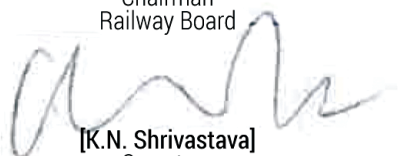
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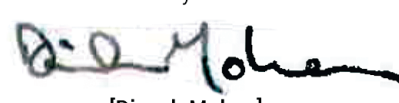
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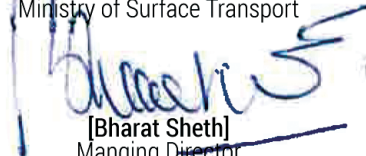
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MAIN REPORT

1. NTDPC's APPROACH TO TRANSPORT POLICY

That all modes of the country's transport network are under severe pressure is clearly evident. As the country is poised for significant economic growth in the next two decades, it has become urgent to plan effectively the expansion of the existing network capacity, and the addition of new transport links and corridors.

The National Transport Development Policy Committee (NTDPC) was constituted by the Government of India in 2010 to formulate a long-term transport policy. The present Report is devoted to setting the conditions for a coherent transport strategy for India in the long term: the horizon is 2032, two decades from the beginning of the country's 12th Five Year Plan to the end of its 15th. Our vision is that a well-developed and competent institutional system for planning, management and execution of transport should be in place by the end of this period, if not earlier, 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.

The challenge confronting India now is to take the necessary steps to achieving a sustainable middle income status and beyond over the next 20 years. To achieve this, economic growth over the next 20 years has to be at rates that are at least as high as those achieved in the last 20. But our aspirations are and must be even higher. And transport growth and development must be commensurate with this aspiration. We must aim for per capita income to at least double every 10 years so that real per capita income by 2032 is around four times what it is today.

For this to happen, adequate transport provision in terms of quality, quantity and resource-efficiency is essential. If the required transport investment is not made, and in time, to satisfy both the burgeoning passenger and freight demands, the aspirational growth envisaged will simply not be achieved. *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.*

To achieve a significant improvement in overall productivity and efficiency, it is imperative that future development of the network should be aimed at a better integration of the various modes, so as to facili-

tate the development of multi-modal transport, both within the country and for our export-import trade. The objective must be to create a system at minimum cost that is safe and reliable and which minimises its adverse impact on the environment. This will call for heavy investments in transport infrastructure; a massive effort at building capacity in the human resources area to raise the level of skills and professional knowledge in the sector; and accelerating reform measures to ease and simplify the regime of taxes, levies and procedures that currently impede the smooth and rapid flow of transport across the country.

WHAT IS DIFFERENT IN THIS REPORT?

Much of the thinking on transport in India has been project-centric, done within single-mode silos. But by its very nature, transport as a system connects cities, towns and villages within and across countries; and people as consumers and producers to manufacturers, wholesalers and retailers, and vice versa, within and across countries. The "system" is also composed of various elements: the infrastructure itself, the norms for access and use of the infrastructure (which significantly affect infrastructure's capacity to support flows of goods and people), and the vehicles that move on the infrastructure. *So, a key requirement for thinking on transport strategy is that it must be system based.* In other words, it must cut across modes of transport, administrative geographies, and integrate capital investment with regulatory and policy development.

Whereas this Report also addresses sectoral issues in detail, its focus is on cross-cutting themes underlying transport strategy and resulting investment programmes. It is less focused on specific solutions than on developing human resource capacity and responsive institutions that observe, analyse and act on developments as they occur while remaining embedded within overall strategies that are articulated.

The Report projects India's requirement for transport over the next 20 years to 2032 and what transport investments need to be made on a phased basis to get us there. We are however fully aware that today's projections at some point will indeed be wrong, as conditions change beyond what may be expected or projected today. Transport needs are determined by economic growth as it occurs, by the emerging pace and pattern of urbanisation, by developments in differential sectoral growth, shifts in consumer and producer preferences, and by changes in demographics and technology. But these trends will themselves be impacted by emerging developments in energy availability and prices, and new technologies. So, the economic and regulatory framework underlying transport must be price-responsive. It is quite possible that within a 20-year framework, radically new transportation technologies may develop or alternative energy sources like solar energy may well become available, cost-competitive and viable. We can recall that there was no internet just 20 years ago; it is now ubiquitous in our daily lives, and has transformed the whole logistics business and other segments of transport services. *Thus, the country must have planning capacity in transport that, on the one hand, develops coherent medium and long-term strategies, but on the other, is also able to respond on an ongoing basis to changes that occur over time.* When significant transport investment has to be made, it must be done with considerable forethought.

This Report therefore abstracts from specific problems today, but puts them in the context of India's long-term development trajectory. It makes long-term projections and provides guidance on broad magnitudes of needed transport investment. But it accepts that these projections are only indicative and, being made today, will need to be reviewed as new developments occur in the future. It therefore pays particular attention to building institutional and informational foundations that both signal the onset of specific challenges and help in the provision of a range of options for differential needs of the multitude of producers and consumers in the country. As technologies, prices and incomes undergo specific changes over the next 20 years, the absence of such institutional foundations will run the risk of "lock in" if current choices dominate and restrain adaptation in later periods.

Consistent with this long-term view, in formulating a transport strategy for India, it is also imperative that this be undertaken within the larger context of connectivity within South Asia and between South Asia and South East Asia. NTDP has taken a conscious view that much greater attention should be paid to the development of these links across our borders. This focus has been absent in the formulation of national transport strategy so far.

Transport linkages across our border regions must be developed in tandem with 'backward linkages', i.e. links with the Indian heartland. If the latter fall behind the former, there is a danger of further alienating our border regions and the people inhabiting them. Consequently, NTDP has further focused specially on the transport needs of the North East Region (NER) which has otherwise suffered from relative transport isolation within the region itself, connectivity with the rest of India and cross-border with all the countries surrounding the North East.

This Report emphasises the need for modernisation and expansion of all segments of the transport system and the building of capacity in all its aspects to accomplish this: institutions at national, state and local levels, each embedded with adequate technocratic capacity in both quality and quantity; the setting up or operation of existing regulatory authorities with adequate technical competence to mediate between the needs of producers and consumers, to promote competition and to regulate any consequences of monopoly power; setting up or strengthening research and development institutions on transport across the country; providing for education and nurturing of scientific talent for transport; rationalisation of fiscal regimes to remove distortions while raising revenue; and embedding safety concerns in all transport planning and its execution.

While the main section of this Report looks at these broader systemic issues and makes recommendations on how to achieve these goals, the second section, looks at six specific sectors, and what needs to be done to take these to the next stage of development commensurate with our aspirations as a nation. These are

- Railways
- Roads and Road Transport
- Civil Aviation
- Ports and Shipping
- Urban Transport
- Transport Development in the North East

Throughout, as mentioned earlier, NTDP takes an integrated system based approach to transport issues. As demonstrated the world over, this is the most useful and effective way to plan this most vital of human, social and economic activity.

To achieve a significant improvement in productivity and efficiency, it is imperative that future planning of India's transport network is aimed at the development of multi-modal transport, both within the country and for export-import trade

2. TRENDS IN GROWTH AND DEVELOPMENT OF TRANSPORT

The transport system in India comprises distinct modes such as rail, road transport, coastal shipping, civil aviation, inland water transport and pipelines.

Rail and roads dominate the transport system in India, carrying about 87 per cent of the total freight traffic in the country in 2007-08. Unfortunately, the rail-road mix in freight movement has developed rather sub-optimally over the years, as railways consistently lost out to roads, unable to install capacity or respond to market needs. The divide between the two modes became even more pronounced as roads expanded rapidly on the back of focused policy and investments, particularly during the last decade or so.

The Total Transport System Study (TTSS) carried out by RITES for the Planning Commission in 2007-08 calculated that railways' share in total inter-regional freight traffic came down from 89 per cent in 1951 to 65 per cent in 1978-79, 53 per cent in 1986-87 and 30 per cent in 2007-08. This consistent and unchecked fall in the share of railways through the years was estimated by RITES to have cost the Indian economy about Rs 385 billion (16 per cent of the total transport cost) in the year 2007-08.

For passenger traffic as well, rail and roads continue to be the dominant modes in India. The traffic carried by air and water transport is negligible, though on certain routes, the former carries considerable volumes which continue to increase rapidly. Over time, roads have emerged as the predominant mode for passenger transport. The share of roads in passenger traffic (billion passenger kilometre or bpkm) in total passenger traffic carried by rail and roads together has increased from 32 per cent in 1951 to about 90 per cent in 2011-12.

TRAFFIC IN 2032

NTDPC has estimated transport demand for the terminal years of the 12th Five Year Plan (2016-17), 13th Plan (2021-22), 14th Plan (2026-27) and 15th Plan (2031-32). The GDP growth rate estimates are as follows: 6.9 per cent for the 12th (2016-17)⁹ Plan, 8 per cent for the 13th (2021-22) Plan, 8.5 per cent during 14th (2026-27) Plan and 9 per cent in the 15th (2031-32) Plan.

FREIGHT TRAFFIC

It is estimated that the modal share of rail and road in the total freight traffic will be 35:65 in the 12th Plan, 39:61 in the 13th, 45:55 in the 14th and 50:50 in the 15th Plan. With elasticity at 1.2, total freight traffic is expected to grow at 9.7 per cent per annum to reach over 13,000 BTKM in 2031-32 from about 2,000 BTKM in 2011-12. Rail and road freight traffic are projected to grow at about 12 per cent and 8 per cent per annum respectively to achieve a 50 per cent share each in the total freight traffic at the end of 15th Plan.

PASSENGER TRAFFIC

Total passenger traffic is expected to grow at about 15 per cent per annum to reach 168,875 bpkm in 2031-32 from 10,375 bpkm in 2011-12. Growth in rail passenger traffic is expected to be around 9 per cent per annum, and for road traffic, 15.4 per cent.

With these assumptions, it can be seen that total passenger traffic could increase by a factor of almost 16 over the next 20 years. The comparable increase in the last 10 years or so was by a factor of about 7 or 8. Overall, these projections provide an idea of the challenge facing overall transport investment in the country, if India is to achieve sustainable and continuous growth in the next two decades.

PUBLIC SECTOR INVESTMENT

Public action has been and is likely to continue to be the dominant force in development of transport infrastructure and facilities. The transport sector has received special attention in India's planning process and public investment has increased over the various Plans.

However, with expanding investment requirements, public resources alone are not adequate. This necessitates private sector participation, a decision that is expected to not only augment the resources available for the transport sector but also to improve service delivery and efficiency.

TRANSPORT DEVELOPMENT IN INDIA

RAILWAYS

The Indian Railways had a modest beginning in 1853 when the first train journeyed from Mumbai to Thane, covering a distance of 34 km. Today, Indian Railways (IR) is the third largest railway network in the world under a single management with 7,500 railway stations, 9,549 locomotives, 55,339 passenger coaches, 239,321 freight cars and 64,600 route km. IR operates 12,000 passenger trains every day and 7,000 freight trains. It transports 2.8 million tonnes of freight traffic and 25 million passengers every day.

RECENT INITIATIVES FOR CAPACITY AUGMENTATION

A key important development that is taking place now needs special mention:

- Dedicated Freight Corridors (DFCs), which have been envisaged to augment rail freight transportation capacity, particularly on the Eastern and Western Corridors. The existing trunk routes of Howrah-Delhi on the Eastern Corridor and Mumbai-Delhi on the Western Corridor are currently saturated with line capacity utilisation varying between 115 per cent and 150 per cent.

The DFCs are expected to ensure that long run traffic demand is met adequately and efficiently. Railways are planning the initiative of DFCs. The diversion of freight to DFCs on trunk routes will free up the existing network for the kind of capacity expansion needed for passenger movement.

ROADS AND ROAD TRANSPORT

The total road length increased from about 400,000 km to 4.7 million km between 1951 and 2011. Surfaced roads increased from 157,000 km to around 2.5 million km. Road density in India is now nearly 1.42 km per sq km, which compares favourably with many countries. Surfaced road length accounted for 54 per cent of total road length in 2011, compared with 39 per cent in 1951.

The Indian road network can be divided into three main categories:

- National Highways
- State Highways and other Public Works Department (PWD) roads
- The rural road network

The development of roads got a big boost with the launching of the NHDP and the Pradhan Mantri Gram Sadak Yojana (PMGSY). While NHDP aimed at primarily strengthening and widening high-density corridors of National Highways, PMGSY was designed to improve the accessibility of habitations in rural areas. However, similar attention was

The DFCs are expected to ensure that long run traffic demand is met adequately and efficiently. Railways are planning the initiative of DFCs. The diversion of freight to DFCs on trunk routes will free up the existing network for the kind of capacity expansion needed for passenger movement.

not assigned to State Highways and Major District Roads.

NHDP has contributed largely towards improving the capacity and road quality of National Highways. The length of NHs with two lanes increased from 25,395 km in 1996 to 41,518 km in 2012, and those with four lanes and above from 1,170 km to 17,774 km. During the same period, the combined network of State Highways and other PWD roads posted a sevenfold expansion in length with a CAGR of 3.2 per cent.

The highest CAGR of 4.4 per cent from 1951 to 2011 was registered by rural roads comprising Panchayati roads, and roads constructed under the Jawahar Rozgar Yojana (JRY) and PMGSY. However, despite the steady growth rate, the development of the rural road network has not been fully balanced. While certain states provide 100 per cent connectivity, some others still have a large number of habitations with poor accessibility.

CIVIL AVIATION

In the last decade, the sector has grown at a phenomenal pace, and India has emerged as the world's ninth largest civil aviation market.

Passenger throughput at Indian airports during 2011-2012 was 162 million, of which 122 million or about 75 per cent were domestic passengers and the rest international. Total freight traffic handled by Indian airports has increased at a CAGR of about 9.2 per cent in the last 11 years to reach 2.28 MMT by 2012. Domestic cargo, buoyed by increasing domestic trade, has grown at a pace of 8.4 per cent, while international cargo grew at nearly 9.

The air traffic density (1000 passengers per million urban population) in India is very low at 72. China (282) is four times higher; Brazil (231) three times; Malaysia (1,225) 17 times, USA (2,896) 40 times, and Sri Lanka (530) more than seven times higher. China's domestic traffic is five times that of India's. Moreover, India has an aircraft for every 2.89 million people in comparison to 1.14 million in China. In terms of freight carriers, out of 15,750 freight carriers globally, India has just 13 scheduled and 149 non-scheduled operators.

PORTS AND SHIPPING

About 95 per cent of India's trade volume (around 70 per cent in terms of value) is moved by sea. India's maritime sector comprises ports, shipping, ship-building and ship repair, as well as inland water transport systems.

Today, India has 12 Major Ports and 200 notified Non-Major Ports along the coastline and islands. Major Ports are administered by the Union Government under the Major Port Trusts Act of 1963, with one exception, Ennore Port, which is administered under the provisions of the Companies Act, 1956. Non-Major Ports are administered by nine maritime states and three union territories within their respective coastlines.

In keeping with the general policy of economic liberalisation, the port sector was opened to private sector participation in 1997 through an amendment in the Major Port Trusts Act. Accordingly, a regulatory body known as Tariff Authority for Major Ports (TAMP) was introduced for regulating both vessel-related and cargo-related tariffs. TAMP was also made responsible for regulating rates for lease of properties in respect of Major Port Trusts and private operators.

During 2011-12, total cargo handled by Major and Non-Major ports was 914 million tonnes with the 13 Major Ports handling nearly 61 per cent of it—560 million tonnes. The period from 1990-91 to 2011-12 witnessed an overall traffic CAGR of 8.6 per cent with traffic at the Major Ports and Non-Major Ports growing at 6.4 per cent and at about 18 per cent respectively. The increased throughput of Non-Major Ports has

Over the years, cargo handling capacity of Major Ports has steadily increased. However, traffic demand clearly outpaced capacity additions, resulting in port congestion. Utilisation at Major Ports was about 80 per cent in 2011-12, way above the identified optimum capacity utilisation of 70 per cent, implying that the cargo evacuation facilities are under great strain.

The performance of Indian ports has generally deteriorated over the years.

- Average pre-berthing detention (PBD) of vessels was 2.05 days in 2011-12.
- Average turn round time (TRT) in 2011-12, average TRT was 4.56 days.

The gap between the growth in traffic and growth of port capacity is apparently widening. An expansion in total capacity by about 7.7 per cent by the end of the 12th Plan from 2011-12 levels is suggested.

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. However, the share of coastal shipping in India's domestic transport is miniscule, despite the various benefits it offers. In 1992, the shipping fleet possessed 441 ships with a total tonnage of 6.3 million GT which increased to 1,154 ships and 10.4 million GT in 2012, indicating a CAGR of 4.9 per cent and 2.6 per cent respectively.

Inland waterways in India are underdeveloped as a mode of transportation, despite their inherent advantages of fuel efficiency, environment friendliness, hinterland connectivity to less developed rural regions, and its capacity to shift large volumes of cargo from congested roads.

URBAN TRANSPORT

India's urban population concentration in larger Class 1 (100,000+) and million plus cities has been steadily increasing, leading to greater challenges in urban transport. According to the 2011 census, a total of 468 Class I urban agglomerations/ cities are believed to constitute more than 70 per cent of the urban population. Given that the issues of urban transport and private vehicle use are essentially concentrated in larger cities, this is an important base trend for projecting urban transport requirements.

Cities have witnessed increasing usage of private vehicles because they are yet to develop adequate public transport systems to meet increased travel requirements. Since 1991, the total number of registered motor vehicles has gone up from 21 million to 142 million, a more than sixfold increase. Two wheeler private transport has gone up from 14 million to 102 million, a rise of more than 13 times.

Analysis of data on vehicles registered in India reveals that the share of buses has declined to 1.1 per cent of all registered vehicles in 2011 from 11.1 per cent in 1951. The decline has been particularly rapid in the last decade from 2000 to 2011, when the growth in two-wheelers and cars was significantly higher across metropolitan cities.

KEY ISSUES

INTERCONNECTED, HIERARCHICAL TRANSPORT NETWORK

India must adopt a holistic approach in designing integrated transport networks. Hierarchical connectivity, intermodal access and fit-for-purpose network standards should be emphasised. Network expansions and capacity enhancements must be assessed for their impact on the existing network, and within and across networks. But, with substantial logistics infrastructure yet to be built, India can still make

amends to reach a more desirable and efficient state for its transport system.

CAUSALITY AND TIMELINESS

Both sides of the causality between demands for transport and for other goods and services should be considered in making the case for new infrastructure spending. Infrastructure should be programmed in anticipation of future demand. It is frequently easier, cheaper and faster to do this than post hoc construction that increases capacity at the margin. Once created, maintenance should be regular, timely and pre-emptive, rather than rehabilitative and this should become an integral part of the asset management system of each mode of transport. Allowance should also be made for allowing dynamic responses to changing situations.

REBALANCING AND CAPACITY

India's transport networks are severely constrained for capacity. Railways in particular, despite being a more reliable and energy-efficient mode, have been losing out to roads for want of capacity augmentation at various fronts. Increased funding has not translated into commensurate increases in the capacity of physical transport infrastructure, essentially due to greater investment focus on new and sometimes unhelpful infrastructure creation rather than on capacity augmentation.

FUNDING

Differential characteristics of the various transport modes warrant different funding models. Opportunities for improving the source of public funding exist for all modes, to better match costs and benefits for economic efficiency. Problems are especially rife in how the railways are funded. While retaining the role for the government in infrastructure funding, there is a logical need for stepping up private investment to both fill the investment gap and also allow increased flow of public investment in perhaps commercially unviable but economically and socially important investment decisions.

PRICING

A complex web of subsidies, tariffs and taxation policies applies to transport in India. This results in distorted pricing that does not serve as an efficient allocative signal, and creates opportunities for wasteful leakages, and rent-seeking. More sophisticated and less distortionary pricing can result in a powerful tool in the government's armoury to shape transport markets.

URBAN TRANSPORT

A clear framework of supply side measures and equally important demand side gradual approach

of progressively introducing restraints on personalised modes of transport, while strengthening public transport, is needed to meet the demands of the burgeoning urban population. It is however essential to make rational and customised decisions when choice for investment in one form of public transport system vis-à-vis another is considered, as opposed to 'one size fits all' kind of widespread replication of a particular model.

GOVERNANCE AND INSTITUTIONS

India's unique and dated system of institutional governance has resulted in a transport system that favours silo decisions, with the result that there is little intermodal coordination, and a system that is beset by unclear responsibilities, politicisation of investment, and weak accountability. The overall outcomes are characterised by inefficiency and waste.

SKILLS AND HUMAN RESOURCES

India urgently requires people adept at the following with respect to infrastructure development: planning, project identification and development, efficient and transparent contract procurement, administration, and operation and management. The severe shortage of skilled transport professionals must be addressed forthwith.

WE RECOMMEND...

Hierarchical connectivity, intermodal access and fit-for-purpose network standards should be emphasised.

Infrastructure should be programmed in anticipation of future demand.

Investment should be made for significant capacity augmentation of the railways.

While retaining the role for the government in infrastructure funding, private investment must be stepped up.

More sophisticated and less distortionary pricing policies must be developed.

The severe shortage of skilled transport professionals must be addressed forthwith.

3.

MACROECONOMIC GROWTH BACKDROP: TRANSPORT INVESTMENT REQUIREMENTS 2012-2032

This chapter provides macroeconomic projections that could fulfill the infrastructure and transport requirements needed over the next two decades, taking into consideration assumptions about expected growth of the Indian economy. In addition, we provide a bottom-up approach to look at each sectoral investment need.

There is a close relationship between economic growth and infrastructure investment, of which transport investment is a very significant component. When talking about economic growth, it is not possible to accelerate growth if transport investment is not accelerating correspondingly. Conversely, it will not be possible to find the resources required for infrastructure unless the country's economic growth accelerates.

The projections made in this chapter should be considered as indicators of the plausible magnitudes that can be invested in infrastructure and transport over the next two decades. Such investments could take place if the policy framework in each sector is made investor-friendly and transparent. We are aware that there will be leads and lags between different sectors over time. For instance, it is plausible that the power and telecommunications sectors could receive greater investment than suggested by our projections.

ACCELERATING GROWTH

The Indian economy has been projected to accelerate its growth from the 11th Plan average of 8.0 per cent and the lower 12th Plan annual growth envisaged at around 7 per cent to 9.0 per cent subsequently upto 2031-32. To achieve such GDP growth, the investment rate would need to increase from the current 35 per cent of GDP to about 42 per cent in 2031-32. The economy would have to become more efficient to fulfill these expectations: the Incremental Capital Output Ratio (ICOR) would have to be around 4.2. Also, the rate of industrial growth would have to accelerate from an average of 7 per cent during the 11th Plan to approach 10 per cent per year over the next 20 years.

WHY TRADE NEEDS TO EXPAND

The implication of such growth for the external sector of the economy is a high degree of continuing trade

expansion over the next twenty years. This is because achieving the desired investment level would need significant mobilisation of external capital inflows to finance industrial and infrastructure investment requirements, and the equipment imports implied by such expansion. The sustainability of such economic growth would require continuing high growth in exports of goods and services, though declining from around 20-25 per cent recorded in the 11th Plan to about 10 per cent by 2016, and then growing at 10-11 per cent per year over the next 15 years. If this takes place, total exports should reach around \$3 trillion by 2031-32. At these levels, exports would comprise about 38 per cent of GDP by 2031-32, up from the current level of 24 per cent. With such consistent growth in exports, it would be feasible for India to sustain a current account deficit of about 2.5 per cent of GDP as assumed in our projections, which is required for the non-inflationary absorption of external capital inflows.

In order to keep the debt-service requirements at a sustainable level, the debt-equity ratio of net capital inflows would have to be less than one. Therefore, the implied net annual debt flows would increase from the current level of about \$20-40 billion to \$130 billion during 2027-32. As debt repayments also rise, this implies that annual gross debt flows will have to increase from around \$40-60 billion now to \$120 billion in the 13th Plan period and rising to \$300 billion by the 15th Plan. The annual net foreign investment inflow, including both foreign direct and portfolio inflows will represent an increase from the current \$45 billion to \$200 billion by 2027-32.

Such inflow of external capital requires an open foreign investment regime. On the debt side, there is a negative expectation about the official net debt flows: hence, most of the new debt flows would have to be commercial, which would be highly reliant on the maintenance of high credit ratings for India and its borrowing entities.

THE INVESTMENTS REQUIRED

The macro-economic exercise suggests that it is feasible for total investments in infrastructure to increase from the current level of 5.8 per cent of GDP to 8.0 per cent (national accounts basis) after the 12th Plan period, up to 2031-32. About 1 to 1.5 per cent of GDP can be added to make these projections comparable with the Planning Commission definitions of infrastructure investment. In absolute terms, this implies that the annual level of investment could increase from the current Rs 6 trillion (\$100 billion) to about Rs 30 trillion (\$570 billion) by 2031-32. If we can manage to steer about 30-40 per cent of the total capital inflows into the financing of infrastructure, we could expect about 15-25 per cent of the of the total requirements for infrastructure to be externally financed. The rest as much as 75-85 per cent will have to be domestically financed.

There is a clear need for raising the share of Indian Railways in total infrastructure investment and within the transport sector as well. As noted, significant success has been achieved in ramping up investment in roads over the past two decades, and particularly since the year 2000. Thus, we are proposing a significant increase in investment in Railways from about 0.4 per cent of GDP in the last two decades to around 0.8 per cent in the 12th Plan and then rising to around 1.1 and 1.2 per cent of GDP in the following three Plan periods.

Total investment in transport is projected to increase from about 2.6 per cent average in the 11th Plan to 3.3 per cent in the 12th Plan, and stabilising at 3.7 per cent of GDP in the 13th, 14th and 15th Plans (2017-32). Here again, 0.5 to 0.7 per cent of GDP can be added to be comparable with the Planning Commission investment concepts. In absolute terms, the annual level of investment in railways, roads and bridges, and other transport, will increase from Rs 2.2 trillion (\$45 billion) in 2011-12 to Rs 3.8 trillion (\$70 billion) during the 12th Plan, Rs 6.3 trillion (\$110 billion) in the 13th Plan and rising to about Rs 14 trillion (\$250 billion) in the 15th Plan period. Of this, investments in Railways by itself will increase from Rs 300 billion (\$6.5 billion) in 2011-12 to Rs 900 billion (\$17 billion) during the 12th Plan, Rs 1.9 trillion (\$33 billion) in the 13th Plan, and rising to Rs 4.6 trillion (\$85 billion) in the 15th Plan period, all in constant 2012-13 prices. In this scenario, both public and private sector investments in transport as a proportion of GDP will need to increase significantly.

Public sector investment in infrastructure cannot be reduced from the current levels as a proportion of GDP. It should actually rise marginally: the projections for the next two decades show public sector investment in infrastructure should go up marginally from 4 per cent of GDP during the 12th Plan period to 4.3 to 4.5 per cent of GDP in the next three Plans.

There is a clear need for raising the share of Indian Railways in total transport investment. We are proposing an increase in investment in Railways from about 0.4 per cent of GDP in the last two decades to around 0.8 per cent in the 12th Plan and then rising to around 1.1 and 1.2 per cent of GDP in the following three Plans

This increase in public sector investment is primarily due to the increased investment proposed in the railways. Depending on private sector investment trends, there could also be a shift in sectoral composition of public sector infrastructure investments. Private sector investment is complementary to public sector investment rather than a substitute. This implies that public sector infrastructure investment will have to be increasingly commercially viable if public resources invested in infrastructure increase somewhat faster than GDP growth.

Thus, a greater effort will need to be made to strengthen and commercialise all public sector entities that invest in and manage public transport infrastructure at both the central and state levels. The Railways, in particular, need very significant organisational and accounting change (as detailed in Volume III, Chapter 1) if the kind of capacity and quality expansion envisaged is to be achieved. Similarly, urban transport entities ranging from bus transport companies, BRT and other MRT entities will have to be increasingly commercially viable. For this to happen, significant resources will have to be invested in capacity development across the board.

We project private sector investment to rise from less than 1 per cent of GDP in the 11th Plan period to around 1.3 per cent in the 12th Plan and around 1.5 to 1.6 per cent in the following three Plan periods. In absolute terms, this implies an increase from an annual average of about Rs 700-900 billion (\$16-18 billion) in the latter years of the 11th Plan to around an annual average of Rs 1.5 trillion (\$27 billion) in the 12th Plan, rising to Rs 2.6 trillion (\$50 billion) in the 13th Plan and as much as Rs 6.3 trillion (\$110 billion) in the 15th Plan (all numbers in 2012-13 prices).

Most of the external capital inflow related to infrastructure, in terms of both equity and debt, is going into telecommunications and the power sector: The flow of external capital into the transport sector is, so far, not very large. Thus, the proportion of transport investments that can be expected to be externally financed is unlikely to be higher than 15 per cent: it could well be lower.

Thus, an important upshot of our exercise is that:

- Expectations of foreign financing of trans-

- port investment need to be realistic in terms of the attractiveness of this sector for foreign investment, in terms of both equity and debt.
- Special efforts will have to be made to influence the flow of domestic savings into the transport sectors.

Finally, high growth in trade and a stable domestic macroeconomic and financial environment is critical to India in order to attract the external capital inflows needed on a sustainable basis. Further, expecting a higher level of external capital inflows than those projected might be unrealistic and also destabilising. Therefore, the bulk of resources for overall infrastructure investment will have to originate from domestic savings.

NTDPC also made bottom-up estimates for investment requirements in each infrastructure sector. The aggregate and sectoral estimates provided by the Working Groups, consisting of the relevant government ministry representatives and sectoral experts, turn out to be lower than the macroeconomic consistent model projections of availability of resource flows for transport infrastructure. We have not attempted to reconcile the two sets of estimates. So these projections suggest that we can be more ambitious in our transport planning in the 13th Plan and beyond.

WE RECOMMEND...

Investments in transport should increase from Rs 2.2 trillion (\$45 billion) in 2011-12 to Rs 3.8 trillion (\$70 billion) during the 12th Plan, and rising to about Rs 14 trillion (\$250 billion) in the 15th Plan period.

Annual investment in railways should increase from Rs 300 billion (\$6.5 billion) in 2011-12 to Rs 900 billion (\$17 billion) during the 12th Plan, and rising to Rs 4.6 trillion (\$85 billion) in the 15th Plan period.

Public sector investment in infrastructure as a proportion of GDP should rise marginally, from 4 per cent of GDP during the 12th Plan period to 4.3 to 4.5 per cent in the next three Plans.

A greater effort needs to be made to strengthen and commercialise all public sector entities that invest in and manage public transport infrastructure at both the central and state levels.

4.

INTEGRATED TRANSPORT: STRATEGY AND LOGISTICS

The Committee aims to design a transport system—a network of networks—that permits the greatest choice at the lowest resource cost; one that is safe, efficient, effective, and is reflective of the net economic, social, and environmental costs of service provision.

The prescription for achieving an integrated transport strategy proceeds as follows: (1) establish traffic flows and unit transportation costs across the various modes for the various commodities; (2) identify existing distortions in the market for transport; (3) identify other government development and distribution priorities and the role of transport in these matters; (4) use these facts to arrive at the desired optimal modal mix; (5) install sufficient capacity and maintain both old and new infrastructure to ensure that no mismatch between actual and rated capacities; (6) use economically sensible pricing policies that are determined either by the market or by independent tariff-setting authorities to encourage a mode choice driven by efficient markets; (7) install nodal infrastructure and promote technologies that reduce the costs of mode- and gauge-transfer.

LOGISTICS AND INTEGRATED TRANSPORT

Logistics costs to the economy are variously estimated at around 9 per cent of GDP for the United States, 11 per cent for Japan, 12 per cent for France and Korea, and 18 per cent for China. Cost estimates for India do not appear to be as robustly calculated, and various studies have provided a range of 12 to 15 per cent of GDP. The high level of coordination required between the many fragmented and specialised participants in the logistics industry in India is sometimes cited as a cause for the relatively high proportion of logistics expenditure in GDP. In one panel study, it is noted that a 0.5 per cent decrease in logistics costs (relative to GDP) leads to a 2 per cent increase in trade and a 40 per cent increase in the range of products that are exported out of a country.

The current state of the logistics sector in India can be crudely characterised as largely unsophisticated, lacking in organisation, somewhat neglected by policy, and hamstrung by a shortage in skills. This is manifest in the observed inefficiencies of the sector.

The liberalisation of the economy, the growth of markets in tier-II and tier-III cities, the expansion of

trade, the dramatic increases in investment in the highway network, the subsidies extended to diesel fuel, and the discriminatory pricing of rail freight vis-à-vis passenger transport have all conspired to now leave rail with a roughly 30 per cent share of freight movement today.

The economic consequences are that goods are freighted inefficiently by road adding to their total cost, and reducing the competitiveness of exports. This does not include the generalised deleterious effects of distorted markets. The environmental consequences can be measured in terms of greenhouse gas emissions and energy usages that are higher than they need be, congestion, and other effects.

Indian trucking is an unorganised industry. About 75 per cent of trucking firms own small fleets of less than five trucks, with only 11 per cent operating more than 20 trucks. Poor maintenance and low-quality spare parts rapidly reduce operational efficiency of trucks. On the whole, the industry is intensely competitive with low barriers to entry for either operator or driver, a high degree of substitutability, and significant bargaining power vested with the purchasers of trucking services. The capital required to enter the market is small, the licensing regime is not overly strict, and only basic skills and qualifications are requisite. Service quality in terms of keeping to schedule and ensuring safety are not made priorities.

Once on the road, the rickety trucks face problems that are not limited to potholed roads or clogged highways which reduce their speeds to about a third of that achieved by developed-world counterparts. On a trans-national journey, they are stopped at multiple checkpoints for inspections, payments of tolls and taxes, octroi and so forth. The 11th Five Year Plan notes: 'The World Bank has estimated that truck delays at checkpoints cost the Indian economy anywhere between Rs 9 billion to Rs 23 billion.'

Inadequate drafts and port capacities prevent the largest container ships from calling at Indian ports. Poor road and rail connectivity to several ports hampers the efficient removal of all freight, but espe-

cially of containers. Clearance procedures for customs, security and bio-security, are slower and more involved than international standards, increasing cargo dwell-time at ports and raising costs. Limited availability and use of material handling equipment and the latest automation technologies at the ports also slows vessel turnaround times, reduces the certainty—and hence the usefulness—of time-bound freight movement, and also increases the time that ships must idle at sea before berths become available.

Indian airports too, including the new airports developed in Delhi, Bangalore, and Hyderabad, have not adopted the best practices for enabling express logistics. Dwell-times for air cargo at Indian airports are substantially higher than in other countries.

Subsidies should be limited to those areas where their retention on societal considerations is overwhelmingly justified. Wherever subsidies are retained, they must be made as explicit as possible so that they are clearly identifiable to ensure transparency.

Indian warehouses are of poor quality and inadequate for meeting the specialised needs of modern manufactured products and business processes. Differential retail and consumption tax rates across the states prevent warehouses to be located optimally from a supply-chain perspective; instead, the warehouses often migrate to the lowest-tax jurisdictions. The mandates wielded by various regulatory authorities over warehousing are often in conflict, and the regulations themselves require clarification.

THE DESIRED END STATE

The desired 'end state' is an overlay of transportation networks, allowing for the efficient transportation of each commodity type as well as natural transition nodes where quantities are aggregated and disaggregated for more efficient transport on the best mode and gauge for a particular stage of the journey.

To achieve this desired end state, a number of policy decisions need to be taken, strategies to be followed and investments to be made.

Government must adopt an integrated transport strategy guided by inter-generational drivers of patterns of transport demand. The overall aim of the integrated strategy should be to uncover an optimal modal mix. This desired mix should reflect the full resource costs of each transport mode for each type of commodity transported over various

distances and terrains. It should also reflect the government's distributive and allocative agenda clearly. In itself, the intermodal principle is not about advocating a particular modal mix. Instead, it is highly likely that from the optimal modal mix, a persuasive case for intermodal transport will be made. The inefficiencies of an insufficiently intermodal transport system are manifest in higher prices, longer journeys, reduced reliability, lower availability of quality services, type restrictions, higher risks of damage or pilferage, and more complex administrative procedures.

Pricing for transport services and for associated inputs like fuels should be depoliticised and set by market or by independent regulatory authorities. Where prices are set by independent authorities, they should be responsive to changing economic fundamentals in a timely fashion to minimise adjustment costs.

Subsidies should be limited to those areas where their retention on societal considerations is overwhelmingly justified. Wherever subsidies are retained, they must be made as explicit as possible so that they are clearly identifiable to ensure transparency.

Growth and consolidation of the transport industry must be encouraged organically by reducing the documentation, administrative and state-border clearance burden required of truck movements and by reducing excise duties on multi-axle trucks.

Provisions in the Motor Vehicles Act (1988, as amended) should be effectively implemented. Recommendations made by the Sundar Committee reviewing the Act should be carefully considered.

Tolls should be electronically collected under a single technological standard together with a clearing house for the various toll operators to reconcile collections and dues.

Truck drivers should be certified to a high, common standard across the country that takes into account the skills such as reading, writing and communication, together with basic technological familiarity, basic knowledge of taxation, permit and license regimes, and the technical nous to manage specialised or hazardous goods in transit.

The network of dedicated freight corridors must be speedily completed. Freight corridor designs must support efficiency measures such as double-stacking of containers, and terminals and junctions should be designed to process unitised cargo.

Ports should provide due emphasis on improving superstructure, by expansions of associated back-up container stack areas, transfer bays, rail transfer

facilities for seamless rail evacuation, gate terminals for proper road evacuations, operational buildings, modern container handling equipment such as quay-side container handling gantry cranes, yard rubber-tyred gantries, reach stackers, terminal tractors, etc. in the terminal areas.

Smaller new ports should be constructed at regular intervals along the coast to increase the number of origin-destination pairs and to increase the attractiveness of coastal shipping.

Restrictions on foreign-flagged vessels from plying coastal routes as part of their international operations should be relaxed to allow them to carry bulk/general cargo and transhipped exim containers, including empty containers to make use of the considerable spare capacity on these ships.

Dedicated terminals or private bonded facilities for air cargo should be set up at all metropolitan airports. Alternatively, consideration may be given to new airports that are dedicated only to cargo flights.

Customs clearances should be available at all times at the largest airports with the heaviest traffic volumes. Important regulatory agencies for inspecting shipments of food, pharmaceuticals, textiles and biological matter should have on-airport offices.

A National Pipeline Grid could be established along the lines of the National Electricity Grid. Disparate pipeline networks could be integrated to allow for efficient flow of products across long distances. Fiscal and tax incentives for investing in pipelines could be introduced.

Around 15 to 25 logistics parks should be established. These hubs should be located at major transportation hubs, including at the origin and destination points of DFCs, and at major industrial centres or near major urban conurbations. The parks should have sufficient space to serve as waypoints to manage inventory, provide storage, and should also have excellent links to the road and rail networks, and possibly to airports and ports depending on the local economy and geography. The parks should have provision for ancillary activities and services such as inspections and certification, customs clearances, offices and hotels.

The hub potential of the park should be determined, whether in regional, national or international terms. The legal and operational restrictions on the functioning of the park should be identified in advance, and feasibility studies should pay particular attention to integration with urban master plans, regional development plans, land and building costs, and acceptance by existing users or neighbours of the designated site.

International standards on unit load devices such as containers and pallets should be adopted and infrastructure adapted to suit. Associated handling equipment such as forklifts, cranes, scanning and inspection equipment, tractor-trailer units, and specialised flatbed rail wagons must become ubiquitous technologies.

A new central body, the Central Logistics Development Council comprising of industry members, ministry representatives, and financial and academic institutions should be set up with the mandate of promoting the logistics industry. The body will collect information, advice on required infrastructure and changes to policy and regulation, propose standards on equipment, technology and manpower.

WE RECOMMEND...

Pricing for transport services and for associated inputs like fuels should be depoliticised and set by market or by independent regulatory authorities.

Road tolls should be electronically collected under a single technological standard together with a clearing house for the various toll operators to reconcile collections and dues.

The network of dedicated freight corridors must be speedily completed.

Smaller new ports should be constructed at regular intervals along the coast to increase the number of origin-destination pairs and to increase the attractiveness of coastal shipping.

Dedicated terminals or private bonded facilities for air cargo should be set up at all metropolitan airports. Alternatively, consideration may be given to new airports that are dedicated only to cargo flights.

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Around 15 to 25 logistics parks should be established. These hubs should be located at major transportation hubs, including at the origin and destination points of DFCs, and at major industrial centres or near major urban conurbations.

A new central body, the Central Logistics Development Council comprising of industry members, ministry representatives, and financial and academic institutions should be set up with the mandate of promoting the logistics industry.

5. INSTITUTIONS FOR TRANSPORT SYSTEM GOVERNANCE

The country's transport system will affect and be affected by various 'known unknowns' in the coming decades, including variation over time and across regions in economic growth, urbanisation, energy use and energy markets, and technology change.

'Transport system governance' is the combination of market, political, and administrative processes that will enable the country to respond to these changes. The 'transport system' comprises various forms of physical infrastructure as well as the policies regulating access to and use of the facilities. As 'governance,' it ideally includes various feedback loops: from market demand to investment, from political aggregation of preferences to policy choice, and from research to definition and evaluation of cost effective technology, policy, and investment options. Any institutional strategy for transport governance must recognise that transport users' decentralised decision making within the guidelines of policy and physical restrictions of infrastructure ultimately determine the extent and distribution of transport services available.

NTDPC is meant to provide this framework for institutional design and policy action. Policy is important for ensuring that the transport system meets social goals such as environmental sustainability, energy efficiency, and social/economic inclusiveness. The government typically sets the terms of access to infrastructure in order to prevent monopolisation of fixed facilities (e.g. roads, railroad tracks, airports, ports) and to maintain incentives for service providers to minimise costs for high quality service. Governments also generally design and enforce safety regulation for services operating on the physical infrastructure (airlines, bus transport, etc), including creating and enforcing norms for network use such as speed limits, and traffic rules—a classic coordination role. Finally, much of the transport system's physical backbone is also publicly financed. There is a range of instruments for achieving these goals: including direct siting and construction of physical infrastructure, subsidies for investments in physical infrastructure, subsidies to service providers, pricing policies, and specific purpose transfers to transport users, among others. Our emphasis on institutional design is distinct from the more common approach of stating a policy goal.

India is unique in having separate national ministries for each mode of transport. India's intergov-

ernmental division of responsibilities is somewhat more centralised than in other geographically large federations, and the country lacks the governance infrastructure for intergovernmental coordination around the points where the pieces of the transport system link together. It also has an unusually complex urban policy environment, with limited metropolitan-level fiscal or administrative powers to coordinate transport infrastructure or policy in denser areas.

This arrangement handicaps intermodal planning and execution at all levels of government. Fragmentation has not led to obviously redundant investment, given the general need for more transport capacity across India, but it has led to system inefficiency. Ports do not always have infrastructure for evacuation of goods; rail networks do not link with road networks for last-mile delivery of goods; bus and metro systems in urban areas do not always exchange people. Highways built by one level of government are not always linked to district roads built and maintained by another. The lack of an institutionalised arena or even professional context for examining the interaction between investment and maintenance of the physical infrastructure; regulation of access; and policies affecting operators in shaping the supply of transport options also dulls the system's incentives and ability to respond to demand.

Urban transport planning is a 'constitutional and institutional orphan' according to the Report of the Working Group on Urban Transport (NTDPC, 2012). It takes place as a collective but not necessarily collaborative effort between national, state, and, to a lesser extent, city government agencies. The specific constellation of agencies involved in urban transport planning varies between states due to their role in defining the financial and human resources of local government institutions, and within states by city size.

OFFICES OF TRANSPORT STRATEGY AT NATIONAL AND STATE LEVELS

Immediate steps need to be taken toward creating national and state institutions with the authority and ability to coordinate forward-looking investments in the backbone of the transport infrastructure as well as guide regulation and other policies to ensure effective utilisation of the physical infrastructure across the country.

NTDPC recommends establishing a national ‘**Office of Transport Strategy**’ (OTS) to host data and technical expertise for developing, monitoring, and refining longer-range strategies for transport as the Ministry of Transport comes together. This OTS could be thought of as a standing version of NTDPC, with a permanent secretariat, budget, and ability to request and generate data. In the short run, it would both develop alternatives and convene the relevant policymakers to consider options. In the long run, the OTS could perhaps be absorbed as the technical secretariat for the Minister of Transport. However, arguments could also be made to keep the OTS associated with the Planning Commission in order to promote greater professional independence and coordination with overall planning.

State-level transport agencies would perform a similar technical role in designing transport programmes, leaving implementation to the existing Departments of Public Works. It would work closely with the State Urban and Rural Development Ministries as well as the Chief Minister on transport planning to address state development, and be the primary liaison to the national government for inter-governmental coordination of transport investment and policy. As state transport planning capacities are built, we recommend that state governments be given greater statutory responsibility for airports and rail-based urban public transport. This is particularly important as smaller regional airports are developed in the coming decades, so that complementarities between airport location and state investments in road networks, tourism infrastructure, and market hubs can be exploited.

Creating state analogues of the national OTS would be an important first step toward building the capacity to respond to these performance incentives. Second, state OTSs would also provide an important counterweight to the national OTS and Ministry of Transport by ensuring that states can be effective advocates for regional development needs and choices of mode and location for investment. A group of strong state OTSs could help offset the risk that the national OTS would be captured by particular interests.

The features of the state OTS would be analogous to those of the national OTS.

UNIFIED TRANSPORT MINISTRY

The division of different transport modes between Ministries at the national level stands in stark contrast to international practice. Nearly all of the 100 largest economies, all of the OECD countries, and all of India’s emerging market ‘peers’, the BRICS countries, have a Ministry of Transport or similar integrated equivalent rather than the collection of mode-specific ministries found in India. Some of these consolidated national agencies are also combined with the Ministry (or equivalent) of communication, a categorisation reminiscent of India’s early post-independence structure.

India needs to have a single unified ministry with a clear mandate to deliver a multi-modal transport system that contributes to the country’s larger development goals including economic growth, expansion of employment, geographic expansion of opportunities, environmental sustainability, and energy security. The current collection of ministries creates a list of mandates to deliver particular types of transport infrastructure, with little incentive or ability to consider how these pieces interact as a circulatory system for moving goods and people.

The existing ministries should become Departments focused on delivering effective transport infrastructure and services for each mode. Each would be led by a Minister of State with support from a Secretary and a technical staff. Each of these Departments must have the technical ability and procedural standing to make a credible case for investment and policy in its mode of transport to meet the broader framework set at the Ministry level. This distribution of authority and technical expertise is important to maintain an ongoing, constructive discussion of various means for meeting transport development goals.

Nearly every other country in the world, and every one of India’s perceived peers, has moved in this direction. Most of these integrated ministries retain the basic division of labour across departments focusing on different modes of transport, with additional ‘integrative’ sections looking at energy efficiency, innovation, and other cross-cutting functions.

Consolidation of all or some parts of various ministries into a single Transport Ministry will be difficult in an era of coalition politics, but it must be done. Politics and the preference for the path of least resistance cannot continue to hold

India needs to have a single unified ministry with a clear mandate to deliver a multi-modal transport system that contributes to the country’s larger development goals including economic growth, environmental sustainability, and energy security

public sector transformation hostage. It is time to negotiate a comprehensive restructuring. The settlement should also include provisions that restrict the Government's ability to re-allocate business, as a way to prevent the problem from recurring.

A similar process of integration of transport planning and policy into a single department must happen at the state level.

At the metropolitan level, in the long run, there is no substitute for establishing financially independent, well-staffed urban governments that would undertake transport among other roles. In the short run, however, we focus on building the information base and capacity, inside and outside government to enable more informed decision-making by the current collection of stakeholders, including the urban citizens who have emerged as a more vocal political force in recent years. .

THE ROAD AHEAD

India faces three main institutional challenges in developing the governance infrastructure to support a transport system that will meet its needs over the coming decades. First, India will have to shed the old version of directive planning to move to a new skill of facilitation, recognising that capital investment in transport infrastructure and regulation or policy are instruments to affect the transport system rather than decrees that determine its final shape.

Second, it will have to integrate decision-making across agencies that have historically focused on particular modes of transport and between elements of the system. Policies concerning physical infrastructure, its use, and investments in rolling stock have historically been undertaken in different parts of the federal system and agencies within each level

WE RECOMMEND...

	IMMEDIATE REFORMS	LONGER RUN GOALS	BRIEF RATIONALE
National	Formation of high-level, independent Office of Transport Strategy (OTS)		Required to move toward investment and strategy for transport as an integrated system
	National Transport Infrastructure Finance to be neutral with respect to means of delivering mobility, sustainability, and inclusion goals.		Principle of subsidiarity, enables experimentation and responsiveness to varied needs.
		Merge existing mode-specific Ministries into a single Transport Ministry	
State	Establish urban transport as a subject to state level.		Principle of subsidiarity. Reduce current fragmentation across road, rail, para-transport, non-motorised modes. Integrate infrastructure investment and regulatory/management oversight.
	Develop formal mechanisms for state participation in decisions about initiation, siting, size, and other aspects of airports and rail-based transport that have significant impact on regional transport systems.		
	Formation of state-level counterparts to the OTS, with particular focus on urban transport		See above. Also builds counterparts for communication between levels of governments and states
Metropolitan	Creation of UMTAs with statutory authority, independent budgets, expert personnel in all urban agglomerations with population greater than three million.		Immediate need for strategic approach to transport in mega-cities to ensure continued economic dynamism, extension of jobs creation, inclusion.
		Creation of UMTAs with independent statutory authority, independent budgets, expert personnel in all urban agglomerations with population greater than one million.	Move over time to global standard, especially as metropolitan governance is strengthened.
	Formation of metropolitan planning committees as per Constitutional mandate.		Important to integrate transport in a broader planning and investment framework. Principle of subsidiarity. Long-standing Constitutional mandate. Basis for innovative, responsive urban governance; global standard practice.
	Creation of public-private centres of excellence in urban transport in all cities larger than one million.		Builds urban transport expertise with local interests and roots as a resource for metropolitan transport authorities
	Invest in unified metropolitan databases		Facilitates transport system and other planning as well as de facto integration of planning across multiple agencies using the same images of the city.

of government. India's fragmentation of transport investment planning between modes of transport stands out in comparative context: it is the only country among the hundred largest economies that continues to maintain separate ministries for each mode of transport. This fragmentation is deeply rooted in India's bureaucracy and will be difficult to overcome, but the process must begin.

'Integration' does not mean centralised decision-making, but rather setting up of systems for information flow, knowledge generation, and continuous, interactive dialogue between relevant organisations throughout the project cycle. We must move toward decentralised coordination, based on the principle of subsidiarity, enabled by information flow among agencies with clear responsibilities and the financial and human resources to carry out their mandates. Third, it will have to reconsider the division of authority between levels of government. Transport governance in India is far more centralised than international practice, in part because of constitutional divisions of authority that have become monopolies on oversight rather than designation of leadership among collaborators, in part because of the power that fiscal centralisation awards to the Union government, and in part because of the allocation of and adaptation to scarce technical capacity. The changes we recommend here start to re-align transport governance with the principles of subsidiarity in federal design.

India's transport governance must move toward five significant changes over the next decade:

- i Creating a consolidated Transport Ministry to focus on systemic performance;**
- ii Setting up an Office of Transport Strategy (OTS) to coordinate transport policies at the national level.**
- iii Clearly decentralising policy and planning authority including urban transport to the constitutionally recognised urban and metropolitan governments;**
- iv Building a comprehensive regulatory environment to govern transport flows, and**
- v Building an interdisciplinary cadre of transport experts.**

India must initiate the institutional investments summarised in the table on the facing page. Transport governance organisations and practices along the lines that we recommend have taken decades to develop in other countries that are under fewer fiscal, growth, and resource constraints.

6. **REGULATORY ISSUES: AN OVERALL APPROACH**

Regulation is an essential part of the foundation for collaboration between the public and private sectors in delivering and managing transport infrastructure and services. This collaboration is inevitable, but its outcomes will be determined by the quality of the framework for the interaction

The combination of extensive economies of scale and scope that generally lead to market concentration and limit competition, the large sunk costs relative to fixed and variable (avoidable) costs and the fact that transport services are deemed essential to a broad range of users, make regulation absolutely essential in the provision of these services. While transport infrastructure facilities (rights of way, track, terminals and associated traffic management) involve heavy upfront investment and display significant economies of scale, service provision (conveyance of passengers and freight) varies from being monopolistic (railways) to competitive (trucking and bus services).

The prospects for competition in transport have changed with technological progress and new ways of provision. Horizontal and vertical unbundling can help separate the potentially competitive components from the natural monopoly segments in transport. Trucking services, for example, are provided almost exclusively by the private sector in most countries. Besides, certain services are entirely similar to private goods, such as urban bus transport, while others such as port, air and rail services may be private or 'club goods' depending upon congestion. Many countries that have implemented economic reforms in transport have sought to increase the role of the private sector in the provision of both transport infrastructure facilities and services. Introducing private sector participation in transport does not eliminate the need for regulation; in fact, it accentuates the role of effective regulation and regulatory institutions. For instance, the introduction of private sector participation in the power and telecommunications sectors in India heightened the need for effective regulation and regulatory institutions in India as these forms of policy influence replaced the mandate that ownership offers. Most parts of the transport infrastructure, and all transport services can now be classified as private goods, albeit with potential for market failure. However, it is crucial to recognise that it is regulation embedded in the local context, rather than ownership which is vital to achieving public policy goals.

Market failures are pervasive and yet it is not clear that where the market has failed, government through

its several instruments will be able to improve the outcomes. The reform will have to be carefully calibrated based on available evidence. It is now clearly established that restructuring of erstwhile monopolies and introduction of competition (where possible) are necessary but not sufficient conditions to improve the technical performance of transport sectors. Even after restructuring, there will be limits to competition in certain segments of the transport sector; due to the high initial and 'lumpy' investment in fixed facilities. In addition, we know that the availability and quality of infrastructure services are often highly politicised and corruption is widespread. The problem of market power in provision combined with the temptation for political interference means that the unfettered market will inevitably lead to socially suboptimal outcomes if pricing and investment decisions are left unregulated. Independent regulation also possesses the advantage of potentially limiting political convenience.

Congestion is an externality that is customary on urban roads especially during peak hours. It is however not the only externality that transport infrastructure and services create. Decisions about infrastructure investment, for example in roads versus public transport, rail, and waterways affect energy efficiency and thus India's prospects for energy security and fiscal health. The current allocation of freight traffic between road and rail is one such negative externality. Transport services and choice of vehicle and fuel affect air pollution, which in turn negatively affects public health. Transport safety is also an externality from investments in particular forms of infrastructure as well as an 'invisible' aspect of service delivery. Regulation is thus required to reduce incentives to cut corners in parts of service provision that customers cannot readily assess when choosing which services to purchase.

As a result, regulation of various parts of the transport network is needed for various reasons: to limit the potential monopoly power exercised by owners of networks with high capital costs; manage congestion, air pollution, and other negative externalities from use of transport networks; achieve positive externali-

ties including network effects; and motivate investments in 'invisible' consumer goods such as safety. Regulation can be used to encourage extension of access to infrastructure and services to lower-income or remote services, though other instruments such as subsidies to providers or targeted transfers.

One of the main goals of regulation are to induce firms to produce the service at the lowest possible costs to align prices with costs so that firms do not make super normal profits which they could without appropriate regulation. Given the growing use of PPP contracts in transport, an increasing role for the regulator will also be to ensure compliance with the PPP contracts. The challenge is considerable; not only because of the complexity and that it requires a learning process, but also because of the lack of a regulatory tradition and track record, scarcity of expertise, and weak formal and informal norms protecting private rights. This problem is everywhere since private participation in transport infrastructure is still an evolving phenomenon.

CROSS-CUTTING THEMES

Designing good regulatory institutions is a non-trivial task. Attributes such independence, transparency, accountability, expertise, legitimacy and credibility are the foundation on which the new regulatory institutions should be created within the scope of local legal tradition. No doubt this is a challenge, but one that will be an important causal factor in determining the future quality of our transport services. Effective regulatory institutions must be designed to provide credible commitments for investors who incur large sunk costs, they should protect consumers from excessive prices and poor-quality service and devise a strategy for achieving universal service goals. Besides, safety and social regulations to reduce health and environmental impacts are now integral to good regulatory institutions. By its very nature, setting and enforcing standards is an integrated activity involving multiple interventions. These interventions need to be combined and implemented in an integrated manner to derive the maximum benefits from each intervention.

India's institutional capacity has been weak, as it has in many emerging markets. A unitary Transport Ministry is a vital step towards good regulatory design along with independent regulatory institutions in each transport sector that includes a separate dispute settlement arrangement. Ministries are reluctant to relinquish control of the sector since it serves short-term political goals. Political constraints and ministerial preferences over time seem to have dominated the reform agenda in different infrastructure sectors. It is time to recognise that institutionalising a robust regulatory philosophy based on a framework with adequate capacity is a necessary, although not sufficient, condition for accelerated and sustainable

Attributes such as independence, transparency, accountability, expertise, legitimacy and credibility are the foundation on which the new regulatory institutions should be created within the scope of local legal tradition

growth. Evidence shows that regulatory strengthening must also happen before restructuring of ownership or lifting of controls on private participation.

Independence implies shielding regulatory agencies from political pressure to the extent possible. The regulatory agency should be given functional autonomy in its day to day activities while the Ministry issues only broad policy guidelines and directives. Legitimacy on the other hand, requires the regulatory agency to follow a transparent consultative process of decision making with opportunities for judicial review. In practice this means holding open house discussions and posting consultation documents on the regulators website. This enables the regulator to collect evidence and also take account of the views of those who have an interest in the outcome. Consultation is an essential part of regulatory accountability – and it has now become intrinsic to the regulatory process. Judicial review of regulatory decisions is a reasonable safeguard to regulatory authority.

Financial autonomy is often linked to regulatory independence. In India, this has not been the practice since regulatory institutions are supported by budgetary allocations that can compromise independence. Depoliticising the regulatory process will thus remain an important long-term goal in transport. Financial autonomy however may or may not guarantee independence. An additional safeguard to prevent 'political capture' is to make appointment processes transparent and grounds for removal clear and structured for all regulatory institutions..

As independent regulation becomes more the norm, questions about institutional design will arise, namely: should regulation and dispute resolution institutions be created for each sector and sub-sector, or should certain functions be consolidated across sectors? India's piecemeal approach to infrastructure reform has led to the proliferation of regulatory bodies and tribunals. 'Regulatory proliferation' is seen as creating continued employment for the bureaucrats and judges, while professionals with technical expertise have been conspicuous by their absence.

This is worrisome and therefore it is vital to create a cadre of professional regulators with technical expertise for the complex tasks of managing the regulatory processes.

Each transport sector in India is beset with numerous legislations. It is imperative to simplify the legal structure. This has begun to happen in sectors such as ports and civil aviation, but clearly a lot more needs to be done

The alternative to sector-specific regulation is a single-umbrella transport regulator with specialised departments, or multi industry regulators. The primary argument in favour of the single-industry regulatory agency approach is that it ensures deep technical and economic expertise about the attributes of the industry within each agency's regulatory jurisdiction, and that this in turn leads to more effective regulatory decisions. The arguments in favour of a multi-industry or super transport regulator include wide-ranging deployment of common skills avoiding unnecessary duplication, opportunities for cross-learning and adoption of new practices across different sectors. Most importantly, it checks the potential for capture of the regulatory agency by single interest groups, especially the firms that are being regulated. There is enough overlap in regulatory issues to make it possible for a single agency to regulate transport. The thematic commonality across the different transport sectors suggests that adopting a multi-industry regulator might make the regulatory process more efficient and transparent, but it will be a lot more difficult to implement in the short term given enormous vested interests. A unitary Transport Ministry and/or a multi-industry regulator, despite its attractiveness, is therefore neither feasible nor practicable to adopt immediately in India. It will require significant legislative changes but should however remain a long term vision.

The Competition Commission of India (CCI) will remain the body to resolve anti-trust and competition-related issues. While elements of competition oversight are common across sectors, there is a delicate balance between, judicial review of regulatory decisions and enforcement of anti-competitive actions by industry players. The boundaries between CCI jurisdiction and the sector regulators will have to be established over time by precedent. It is also important to strengthen the CCI and create sub-groups with technology expertise would be a more flexible structure to be able to adapt as technology changes.

THE ROAD AHEAD

Each transport sector in India is beset with numerous legislations. It is therefore imperative to simplify the legal structure. This has begun to happen in sectors such as ports and civil aviation, but clearly a lot more needs to be done. Existing sector-specific enactments need to be unified into a single statute. This

will simplify procedures and make compliance easier. Certain sections of the existing acts which are anachronistic would also have to be deleted and even some of the acts repealed. But such unification may not be an easy task, and cannot be achieved within a short period of time. The process of private sector participation should not however be held up, pending completion of the work.

Unification of the legislations must be supplemented by the setting up of a statutory regulatory agency for each transport sector. The primary regulatory need for railways is independent price regulation to reduce the persistent cross-subsidisation between freight and passenger services and begin to restore shift freight traffic toward railways. Thus, creating a Railways Tariff Regulatory Authority to provide 'a level playing field to all stakeholders' is a major recommendation, also of various other committees including the Rakesh Mohan Committee on Railway Reform in 2001, the Sam Pitroda-headed Expert Committee on Railway Modernisation and by the Planning Commission. In addition, an independent dispute settlement tribunal could also be created with the existing Railway Rates Tribunal (RRT) charged with this mandate. Over time, as policy opens more opportunities for private participation in railway services, the regulatory framework will need to ensure competitive access to trunk lines and include social regulation to reduce environmental impacts and increase safety.

Road transport includes a number of regulatory challenges including managing PPPs in road construction; increasing safety and reducing environmental impact of road-based transport; ensuring competition in road transport services, and potentially using regulation among other tools to ensure widespread access to road transport. The PPP option is on the agenda for all transport infrastructure, but particularly for roads in which technology is more straightforward and project structures can be replicated as 'model documents.' Expert regulation is particularly important for resolving disputes after the concession. In addition, functions such as tariff setting, regulation of service quality, assessment of concessionaire claims, collection and dissemination of sector information could be performed by an independent body with expert staff tasked with making technical decisions. They should also ideally have incentives to serve long terms that allow the creation of a deep base of expertise and experience and should be shielded from direct political influence while simultaneously building a culture of professionalism.

The primary regulatory priority for Indian ports is to unify national and state regulatory structures. The existing regulatory framework, comprising many regulators and multiple legislations is complex and needs simplification to enhance integration and improved coordination. India needs legislation which is inter alia compatible with the functioning of a market ori-

ented economy and the global character of the maritime transport. A new set of incentives needs to be put in place as part of regulatory restructuring. The existing Ministry-centric port management system is a complex bureaucratic process and distorts incentives.

The jurisdiction of TAMP extends to Major Ports only. Over time, with more competition between ports and within ports (intra-port), the role of TAMP will necessarily undergo a change. Tariff regulation by exception rather than by rule should be the operating principle and its role transformed to limiting abuses of competition and applicable to all commercial ports in the country. This might create overlapping jurisdiction between the new TAMP and the economy-wide competition regulator i.e. the CCI, but this is not unusual for sectors that have a specific regulator. At the state level, a regulatory agency should also be set up to exercise oversight on Non-Major Ports in that state.

For civil aviation, a central regulatory agency called Civil Aviation Authority (CAA) should be created replacing the existing DGCA and AERA. Similar to other infrastructure sectors, multiple regulations and overlapping jurisdictions between institutions cause confusion and delays. CAA will consolidate the existing fragmented regulatory functions and combine economic, technical, safety, environment and consumer protection regulation. A dispute settlement body separate from the CAA will serve to fast-track disputes in the sector. The relationship between the sector specific dispute settlement authority and the CCI will evolve over time and should be guided by the same principles that underpin this institutional relationship in other sectors.

Among all transport infrastructures in India, urban transport is easily the most complex. The governance structure for UT is fragmented and the division of responsibility among the various agencies is unclear.

The key is to create a strong local coordination authority backed by different levels of government. The city should carry the primary responsibility for UT and the role of the centre and state should gradually get reduced. Decentralisation should be engendered by legislation and a dedicated Metropolitan Urban Transport Authority (MUTA) should be set up in each city with population in excess of 1 million and dedicated cells in smaller cities for integrated planning and coordination and delivery of urban transport services.

Many governments implementing economic reform in recent years, including India, have increased the role of the private sector in provision of transport infrastructure and services recognising that under normal circumstances, the role of the state should be one of broad policy formulation and regulatory oversight. Ownership and operation by the public sector

should be in extreme cases of market failure such as for infrastructure that is financially unviable and has high social value. At the same time, a robust regulatory governance structure is needed to ensure gains from the transition to this new model. Attributes of a good governance structure include *sufficient political and financial autonomy for the institutions charged with regulating the sector; structures for decision making that constrain regulatory discretion; adequate access to regulatory means, including legal provisions for effective enforcement of decisions; and efficient rules of accountability and review.*

Given the socio-economic-political context, robust institutions for regulatory governance in transport will no doubt take time, first to create and then for these to mature and gain legitimacy in India. Merely delegating regulatory powers, including enforcement, may not be enough to minimise regulatory risk. But good decisions are more likely if regulatory design is sound. Badly designed regulatory and legal institutions can become a source of performance problems. The guiding principles of good regulatory institutions include independence, transparency, accountability, expertise, credibility and legitimacy. Although independent regulation in India is relatively new, there is a wealth of evidence from the telecom and power sectors that can help design and implement a performance enhancing regulatory mechanism for transport that emphasises local needs and the local context.

WE RECOMMEND...

Existing sector-specific enactments need to be unified into a single statute in each sector.

Unification of the legislations must be supplemented by the setting up of a statutory regulatory agency for each transport sector.

A Railways Tariff Regulatory Authority to provide a level playing field to all stakeholders must be created.

An expert authority should be set up to regulate and monitor PPP projects.

Unifying national and state regulatory structures for Indian ports should be a primary regulatory priority.

For civil aviation, a central regulatory agency called Civil Aviation Authority (CAA) should be created replacing the existing DGCA and AERA.

A dedicated Metropolitan Urban Transport Authority (MUTA) should be set up in each city with population in excess of 1 million and dedicated cells in smaller cities for integrated planning and coordination and delivery of urban transport services.

7. ENERGY AND ENVIRONMENT

Vehicle ownership has soared in India over the last two decades. In 1991, according to the Ministry of Road Transport and Highways (MoRTH), the number of vehicles registered in the country was just over 21 million. By 2011, the number had increased to 142 million.

The high growth rate of new vehicle registrations is expected to continue, at least through the remainder of this decade.

India has come a long way over the last two decades in reducing vehicle emission. Still, associated poor air quality and public health problems drive the need for further emission control. Many Indian cities have been ranked among the most polluted in the world. Vehicles are responsible for the majority of urban NO_x emission and 30-50 per cent of PM emission, in addition to significant HC and CO emission. The problem is exacerbated by the preference for diesel cars in India due to diesel subsidies. Currently, new diesel cars are allowed to emit much more NO_x and PM than gasoline cars

The continued growth of the transport sector may be vital for further economic development, but it has exacerbated India's critical air pollution problem: vehicular emissions. Hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NO_x), particulate matter (PM), and carbon dioxide (CO₂) are a critical issue that has to be tackled on a war footing.

In 2008, the CPCB identified around 70 cities, representing over 80 per cent of cities that were being monitored, that were not complying with the NO_x and PM standards. This was before more stringent air quality standards were brought into effect in 2009. An analysis by the Clean Air Initiative (CAI) Asia of PM concentrations in 130 cities in India also indicated that most of the cities exceeded the national standard. Many of these cities have air pollution levels far above the legal limit, have continuously been in non-compliance for many years, and have no tangible plans to drastically improve air quality in the near future. Increasing vehicular emissions leading to poor air quality have 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. A study supported by the WHO estimated about 154,000 people died in India in 2005 as a result of ambient fine particulate matter (PM_{2.5}) alone. This number has most likely increased since.

The transport sector accounts for nearly 18 per cent of the total energy consumed in India, second only to the industrial sector. Nearly 98 per cent of the energy

needs of transportation are met through petroleum products, and almost half of the total consumption of petroleum products in India occurs on account of transport activities. This demand for energy is expected to grow if no action is taken.

Of the 142 MT CO₂e emissions released by the transport sector in 2007, 87 per cent were on account of road-based vehicular activities. If no action is taken, overall transport CO₂e emissions can come close to 1000 MT by 2030, a fourfold increase from 260 MT in 2010.

CURRENT STATUS

India lags behind international best practices in terms of fuel quality and vehicle emission standards. Sulphur levels in fuel remain high, well above the maximum of 10 ppm required for the best clean vehicle technologies to function optimally. Nor does India have any plans of implementing 10 ppm sulphur fuels nationwide any time soon. As a result, vehicle emission standards are not where they can be. Most of India is at Bharat III, with a handful of cities ahead at Bharat IV.

In contrast, the US, Europe, South Korea, and Japan have had 10 ppm sulphur fuels for many years now. Europe is in the process of moving to Euro 6/VI. Countries at similar economic levels as India, such as China, Mexico, and Brazil, are also planning to move ahead on fuel quality and vehicle emission standards shortly.

There is much room for improvement for compliance and enforcement issues in India. Standards are meaningful only if complied with. The US, in particular, has been at the forefront of compliance efforts for over 40 years. By shifting the focus of vehicle emission compliance from new vehicles to in-use testing, over time the onus has been placed on vehicle manufacturers to ensure their products function as designed throughout their useful life. And testing fuel quality at multiple points along the distribution system has incentivised oil companies and fuel handlers to ensure fuel quality is met at all times. Clear, strict recall policies and punitive measures for non-compliant vehicles and fuels compel industry to test its own products. So

the US EPA save money as it does not have to allocate resources to test many vehicles or all batches of fuel.

India can learn from the vast experience of the US and other countries to enhance its own regulatory programmes. Vehicle emission testing is currently limited to new vehicles, meaning there is little data to analyse the effectiveness of emission control technologies throughout their useful life. Weak test cycles mean that while vehicles pass initial emission testing, they may emit much more in real-world situations. While the laws provide for government testing of fuel quality, there is little evidence this is actually done.

Energy use by the transport sector is increasing dramatically, led primarily by private vehicle use. Studies predict that energy use by the transport sector will increase two to fourfold over the next 20 years. Unless strong action is taken, the consequences will be dire for India's energy security, economy, air quality, and global warming.

Enhanced public transport and NMT (Non Motorised Transport) systems that disincentivise private vehicle use are one step towards combating these problems. These are discussed in more detail in the chapter on urban transport. Establishing vehicle fuel efficiency standards also help mitigate these problems.

India has already developed progressively stricter LDV fuel consumption standards for the remainder of this decade, but they have not yet been notified. They are also significantly weaker than European standards, despite the fact that Indian and European LDV fleets are currently at similar fuel consumption levels. Processes to develop HDV and two- and three-wheeler fuel consumption standards have not even begun while many other countries are starting to implement these standards already.

It is important to treat vehicle emission and fuel use as a system. Improvements in one often lead to improvements in the other. For example, many technologies that improve vehicle fuel efficiency not only lead to lower GHG emission and fuel consumption, which mitigate global warming and reduce India's dependence on imported fuels, but also reduce air pollutant emission, which improves air quality and public health. Therefore, this chapter looks at all these issues holistically.

With the formation of a new Auto Fuel Policy Committee in January 2013, there is a lot of potential for India to make a headway on all of the points mentioned above. The committee has the authority to recommend reforms through the year 2025. The recommendations below are a starting point for that committee to reduce long-term vehicle emission and fuel consumption in India.

Energy use by the transport sector is increasing dramatically, led primarily by private vehicle use. Studies predict that energy use by the transport sector will increase two to fourfold over the next 20 years

THE ROAD AHEAD

50 ppm sulphur fuels should be mandated nationwide by the middle of this decade, and 10 ppm sulphur fuels should be mandated nationwide by 2020. Reforms in diesel pricing being implemented currently should be used to pay for refinery investments needed to produce these cleaner fuels.

Bharat IV fuel quality standard should be implemented nationwide by the middle of this decade, with a target to reach Bharat VI by 2020.

By mid-decade, India should mandate Stage I controls when retail outlets are supplied with fuel, and Stage II controls for vehicle refuelling. India should also mandate all new vehicles to have on-board refuelling vapour recovery (ORVR) systems at the same time. These systems return vapours to a vehicle's fuel tank rather than to retail outlets. Stage II controls can be lifted about ten years after the implementation of ORVR systems because the majority of India's vehicle fleet will then have ORVR systems in place.

Replacing current test cycles with world-harmonised test cycles will make it less likely that certain vehicles 'beat' emission testing by passing the test cycle while emitting much more under real-world conditions. India should make world-harmonised test cycles optional when Bharat IV regulations go into force nationwide and mandatory when Bharat V regulations come into force.

In 2003, the Mashelkar Auto Fuel Policy committee had recommended a review of the auto fuel policy every five years. Yet a new Auto Fuel Policy Committee was not formed until 2013, ten years later, despite the fact that the Mashelkar Committee's mandate was through the year 2010. It should be made compulsory that a new Auto Fuel Policy Committee be formed five years after the previous one completes its work. Provisions should be made for this in the MoPNG's five-year plans.

In 2003, the Mashelkar Auto Fuel Policy Committee had recommended the formation of a National Automobile Pollution and Fuel Authority (NAPFA) responsible for setting and enforcing vehicle emission and fuel quality standards in India. Currently a number of ministries and agencies are responsible for compliance and enforcement in India. This allows blame to

be passed onto others in case of problems. Parliament should establish a permanent NAPFA and ensure that it is fully-funded.

India needs to establish a robust Inspection and Certification (I&C) regime to ensure safety, road worthiness and emission performance of in-use vehicles. National-level vehicle testing needs to move beyond type approval (TA) and conformity of production (COP) to include in-use testing. All motor vehicle categories should be covered under the I&C regime. There should also be a recall policy to recall models which on testing do not adhere to the emission standards. Modern I&C centres with minimum manual interference need to be established on a PPP basis in a phased manner. In the beginning, transport (commercial) vehicles could be targeted, followed by non-transport (private) vehicles. Cities with higher vehicular pollution should be targeted first. Commercial and older vehicles should be tested more frequently, preferably annually. The central government should lay down the policy and regulatory framework for tests, equipment and manpower requirements based on the advice of an independent agency like a National Accreditation Board (NAB) that could also monitor implementation of I&C by state governments.

Until NAPFA is set up, the MoRTH should establish clear punitive measures and recall processes for non-compliant vehicles and the MoPNG should establish clear punitive measures for non-compliant fuels.

There is little, if any, evidence that governmental or independent fuel quality testing is done anywhere along the fuel distribution system in India. Given the history of fuel adulteration, it is especially important to test fuel at retail outlets, where consumers ultimately purchase fuels. Until NAPFA is set up, the MoPNG should develop a national plan to test fuel at retail outlets, along the lines of what is done by the US EPA or Japan's METI and NPA.

A label to clearly display a vehicle's fuel efficiency has been developed but not made mandatory. India should mandate this label for all new model year 2014 and later vehicles so consumers can make informed purchase decisions.

India has already developed LDV fuel consumption standards for the remainder of this decade, but their implementation has been delayed inexplicably. These standards should be notified immediately and assessment for standards beyond 2020 should be started. The country should target LDV fleet average GHG emission to be 95 gCO₂e/km by 2025, Europe's target for 2020.

A lot can be done to improve the fuel efficiency of HDVs and two- and three-wheelers. This is especially important in India, where motorcycles dominate new vehicle sales and will continue to do so

in the future. India should aim to have HDV standards in place by 2015 and two- and three-wheeler standards by 2016. The target should be to reduce fuel consumption by 20 per cent of current levels by 2020 for both categories.

Adequate and quality public transport systems should be assured in all cities with populations above 500,000 and safe NMT options should be available everywhere. Other measures, such as integrated land use planning, enhanced traffic management systems, and integrated transport modes, also help reduce the energy intensity of urban transport systems. The chapter on urban transport details these issues and makes recommendations.

It is recommended that the capacity to conduct LCA should be built in key central agencies like the Planning Commission, state governments and all metros. State governments can conduct LCA for the other cities. These agencies should carry out LCA analysis to facilitate decisions related to inter-modal choices and intra-modal improvements which reduce environmental costs of transport projects.

WE RECOMMEND...

50 ppm sulphur fuels should be mandated nationwide by the middle of this decade, and 10 ppm sulphur fuels should be mandated nationwide by 2020.

Bharat IV fuel quality standard should be implemented nationwide by the middle of this decade, with a target to reach Bharat VI by 2020.

India should make world-harmonised test cycles optional when Bharat IV regulations go into force nationwide and mandatory when Bharat V regulations come into force.

A new Auto Fuel Policy Committee should be formed five years after each previous one completes its work.

A National Automobile Pollution and Fuel Authority responsible for setting and enforcing vehicle emission and fuel quality standards should be set up

India needs to establish a robust Inspection and Certification (I&C) regime to ensure safety, road worthiness and emission performance of in-use vehicles.

Life cycle analysis should be used to facilitate decisions related to inter-modal choices and intra-modal improvements which reduce environmental costs of transport projects.

8. TRANSPORTATION OF ENERGY COMMODITIES

The surge in economic growth, witnessed in recent years in India, has strained the capacity of its transport system as well as the energy supply, particularly electric power.

The government's ambitious development targets and plans, as well as popular discourse, attest to the importance of addressing such infrastructure constraints in a decisive manner over the next two decades, to sustain high levels of economic growth which is also inclusive.

Movement of bulk commodities is a major role of India's transportation system. Coal accounts for almost half the freight volume on Indian Railways, a major supplier of transport services to the electric power and steel industries. Indeed, the congestion caused by inadequate expansion in transport capacity to date, especially on crucial links and corridors, underlies issues such as security of supply chains, inventory of raw materials, port-handling, which affect industry.

The future poses profound challenges. Even if the ambitious aim to improve energy intensity is achieved, sustaining economic growth at 8-10 per cent per annum over the next two decades will require massive increases in power generation and transportation of bulk commodities such as coal, iron and steel.

Development plans from the key ministries of the government as well as initiatives and investment proposals from the private sector seek to address the above issues. The needs are vast and multifaceted while resources are limited. More importantly, the issues are intimately interrelated and the viability of solutions is interdependent, both in terms of the nature of the investment (e.g. transport coal or transmit power) as well as the timing and duration of execution. Hence a piecemeal approach to planning could be severely suboptimal, leading to colossal wastage of resources and time.

FUTURE OUTLOOK

Almost all economic activity requires electricity and steel is an important input for many industries. In order to sustain a GDP growth rate of 8-10 per cent over the next two decades, it is estimated

the production of electrical energy will need to increase 3.5 times from 1,105 BU now to 3,860 BU by 2031-32. As coal is expected to remain the dominant fuel for the power sector, the requirement for coal is expected to grow correspondingly. Domestic coal is expected to grow by about 2.5 times; from about 440 Mt in 2011-12 to 1,110 Mt in 2031-32. Its use in the power industry will be limited by the amount produced and imports will bridge the deficit and grow much faster; by almost five times; from 73 Mt in 2011-12 to 355 Mt by 2031-32.

The intensity of steel use in the economy is expected to increase. So requirements for steel will grow faster than the growth of the economy from 73 Mt in 2011-12 to 495 Mt in 2031-32; almost an eightfold increase. Keeping in mind that a tonne of finished steel requires three to four tonnes of raw material, the transport requirements for the steel industry will be huge; growing from 600 Mt in 2011-12 to about 2230 Mt in 2031-32.

The transport requirements for the power and steel industry are expected to grow from about 900 Mt now to 3,700 Mt in 2031-32. While POL and natural gas will also grow, most of the transport for these commodities will be carried out through pipelines. Some POL will be transported by rail but the volumes will be very small and are not expected to impact the rail network much. However, it will have a huge impact on cargo traffic at ports. It already has the largest share (38 per cent) of port traffic, that will increase by over 2.5 times from about 330 Mt in 2011-12 to 865 Mt in 2031-32.

These very large increases in the transport requirements for bulk commodities will be a great challenge because our transport systems are barely able to cope with the traffic today. The trunk railway network is heavily congested. Generally, a rail route is considered congested when the capacity utilisation increases beyond 80 per cent. Almost all the major rail routes⁸ over which coal and iron ore will be transported are operating above 100 per cent capacity. Build-up of coal stocks at pit-heads is an early warning of the lack of capacity.

Similarly, the capacity utilisation for ports averages 85 per cent with at least four operating at 100 per cent or more. International norms recommend a capacity utilisation below 70 per cent to avoid delays.

Unless well-planned steps to rapidly improve the bulk transport system are successfully implemented, the transport system will become a stranglehold on the economy, starving it of energy materials and other key commodities essential for economic growth.

RAIL NETWORK

Coal and iron ore are brought mostly by road from mines to the rail sidings. Feeder routes then carry the coal or iron ore from the rail sidings to the trunk routes. The trunk routes carry the minerals long distances, usually between distant states. Close to the destination, feeder routes move the materials from the trunk route to the rail siding at the power or steel plant.

Not all shipments of coal or iron ore traverse all these segments. For example, thermal coal destined for a power plant within the coal-producing state is likely to be moved over a single feeder route between the mine and the power plant. The transport requirements can be quite different depending on the types of rail segments traversed. Coal transported to plants within the coal-producing region will rely mostly on MGR, conveyor belts/ropes and short rail routes. Such routes may use only a short part of a DFC. On the other hand, transport to distant states is likely to make extensive use of routes covered by DFCs.

As the economy grows, domestic coal will be used 'closer to home' and therefore, the importance of shorter rail routes will increase. The rate of growth of the economy will affect the relative importance of short rail routes versus DFCs, highlighting the importance of adaptability of plans for bulk transport.

CRITICAL FEEDER ROUTES AT MINES

Most of the increase in coal production is expected to come from three regions: (1) Talcher and Ib Valley coalfields in Odisha with a potential increase of 110 Mtpa by 2031-32; (2) North Karanpura coalfields in Jharkhand with an increase of 75 Mtpa; and (3) Mand-Raigad coalfields in Chhattisgarh with an increase of 90 Mtpa. Feeder routes that will carry coal from the mine to the trunk routes are critical to bring the coal to power and steel plants. But eight critical feeder routes in these regions are awaiting completion. Shortages of coal, which are already slowing down the economy, will become even more acute in the future if these feeder routes are not completed. Similarly, critical feeder routes for moving iron ore must be completed to ensure steel production keeps up with the economy's requirements.

The total cost of these routes will be about Rs 35 billion for coal and Rs 117 billion for steel; just 2.4 per cent of the Railways budget for the 12th Five Year Plan, but with large benefits for the economy. These critical routes must be completed on the highest priority within the 12th Five Year Plan.

IMPORTANCE OF SHORT DISTANCE TRANSPORT OF COAL

As the economy grows, domestic coal will be used closer to home. Consumption of coal within coal-producing states is expected to increase from 44 per cent currently to 60 per cent by 2031-32. If we include transport of coal to neighbouring states, we find that about 70 per cent of domestic coal in 2031-32 will be used within coal-producing regions. As a result, a very large portion of domestic coal will make limited use of DFCs over short sections. Similarly, more than 80 per cent of the imported coal will be used by importing coastal states. **The share of short-rail routes, road, MGR and conveyor belts or ropes will thus grow and these modes should get attention to ensure that the power sector does not suffer from an insufficient supply of coal.**

FEEDER ROUTES TO POWER PLANTS WITHIN COAL PRODUCING STATES

As in-state consumption of coal for power is likely to increase, much of this new capacity will come up in clusters of about 3,000-4,000 MW each. Such power plants need to be located near coal mines and also near sources of water. It is difficult to predict where these clusters will be located but feeder routes from the mines will be needed.

We estimate that such links will be about 70-100 km long and will be required to carry about 20 Mtpa each. Therefore, roughly one such feeder route to a cluster of power plants will be required every other 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. As 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. Decisions for the corresponding transport investment should be taken simultaneously.

PRIVATE PARTICIPATION IN RAIL CONNECTIVITY PROJECTS

The urgent need for such feeder routes highlights the growing need for rail connectivity to previously unconnected areas. Indian Railways (IR) faces resource constraints to fulfill these demands. Therefore, it has launched a new policy to attract private participation in rail connectivity and capacity augmentation. The five models in the policy cover most of the circumstances under which private invest-

ment could accelerate the development of rail infrastructure. IR will remain a key player even with private participation and will be responsible for many functions: certification of lines; supervision of the maintenance of lines; operation of the rail network with IR rolling stock; and collection of freight charges. Therefore, success of the new PPP policy will depend on how well IR is able to execute these functions. Large integrated producers of steel or large mining companies are likely to enter into these PPP arrangements but smaller parties may find it difficult to do so. Institutional mechanisms will need to be developed to facilitate coordination among SMEs and large firms in the same area to pool their resources to create common infrastructure.

NEED TO FOCUS ON THE TRI-STATE REGION OF ODISHA, JHARKHAND AND CHHATTISGARH

Most of the critical feeder routes for coal and iron ore lie in Odisha, Jharkhand and Chhattisgarh. This is no coincidence because steel plants and mineral resources, particularly coal and iron ore, are concentrated in these states. These states produce more than half of the total domestic coal and are expected to produce about two-thirds by 2031-32. Together, they will also have more than half the country's steel capacity. Clearly this tri-state region will be critical for meeting the demand for domestic coal and steel for the next two decades. Ensuring adequate transportation infrastructure in this region, which also services adjoining states, is essential for the country's growth.

CONSTRUCTION OF DFCs

Even though domestic coal will be used closer to home, transport to distant states will also increase. Some DFCs may be more important than others for this long-distance transport. 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. Excluding the Southern DFC which is not expected to carry much coal, the other DFCs have a much smaller and about equal share of the long-distance coal traffic. 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, East-West, North-South and East Coast DFCs should be completed by the end of the 13th Plan, and the Southern DFC can be completed by the end of the 15th Plan. For the DFCs that have one termination point in the eastern resource-rich part of the country, construction must start from there because bulk traffic is the highest in those areas. This will also facilitate transport within coal-producing states using short sections of DFCs.

ADAPTIVE PLANNING AND COORDINATION BETWEEN MINISTRIES

A counter-intuitive result from the model of the power sector is that under the low-growth scenario,

The tri-state region of Odisha, Jharkhand and Chhattisgarh will be critical for meeting the demand for domestic coal and steel for the next two decades. Ensuring adequate transportation infrastructure in this region is essential for the country's economic growth

the movement of domestic coal is larger, putting even more pressure on the rail freight system. This is because as growth slows, domestic coal will not be required to the same extent closer to the producing area and will be available to be sent to areas further away, thus reducing imports of coal. This will increase the burden on the rail transport system, unfortunately, right when public resources are likely to be more constrained. The results from the modeling exercise also show that there can be great variation in both the amount of coal to be transported and the pattern of the movement, triggered by changes in the rate at which the economy is growing, greater use of renewables, increased availability of gas or higher energy efficiency.

Given this uncertainty, it is important that planning for bulk transport of energy commodities be adaptive. A strategic bulk transport planning group, that monitors developments and potential developments in coal and other fuel markets, renewable energy technologies and domestic fuel supply, should be established. In response to changing conditions, it should periodically (say every five years) direct changes in the plans for transport of fuels so that adequate fuel supplies are available to power plants without delay and at low cost. The group should include all major stakeholders and representatives from power, railways, and natural gas sectors.

Chapter 5, Volume II on Institutions for Transport System Governance proposes an Office of Transport Strategy (OTS) that would integrate transport planning across modes and coordinate between the ministries and other levels of government. The strategic bulk transport planning group could be established under the OTS. The OTS could extend coordination to non-transport ministries such as power, petroleum and natural gas, and steel on issues related to transport of bulk commodities.

MODERNISATION OF EQUIPMENT

Freight transport in India is far less efficient than rail in other countries. There is a great need for upgrading and modernising equipment, rolling stock and rail lines. As the Railways recognises, trains must be heavier, longer and faster in order to maximise the use of existing infrastructure. Heavy-haul technology should be used wherever possible and new lines should be designed for it. This increases the capacity of trains about fourfold so that a train per day would

An analysis of the expected port traffic from POL and coal over the next two decades reveals that Gujarat is by far the state that has the most port traffic for the commodities, and would clearly be a prime location for a Mega Port. On the east coast, Odisha, Andhra and Tamil Nadu are potential candidates for Mega Ports. On the west coast, in addition to Gujarat, one or two more Mega Ports will be required.

result in transport of four Mtpa from about one Mtpa using current technology.

IMPROVEMENTS IN FIRST-MILE CONNECTIVITY BETWEEN MINE AND RAIL SIDING

Coal and iron ore are generally transported from coal mines to the nearest rail siding by road. Often, the evacuation of material is hampered by inadequate road capacity from the mine head to the railway siding. Creation of road infrastructure takes time. Therefore, advance planning is essential to develop the required roads but such planning is rarely done.

Conversion of existing fair-weather roads in high-growth coal fields, particularly where captive coal blocks are expected to become operative, into all-weather express coal corridors should be seriously considered. Coal mining companies should also consider developing a hub-based system for transporting coal from existing mines, wherever feasible.

Coal from the mines in the traditional coal fields has to be moved through heavily-populated villages and is vulnerable to blockage and other disturbances due to socio-political events. Hence, wherever possible, long-distance conveyor belt systems should be used for movement. This will also reduce the environmental impact of road transport.

BULK TRANSPORT-RELATED INVESTMENT REQUIRED IN THE RAIL NETWORK

Suggested plan-wise investments have been prioritised on level of impact of the investment; and urgency of the route development. **A total investment of about Rs 8,700 billion over the 20-year period will be required.** The investment is relatively higher in the 12th and 13th Plan when most of the major investments will be made.

PORTS AND SHIPPING

As discussed earlier, by 2031-32, Indian ports will have to handle five times more thermal coal than today, 7.5 times more coking coal, and about 3.5 times more POL. Indian ports are barely able to handle

current levels of imports so these large increases in the future will be a big challenge.

NEED FOR A VISION FOR THE PORTS SECTOR

Efforts are being made to improve the performance of ports; however, they are focused on improving the performance of individual ports while improvements are needed on a systemwide basis. A vision needs to be developed for the ports sector and a national strategy based on it. One issue is the establishment of mega ports. Most of the world's major economies have a few. India has none. Mega ports can accommodate larger ships resulting in a reduction of up to 40 per cent of transport costs. In addition, mega ports provide very significant economies of scale for advanced handling equipment which can dramatically reduce turnaround times for vessels. A vision for the ports sector should consider issues such as: How many mega ports should there be in the country and where should they be located? What will be the roles of mega ports, Major Ports and Non-Major Ports in such a framework? What role should coastal shipping play in the framework?

SELECTION OF SITES FOR MEGA PORTS

An analysis of the expected port traffic from POL and coal over the next two decades reveals that Gujarat is by far the state that has the most port traffic for all three commodities, and would clearly be a prime location for a mega port. On the East coast, Odisha, Andhra and Tamil Nadu have a large amount of traffic and are potential candidates for mega ports. On the west coast, in addition to Gujarat, one or two more mega ports will be required. Maharashtra has the largest amount of port traffic on the west coast after Gujarat, and it may be appropriate to have a port on the southern end of the Maharashtra coast that could also be used to serve Goa and Karnataka. Some of the existing ports that have a deep draft and could be developed to become mega ports are: Mundra (Gujarat); Gangavaram (AP); Dhamra (Odisha); and Ennore (TN).

However, selection of sites for locating mega ports will require extensive modeling and analysis. First, all types of port traffic including containers and 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 modeling is required to examine the costs and benefits of the potential sites.

PROMOTION OF COASTAL SHIPPING

Coastal shipping is an important mode of transport for bulk commodities that uses only about one-sixth the fuel per tonne-km as that used by road transport and about half of that used by rail. Hence, it is less expensive and has a lower environmental impact. However, coastal shipping carries about only about 7 per cent of the freight traffic, well below its potential given India's long coastline. The cost advantage of coastal shipping is not realised because of high handling charges and poor first and last mile connec-

tivity. Handling charges can be reduced by creating dedicated ports or terminals for coastal shipping. Terminals dedicated to service coastal ships should be set up at the Major Ports. In addition, five or six Non-Major Ports on the east and west coasts should be selected to be ports for coastal shipping and developed and equipped for that purpose. Adequate road and rail connectivity to these coastal shipping terminals and ports should be provided.

INVESTMENTS IN THE PORT SECTOR

Investment of about Rs 1,485 billion will be required over the 20-year period.

WE RECOMMEND...

Ensure adequate transportation infrastructure in the tri-state region of Odisha, Jharkhand and Chhattisgarh on priority basis.

Build (or complete) feeder routes to carry coal from the mines to the trunk routes on an urgent basis, especially in the tri-state region.

Focus on short-rail routes, merry-go-rounds, and conveyor belts or ropes that can carry coal to its destination over short distances.

Future power plants will be located near coal mines. Feeder routes with heavy-haul technology from mines to plants should be part of the power plant planning process.

Encourage private participation in rail connectivity and capacity augmentation.

The Eastern Dedicated Freight Corridor (DFC) must be given the highest priority among the DFCs, since it will be critical for carrying coal over long distances, and should be completed within the 12th Five Year Plan.

A strategic bulk transport planning group, that monitors developments and potential developments in coal and other fuel markets, renewable energy technologies and domestic fuel supply, should be established.

Build four to six Mega Ports at sites chosen after analysis of expected port traffic from POL and coal over the next two decades.

Encourage coastal shipping for bulk transport. Terminals dedicated to service coastal ships should be set up at the major and non-major ports.

9. FISCAL ISSUES

The objective of this chapter is to look into the current system of transport taxes and user charges as a part of transport pricing strategy in India. Transport pricing is a method of resource allocation through a collection of tools that affect the final price of transport services and thus influences the behaviour of users and transport service providers. It is commonly assumed that there is no such thing as the 'right' price; there are only optimal pricing strategies aimed at achieving specific objectives.

The country's current transport pricing system is an accumulation of multiple taxes and user charges implemented at different points of time at varying levels of governance. In addition, fuel tax is an integral part of transport pricing. The taxation structure is quite different across modes and states. This is partly due to the existing constitutional provisions. The central government levies indirect taxes in the forms of union excise, import duty and service tax whereas the state governments levy sales tax/VAT, MVT, and P>. Taxes are imposed on inputs as well as outputs of transport services, thus affecting the cost and price structure in these sectors. The tax differentiation in this sector is determined by a number of parameters that vary across states, uses and types. Apart from taxes, governments also raise revenues through user charges. The toll charges are used mainly for the development and maintenance of road infrastructure. Similarly, route navigation facility charges; landing, parking and housing charges; terminal navigation landing charges; etc. are some of the user charges in the aviation sector. Ports also collect several user charges for port services.

Our documentation of taxes and user charges in various sectors of transport indicates that the prevailing regime is extremely complex. There are wide variations in tax regimes across states. The road transport sector has suffered on account of entry barriers

through taxes imposed on interstate movement. Cities located across the state borders should share a common taxation mechanism so that unnecessary wastage of time and harassment at borders are avoided. Intra-modal tax structures are also complex within each state. Taxes on various categories of fuel vary within and

across states. The issue of incorporating externalities including congestion and pollution (social costs) in marginal cost pricing does not seem to have been addressed adequately while formulating the tax rates. Whereas revenue objective of pricing policy has been achieved partially, ad-hoc and complex nature of some of the taxes, especially at the state level, has resulted in less-than-efficient delivery of transport services which would, in turn, affect the efficiency of other sectors.

Inefficiencies in transport sectors get transmitted to other sectors of the economy as some of the sectors are relatively heavy users of transport services and have strong linkages with rest of the economy.

THE ROAD AHEAD

One key area of economic reform in India has been the simplification and rationalisation of taxes, both direct and indirect, at both the central and state levels.

It is therefore imperative that just as the state sales tax structure has been greatly simplified to a state VAT system, the road transport tax structure needs detailed review. Action needs to be taken to undertake a similar exercise across states to arrive at a simple and rational road transport tax structure that promotes economic efficiency and environmental sustainability. It is therefore recommended that the Ministry of Finance may convene an Empowered Committee of State Finance Ministers to undertake this exercise on collaboration with the Road Transport Ministry.

The mandate of the Empowered Committee would be to chart out a model act on road transport taxes and user charges. This would then be circulated among states and union territories for their consideration for adoption. Replacing various taxes (MVT, P>, etc.) by a single composite tax (some states have already implemented it) for all states is recom-

An exercise needs to be undertaken across states to arrive at a simple and rational road transport tax structure that promotes economic efficiency and environmental sustainability

mended by different stake holders. A relatively uniform and transparent tax regime would facilitate the move towards a common Indian market. Uniformity of taxes among the states will give a boost to the interstate vehicle movement. The road tax system needs comprehensive reform rather than piecemeal and ad-hoc reforms at state level.

There is a need to integrate tax administration related to interstate movement of freight and passengers through information and communication technology (ICT) at national, state and regional level. This will greatly reduce transaction and logistic cost due to borderless and paperless movement. A competent authority may look into the possibility of implementing 'green channel' (Gujarat has already implemented) if proper paperwork has already been done in advance for specific consignments. A 'single window' clearance system for all types of taxes and charges at state border will greatly reduce transaction cost.

Transport infrastructure requires heavy capital investment and charges should be levied on users. User charges should be effectively collected for use of railway infrastructure as well. We recommend that Indian Railways should develop a system of accounting of depreciation and internalisation of all costs into its pricing system through user charges. Once the depreciation costs are accounted for, cross-subsidisation or direct subsidisation may still exist in its current form. It is important to emphasise that public transport pricing is widely used as an instrument of poverty alleviation. The fares are regulated in developing countries in order to provide affordable mode of transport to the poor. We do not recommend completely doing away with cross-subsidisation. Moreover, considering the resource constraints such as energy resources, taxation on transport is required to be designed to encourage public transportation. It is also environmentally desirable to promote the use of public transport. However, developing a system of accounting for infrastructure cost and user charges is important.

We also recommend that the competent authority proposed should undertake a study to identify and quantify the efficiency loss in transport sectors due to several obstacles for free movement of freight across states. Special focus should be given to the complexity of the tax system and lack of harmonisation of regulations across states.

Negative externalities need to be internalised in transport pricing, especially in urban transport. However, it is very difficult to estimate the exact monetary figure for the marginal social cost. We recommend the formation of an expert group to look into this possibility. Once a reasonable figure is found, a composite and uniform tax can replace current ad hoc environmental cesses at state

level. It is up to the expert group to decide the proper base for the environmental tax in transport.

There is a need to integrate tax administration related to interstate movement of freight and passengers through information and communication technology (ICT) at national, state and regional levels

WE RECOMMEND...

Action to be taken to undertake a detailed review of the road transport tax structure at the state level.

Ministry of Finance may convene an Empowered Committee of State Finance Ministers to rationalise and simplify this tax structure to a single composite tax.

Tax administration related to interstate movement must be integrated through information and communication technology at national, state and regional level.

Indian Railways should develop a system of accounting of depreciation and internalisation of all costs into its pricing system through user charges.

An expert group should estimate the monetary figure for the marginal social cost due to negative externalities, so that a composite and uniform tax can replace current ad hoc environmental cesses at state level.

10.

POTENTIAL OF INFORMATION AND COMMUNICATION TECHNOLOGY TO ENHANCE TRANSPORT EFFICIENCY

Indian firms have been world leaders in ICT. Given their immense knowledge, power and capabilities they have deployed to solve other country's transportation woes, it would be to India's benefit to use these valuable resources to solve its own transportation problems

ICT components and technologies that could be used to improve the transportation system fall into three categories: (1) automation technology (sensors and controllers) which can help in location of vehicles and control of gates at access points; (2) communication technology (e.g. 3G) which can help in receiving and transmitting information to and from vehicles; and (3) information technology (hardware and software systems) which can be built on top of the underlying automation and communication systems to manage traffic, move victims during accidents to nearby medical facilities, plan trips, and coordinate transportation systems.

ICT-based systems and services fall into the following four broad categories:

1. Inter and intra-vehicle systems, which as the name suggests, are systems within vehicles which help in improving safety and navigation
2. Traffic management systems
3. Transport co-ordination systems which help in multi-modal transport of passengers and freight
4. Traveller or User Information Systems which provide users with real-time information about public transport or freight transport

CAPACITY BUILDING FOR IT IN TRANSPORTATION

All the initiatives we suggest in this chapter to enhance efficiency, utilisation and safety of transport systems will require a strong institutional foundation for development and implementation.

We recommend that an autonomous central-level institution called the Indian Institute of Information Technology in Transportation (IIITT) be created. IIITT will be similar to RITA (Research and Innovative Technology Administration), which coordinates the US Department of Transportation research programmes and helps in the deployment of state-of-the-art technologies for improving US transportation.

ICT FOR RAILWAYS

INCREASING REVENUE AND DECREASING EXPENSES

Passenger revenue can be increased by raising seat and berth utilisation in existing trains and by increasing the number of trains with the same set of coaching rakes and locomotives. This requires better passenger demand forecasting, timetabling, integrated coaching and rake scheduling, scheduling of terminal facilities, optimisation of coach-crew allocation, locomotive allocation optimisation, and TTE allocation optimisation. IT solutions will make these complex tasks more manageable.

Freight revenue can be increased by loading and carrying more freight with the same set of wagons and goods locomotives and without increasing the freight rates. Advance data analytics can be run to provide a forecast of the pipeline for congested terminals and forecasting goods train arrival at the destination.

A best-in-class inventory management system will lead to cost savings, and an increase in process automation will reduce time taken in tendering related activities and work monitoring activities which will lead to better overall quality of works. Computerisation of this aspect of railway working will greatly increase quality, reduce long-term cost and improve transparency in contract management.

ENTERPRISE-WIDE INTEGRATION AND KNOWLEDGE MANAGEMENT

Different IT solutions developed by different departments or divisions function as islands of information and do not interact with one another because there is no common platform or set of standards for information exchange. We recommend enterprise-wide integration.

INSTITUTION AND CAPACITY BUILDING

Given the very large size of IR as an organisation, bringing about these changes will require strong institutions and a large number of professionals having domain knowledge and expertise in ICT.

We, therefore, recommend the following institutional changes which are both economical and least disruptive:

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

SECURITY

The IT Security Framework must provide the following capabilities:

- (1) Host-based access control for protecting critical servers
- (2) An audit trail of untampered logs of every incident that has happened
- (3) Identity management
- (4) Web access management and single sign-on (SSO)
- (5) Data loss prevention

It is suggested that a Joint Working Group comprising cyber experts, representatives of Indian Computer Emergency Response Team (CIRT-In), National Critical Information Infrastructure Protection Centre (CERT-In) and railway professionals is set up to address the critical issue of cyber security.

ICT FOR ROAD TRANSPORT

There are three areas of the road sector where ICT could play a significant role in mitigating problems:

- (1) Good quality data to support evidence-based policy-making;
- (2) Increase in efficiency of the road transport system and satisfaction of its users; and
- (3) Management of safety and care of the injured.

GOOD QUALITY DATA

ICT will play a pivotal role in filling data gaps. Detailed studies will be required where sensors and controllers will help gather raw data about number of vehicles, passengers, etc; communication technologies will be used to transmit the raw data to computer systems, and hardware and software systems will be used to set up the databases. Software programs and data analysis will facilitate drawing of conclusions.

In order to create an interconnected network of ports and ensure consistency in ICT policies, ICT infrastructure and the business processes being covered, it is required that the Ministry of Shipping lays down the ICT policy and roadmap for India's maritime sector

INCREASING EFFICIENCY AND USER SATISFACTION

In order to ensure uniformity and interoperability throughout the country, the Government has decided to create a National Register and State Registers of Driving Licences (DL) of drivers and Registration Certificates (RC) of motor vehicles. This initiative would help not only in interoperability between states but will also improve enforcement and instant verification of Driving Licences and Registration Certificates.

Considerable time is lost by freight transporters at borders between states, because of long waits for border checks and payments often done manually. ICT can allow permit fees to be e-paid. Presently, Gujarat and Andhra Pradesh have automated ICPs. This has resulted in 100 per cent checking of vehicles and a fourfold increase in revenue collection. The automation can lead to faster delivery time, fewer opportunities for leakage in revenue and stabilised revenue flows.

Operators of the many toll roads have different methods of payment resulting in long queues at toll booths. In order to increase efficiency and productivity of the toll-based system of payment, the method of toll payments should be standardised. The Nandan Nilekani Committee on Unified Electronic Toll Collection proposed an On-Board Unit (OBU) that can be read across all tolls.

Currently different data on manufacturing and transportation of products is being collected by the different taxation departments (Excise, CST and VAT). These data can be brought under a centralised database system through which movement of different commodities can be tracked. The ensuing data collection can help in efficient movement (lower cost and time) of freight.

SAFETY MANAGEMENT AND CARE OF THE INJURED

Indian roads have high levels of accidents and injuries. A new safety post-accident initiative called 'Golden Care' is recommended to reduce fatalities in the event of an accident on National Highways 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, administrators should ensure that whenever an emergency situation occurs on the

highways, victims are rushed to a nearby medical centre within 10 minutes of the accident.

ICT FOR PORTS

A preliminary study of the ICT applications at various ports in India suggests that though the basic automation of terminal operations and other functional areas has been undertaken or is being implemented, it has not yielded the desired results due to lack of integration and a holistic approach towards automation. Different IT solutions function as islands of information and do not interact with one another because there is no common platform or set of standards for information exchange. Therefore, stakeholders still need to have documents verified at multiple points, even though each of these points or offices themselves might have been automated, as there is no communication link or compatibility between the existing systems. This defeats the entire purpose of automation resulting in no savings in time.

INTEGRATED IT POLICY AND PLANNING

Going forward, all Major Ports would need an extensive IT infrastructure to manage their day-to-day operations. In addition to their usual assets such as cranes, machinery etc. they will need to set up data centres, have enough computers, servers, network connectivity, application software and trained manpower to manage all these ICT-related additions. In order to create an interconnected network of ports and ensure consistency in ICT policies, ICT infrastructure and the business processes being covered, it is required that the Ministry of Shipping lays down the ICT policy and roadmap for India's maritime sector.

INTEROPERABILITY AND ELECTRONIC DATA INTERCHANGE (EDI)

Once a uniform policy and roadmap are established for all the ports, attention needs to be focused on making the various systems interoperable both within and between ports. Ports do not work in isolation but are dependent on a community of service providers such as shipping lines, C&F agents, freight forwarders, transport operators, customs, clearing agents etc. It is therefore envisaged that in future, all the stakeholders in maritime trade will be ICT-enabled and would be able to share real-time information and status updates with one another. The shipping line will share the location of its vessel and communicate its expected time of arrival (ETA) to the port, in order to avoid pre-berthing detentions. The ports, in turn, will plan the loading and unloading schedule and evacuation strategy. Pre-submission of cargo details to Customs through EDI will also save processing time. All these initiatives for stakeholder automation can significantly reduce cargo dwell time at ports and help in improving India's trade competitiveness.

It is imperative that we lay down standards and protocols for these information exchanges. All software applications and solutions developed for the maritime industry will need to conform to these standards. Since it will involve international shipping lines and other overseas service providers, it is proposed that the standards comply with international norms.

SMART CARGO

Recent developments in Radio Frequency Identification (RFID) technology seek to make the cargo intelligent. The containers will have smart tags and will be able to identify themselves to the RFID tag reader providing information on content, origin-destination etc. They can also have sensors attached to them which will raise alarms in case of unauthorised seal tampering or other unusual conditions like a rise/fall in temperature beyond threshold limits. We can also track the door-to-door movement of these containers right from the container yard to the delivery point using sophisticated technologies. This will reduce handling time and eliminate risks associated with container security and missing consignments.

OTHER APPLICATIONS

ICT should can be used for better yard planning and terminal management, which will reduce ship turnaround time. Traffic congestion at the port gates can be minimised by automating entry and exit of vehicles and drivers through the gates of a container terminal through smart cards and biometric identification of the driver. A robust Decision Support System (DSS) can be used for analysis and simulation and can greatly facilitate more efficient allocation decisions.

A 'smart' port is characterised by seamless integration of automated equipment, existing terminal processes and terminal operating systems. 'Last mile' automation of port operations using ICT systems can go a long way in increasing even a smart port's throughput. This is especially true in the case of ports handling bulk cargo.

INSTITUTION AND CAPACITY BUILDING

NTDPC recommends the establishment of an Indian Institute of Maritime Research & Planning (IIMRP). In addition to developing and implementing a well-coordinated introduction of ICT in the ports sector, IIMRP could be given a broader mandate to strengthen India's competitiveness in sea trade and commerce, and provide direction to the policymakers for that purpose.

ICT FOR CIVIL AVIATION

We have identified four main areas where ICT can play a role in improving aviation infrastructure:

- Optimisation of airport operations
- Effective management of airspace and airside operations

- Safety and security enhancement
- Efficient air cargo operations

OPTIMISATION OF AIRPORT OPERATIONS

Regulatory approval and procedures should be in place to permit non-physical (i.e. via the internet or via mobile phones) check-in of passengers at all airports. Smart phones have enormous potential to increase both personal and business productivity. At the airport, a mobile 2D bar coded boarding pass (BCBP) allows passengers using online check-in to carry their boarding pass in digital form on their mobile phones and then use it to navigate their way through the airport touch points—bag drop, security, and boarding gate—and on to the aircraft with minimal human intervention. While the technology for realising these services is available, the regulatory framework is missing.

RFID technologies provide the ability to automatically collect real-time data about the physical location and properties of any piece of baggage which has been tagged.

EFFECTIVE MANAGEMENT OF AIRSPACE AND AIRSIDE OPERATIONS

India's ATM (Air Traffic Management) system utilises ground-based navigation system such as use of radars due to which flight paths are fixed and predetermined, leading to wastage of fuel and time. Hence, efforts are in the pipeline to transition to 'flexible use of airspace'. Using advanced technologies such as GAGAN, aircraft routes will be calculated in real time, factoring inputs such as weather and the current traffic situation etc. This will help reduce delays due to airspace congestion as well as cut down on aircraft wait times in landing at airports. .

SAFETY AND SECURITY ENHANCEMENT

Currently, all Indian airports together handle close to 160 million passengers and this number is estimated to triple by 2020. Given this high level of traffic in the presence of elevated security threats, it is critical to install effective and efficient security measures and procedures at Indian airports that can handle the greatly increased traffic without causing congestion and yet ensure the safety of passengers and airports.

EFFICIENT AIR CARGO OPERATIONS

The air freight handling value chain has several stakeholders such as shippers, cargo terminal operators, trucking company, airlines. Each of these entities has its own objectives and operates independently, with most of the information exchange happening manually. This leads to lost time and data inaccuracy, redundancy, increased costs and delayed decision making.

Given the elevated security threats, it is critical to install effective and efficient security measures and procedures at airports that can handle the greatly increased traffic and yet ensure the safety of passengers and airports.

To resolve these issues, we propose a centralised information management system to integrate all these stakeholders so that there is more transparency in the entire value chain, leading to increased operational and economic efficiency. Each of the stakeholders will have a web portal wherein they can view all relevant information about other links in the supply chain.

ICT FOR URBAN TRANSPORT

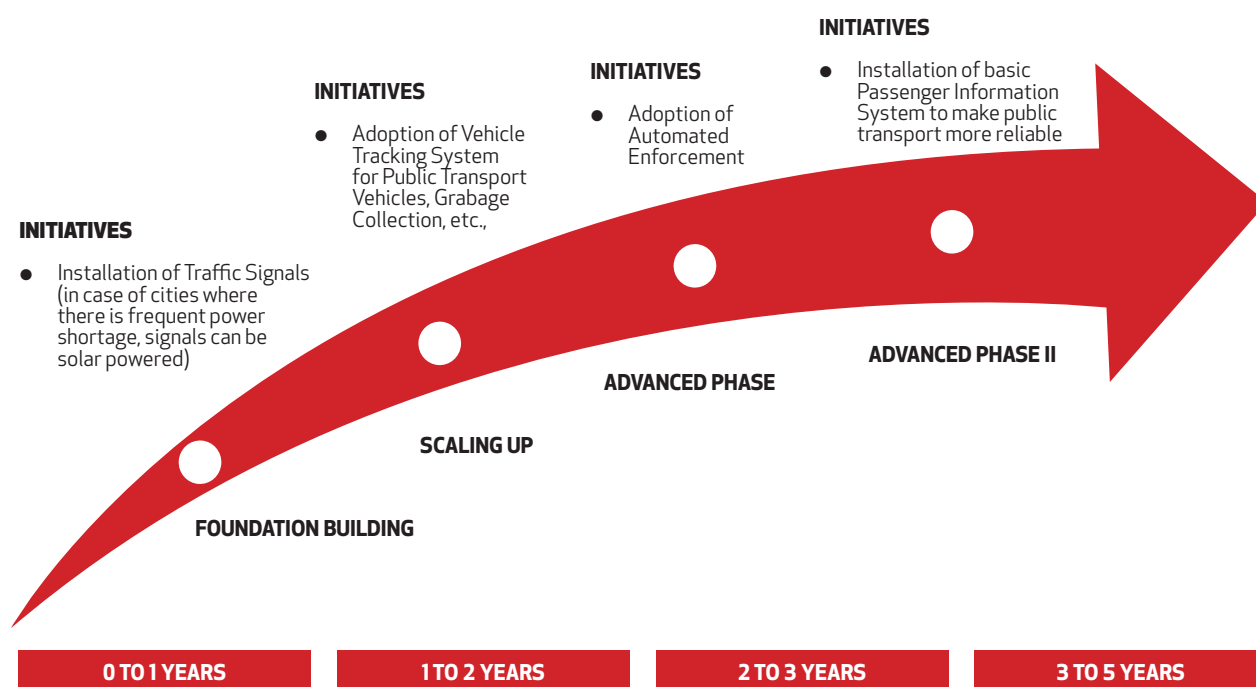
Until recently, not much attention was paid to leveraging technology to meet urban transport challenges. However that is changing, but not uniformly. On the issue of ICT implementation for urban transport, cities in India can be divided into three categories:

1. **Cities using ICT for Urban Transport** such as Bangalore, Delhi and Mumbai, where transport planning and some ICT implementation work has already been undertaken
2. **Cities starting to use ICT for Urban Transport** such as Pune, Ahmedabad and Hyderabad, where some ICT solutions are already working, however more work is required to develop them fully
3. **Cities yet to start to use ICT for Urban Transport** such as Ranchi, Lucknow, Kanpur, Meerut, Mathura, where ICT implementation is at a very nascent stage, or no ICT projects have been implemented. Some of these growing cities are still in the planning stage and have yet to use technology for managing urban transport

Urban transportation in India requires an implementation plan which will address the issues of traffic congestion, pollution, parking, safety by utilising the latest traffic technologies feasible in Indian circumstances. The plan should be flexible to accommodate the growing population and the technology solutions should be scalable in nature. Technological solutions can be implemented in a phased manner taking into account trends in urbanisation, the existing status of technology being used and funding available for urban transport. Category 1 and 2 cities have been introducing ICT in urban transport; however cities in Category 3 have not. Therefore, the roadmap for implementing is different for Category 3 cities.

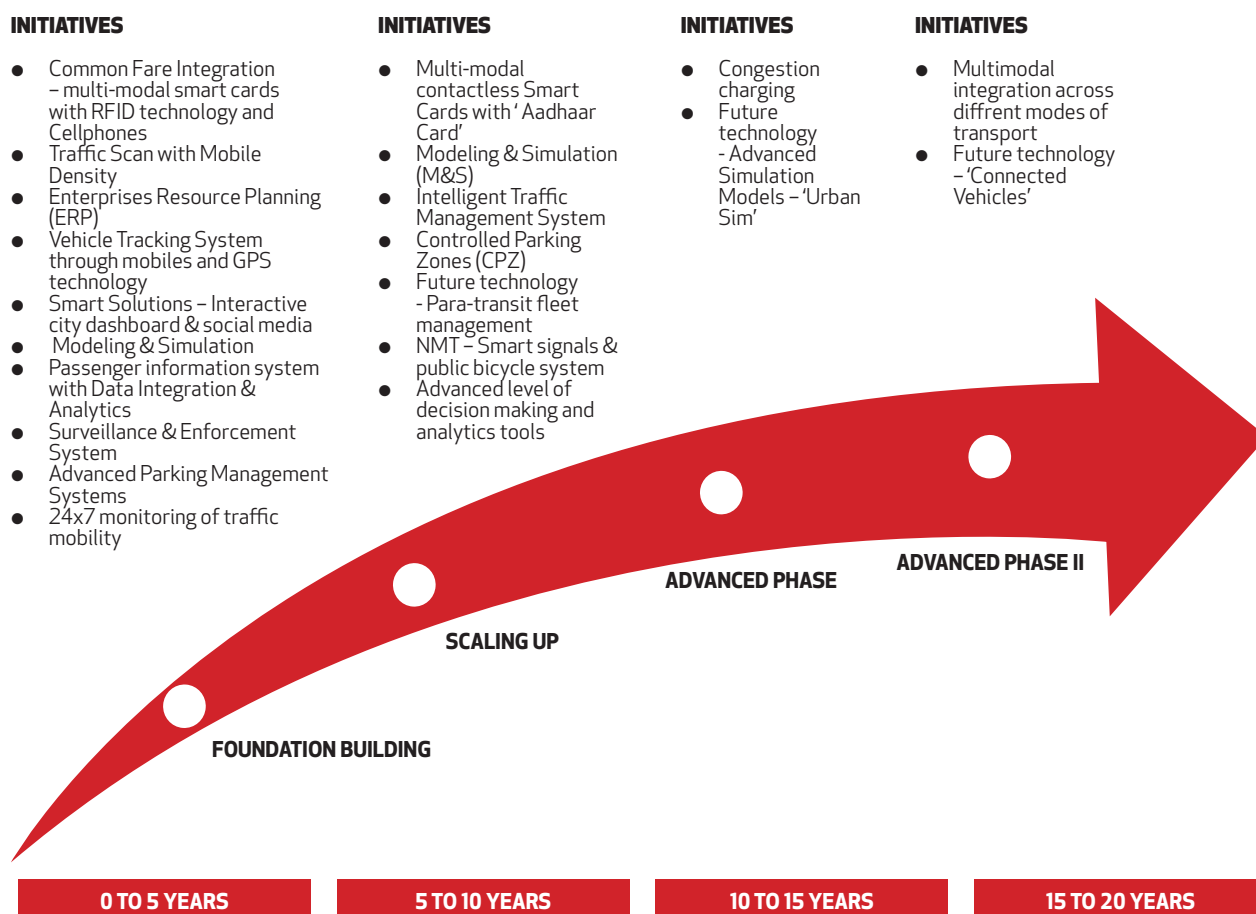
Cities that are yet to start using using ICT for managing urban transport (Category 3) need to implement a 'Pre-Implementation Plan' lasting about five years

Figure 10.1
Pre-Implementation Plan (Cities currently without ICT in UT)



Source: Infosys Research

Implementation Plan for Category 1 & 2 Cities



Source: Infosys Research

11.

RESEARCH AND HUMAN RESOURCE DEVELOPMENT

Transportation planning and policy implementation has become a very complex and contentious activity. This is partly because many infrastructure projects are capital intensive, and partly because solutions to many issues are not very clear. In an age of instant information transfer, decisions based ahistorically on current fashions may not suit our socio-economic environment. The fact that the future of energy availability and environmental concerns is highly uncertain makes the job even more difficult.

In this scenario, it is very important the country has a large number of professionals who are aware of all international developments in policy and technology and also have an in-depth knowledge of our local conditions and needs. The existence of a large number of such professionals will ensure competition among them to keep them honest and also throw up a few outstanding individuals of international standing in each area of activity.

At present, knowledge gaps exist in all areas of activity:

- Design, construction, operation, management, maintenance
- Safety
- Demand management
- Project management
- Use of ITS
- Finance

Future transportation planning and policy making will also require a much more sophisticated approach to set in place systems that ensure the consideration of climate change and safety issues as integral components of infrastructure and technology options.

At present, India fares poorly in terms of total knowledge output. When normalised for population levels in 2011, India's output appears poor in comparison with both Brazil and China. Even more worrisome is the fact that the gap between India and China has widened considerably in the past decade especially on topics dealing with railway technology safety and environment. This means that if we want to catch up with countries like China in ten years with their present levels of productivity, we will have to grow at more than 10 per cent per year. We must plan to set up systems for local knowledge producing mechanisms that aid researchers in responding to demands of society.

Functioning transportation systems in any location involve interactions between individuals, socio-economic imperatives, technologies, geophysical structures, built environment, organisational capacities, political compulsions, knowledge limitations, influence of special interest groups, and historical path dependencies of societies.

International experience offers several relevant lessons for building expertise and a professional community. First, it is important to establish transport planning as a high-status occupation and applied science makes it easier to attract ongoing political and financial support as well as some of the most competent professionals. Second, it is important to decentralise the institutional system and build networks. Third, it is important to encourage transport stakeholders to learn by doing

'Capacity building' comprises three challenges: training individuals, building systems for research and development to update capacity, and ensuring that these individuals have the ability and incentives to be productive within teams and organisations. India must not only increase the supply of capacity by expanding the number and quality of opportunities to study transport planning and allied fields, but it must also ensure a strong demand side.

The effective 'demand' for capacity will depend on employment policies that attract these transport planners to public sector work and also on public expenditure and programmatic policies that encourage ministries, state agencies, and metropolitan bodies to spend discerningly on capacity building. In addition, as some private sector infrastructure companies become large and engage in large transport projects, they can also be encouraged to use the services of transport planning specialists. The Government will also need to invest in transport research so that training, decision support, and policy action

The effort necessary for setting up institutions and structures needed for planning, decision-making and implementation for the next two decades will be substantial. This will require that funds be earmarked for these institutions as 1-2 per cent of investment for each sector

improve over time and adapt to changing opportunities and challenges. Capacity building should also be designed to also support India's efforts to integrate its many transport-related organisations with a common culture focused on transport systems across national, state, and metropolitan scales.

It is quite clear that there is already a great shortage of trained manpower, along with absence of institutional support for policy making and technology development in India. We do not have any institutions within government departments and operating agencies, universities centres or standalone institutions in any area of transportation that compare favourably with institutions reviewed in previous sections except for an institution or two like the National Aerospace Laboratory. The research centres at academic institutions are sub-critical in the number of faculty members involved, and resources available. Except in a few centres, most of the academic activity is not interdisciplinary in nature, and there is almost a complete absence of involvement of professionals from the social sciences—economics, law, etc.

INVESTMENT IN INSTITUTIONS

The effort necessary for setting up institutions and structures needed for planning, decision-making and implementation for the next two decades will be quite substantial. This will require that funds be earmarked for these institutions as 1-2 per cent of investment for each transport sector. This is a very small amount to invest considering the challenges facing us. We have to start planning for these institutions now to catch up with other nations in a decade or so.

The number, size and type of institutions being recommended is based on international comparisons, in particular with countries with similar levels of development at present. Furthermore, if India is to emerge as an economic power by 2030, it needs to invest significantly in human resource institutions to exhibit much greater soft power than it does at present. As indicated earlier, India is significantly behind countries like China and Korea in knowledge production, skills, innovation and technology development at all levels and areas of transport operations.

International experience suggests that it takes more than a decade to build viable quality institutions. Demand has to be created for persons with expertise in these areas with availability of jobs in institutions. This sends a signal to academic institutions to start relevant academic programmes and for potential students to apply for the same. We present these institutions as distinct public and private entities, but collaboration is also important to ensure that transportation research is seen as neutral and credible, particularly if the recommended action on route planning for road and rail, subsidies for passenger transport, air quality regulation, reinvigorating different forms of mass transport and investment in non-motorised transport takes place.

STAND ALONE NATIONAL INSTITUTIONS

(a) Indian Institute for Transport Research (IITR)

The Institute would be responsible for research on all aspects of transport and logistics by all modes. It will be expected to play a leading role in national transport policy and technology development. The Institution may be set up under the Ministry of Science and Technology and would work closely with the Office of Transport Strategy recommended by committee. IITR could develop 4-5 regional centres to focus on regional issues and coordination with regional authorities. At maturity, IITR should expect to employ about 300-500 professionals at the post-graduate level by the end of the 13th Five Year Plan period.

(b) Indian Institute for Transportation Statistics (IITS)

IITS will be responsible for acquiring, preserving, managing, disseminating transportation data, statistical analysis and associated information for use by central, state and city transportation departments, researchers and any other concerned agencies.

SCIENCE AND TECHNOLOGY CAPABILITY IN TRANSPORT MINISTRIES

(a) Research Institutions

Each Department associated with transport (air, water, road and railways) should establish a multidisciplinary research organisation for applied research on current concerns and future technology development. Elsewhere, we have recommended the formation of a unified Ministry of Transport. As soon as such a Ministry is established, it would become easier for these institutions to collaborate with each other.

- Indian Institute for Aviation Research
- Indian Maritime and Water Transport Research Institute
- Indian Institute for Intercity Road Transport
- Indian Institute for Urban Transport
- Railway Research and Development Institute

By the end of the 13th Five Year Plan each of these research institutes would have:

- 100-300 research professionals (60 per cent -70 per cent permanent employees of the institute and 30 per cent -40 per cent on deputation)
- Regional Centres for coordination with state and city governments
- Advanced laboratories for technology development and testing
- Statutory responsibility for setting standards and regulations

(b) Department of Technology Development and Policy Analysis

Each Transport Department must set up an internal Division of Technology Development and Policy Analysis. The Department must be staffed by 20-50 professionals headed by an officer of the rank of Additional Secretary to the Government of India. However, two-thirds of the professionals working in the Department would be permanent employees with service conditions same as those of scientists working in the CSIR, and one third would be on deputation. These entities could collaborate intensively with the Office of Transport Strategy (OTS) recommended elsewhere.

STATE AND CITY LEVEL INSTITUTIONS

- All states should consider establishing a State Institute for Transport Research (SITR) with objectives similar to the Indian Institute for Transport Research (IITR), but with greater focus on local issues. The SITR should include a special transport statistics division that would liaison with the Indian Institute for Transportation Statistics. At maturity these institutes should have a staff of 50-100 professionals.
- At the state level the each ministry dealing with transport issues should establish a transport research department focusing on special needs of that state. The responsibility of the department would be to generate state level detailed plans, data needed for the same, evaluation of projects and policies, liaison with the Central Government, and funding of research projects at state level institutions and universities.
- All megacities (population >5 million) must establish transportation planning research department that could have responsibilities similar to state level units.

ACADEMIC CENTRES OF EXCELLENCE

At present most of the academic programmes in India related to transport capacity appear to be much less integrated than the global norm. Each Ministry dealing with transport and the Ministry of Human Resource Development must set up academic centres of excellence. It is expected that the centres funded by transport ministries would be more focussed on applied research, whereas those set up by the Ministry of Human Resource Development would help

provide graduate scholarships, extra faculty positions and infrastructure funds.

Such centres must of necessity 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.

KNOWLEDGE GENERATION IN OPERATING COMPANIES/ ORGANISATIONS/ MUNICIPALITIES

Present operating companies like DMRC, BEST, DTC, etc, and municipalities, have very little knowledge generation capacity. Mechanisms have to be set up to revamp these organisations and make them much more professional. Each one of these organisations must have a knowledge generation unit that has a budget of about 3-5 per cent of the turnover of the organisation by 2020

JOB OPPORTUNITIES FOR HIGHLY TRAINED PROFESSIONALS IN THE TRANSPORT SECTOR

There needs to be strong demand creation for graduates with advanced degrees, in both research as well as operational organisations, so that the country could move systematically toward a sustainable transportation future. Concrete policies at each agency would need to be worked out. Each agency and department should create ten year projections for expanding the employment of higher skilled operational staff including, MTechs and PhDs to a desirable level. This would need to be accompanied by a revision of salary and service conditions that suit people with a knowledge base (CSIR service conditions can be a starting point).

PRODUCTION OF THE WORKFORCE

Each Ministry associated with transportation issues should establish scholarships, which can be awarded through open competition at a national level. Scholarships may be given with all expenses covered to those who are able to get admission to reputed Indian and foreign universities.

SPONSORED MASTERS AND BACHELORS DEGREE PROGRAMMES

All operating departments, institutions and corporations related with transportation should be required to sponsor about 2-5 per cent of their staff for obtaining masters degrees in relevant subjects as fulltime students every year.

A task force should be constituted by the Planning Commission to prepare a report on the number of new special bachelors and masters degree programmes

Lateral hiring could be a way to build critical expertise within the public sector. Transport planning capacity may get built faster in the private sector, and thus ease of movement between public and private would ensure flows to the areas of greatest need.

that need to be set up at different institutions around the country for training of the workforce necessary over the next 10-year period.

IN-SERVICE TRAINING.

The skills gap cannot be taken care of by the production of new professionals alone. Many of those already in service will be around for the next 15-20 years and it is essential that they have an opportunity to improve their skills and acquire knowledge necessary to apply modern techniques and technologies. In service training and knowledge acquisition requires three parallel efforts:

1. Periodic testing of engineers and technical personnel
2. Short-term training programmes
3. Pursuing higher degrees

LATERAL HIRING

Lateral hiring could also be a way to build critical expertise within the public sector as quickly as it is built in the country more broadly. As discussed above, India does not yet have significant reserves of transport planning capacity in the private sector, but these may be built faster than public expertise and thus ease of movement between public and private would ensure capacity flows to the areas of greatest need.

CONCLUSIONS

We have placed great emphasis on the importance of human resource development in all aspects of the transportation sector. This also reflects the difficulties we have faced in compiling this report as we have interacted with Ministries and government agencies at the central, state and local levels, and with the best professionals available. At the same time, the ramping up of investment in all areas of transport is already taking place, and we are recommending a further enhancement in such investment over the next two decades. Corresponding with economic growth and higher income levels, aspirations of people for higher quality of transportation are also going up consistently. Accordingly, we are also witnessing increasing demands for investment in capital intensive projects such as high-speed trains (HST), limited access expressways, urban mass transit systems such as Metros, and the like. The decision making in such projects is now being done without adequate availability of data, nor adequate appreciation of the various trade

offs involved in resource allocation between different modes and options.

It is in this context that we are recommending the establishment of new institutions connected with transport on a somewhat large scale. We are aware of various criticisms, which characterise these recommendations as being utopian and unrealistic. As we have documented, comparison even with other emerging market economies shows that the kind and size of institutions recommended are quite comparable with those already existing in these countries. Compared with the magnitude of overall investment envisaged in the transport sector, the investment in such institutions would amount not more than 1-2 per cent of GDP. The gains in better planning and execution of transport projects will far outweigh the cost of such investment in essential human resource development. Of equal importance is a focused and sustained programme of upgrading existing personnel, most of whom will be in service over the next 20 years.

We recommend that the Planning Commission establish a Special Mission to carry forward the recommendations in this chapter on unified basis, within the 12th Plan period.

WE RECOMMEND...

An Indian Institute for Transport Research and an Indian Institute for Transportation Statistics should be set up.

Each Transport Department should establish a multidisciplinary research organisation for applied research on current concerns and future technology development.

Each transport agency and department should be strengthened technically. They should create 10-year projection for expanding the employment of higher skilled staff including MTechs and PhDs to a desirable level.

Each Ministry associated with transportation should establish scholarships, which can be awarded through open competition at a national level.

Making a career in the transport sector look attractive and satisfying should be a high priority.

12. SAFETY

Hospitalisation and death due to injuries and violence are major threats to health across the world. It is estimated that more than five million people die each year as a result of some form of injury and many more are disabled for life.

Transportation-related death and injuries constitute a significant proportion of this. For young adults and working age males, road traffic accidents have become a leading cause of death in most countries including India. Given current trends, the global burden of injuries and violence is expected to rise considerably in the coming decades, particularly in low- and middle-income countries like India.

Vehicle ownership has soared in India over the last two decades. In 1991, according to the Ministry of Road Transport and Highways (MoRTH), the number of vehicles registered in the country was just over 21 million. By 2011, the number had increased to 142 million.

It is estimated that the cost of road traffic crashes alone may be about 3 per cent of the GDP. The situation is quite serious and unless policies and evidence-based countermeasures are put in place urgently the situation is likely to worsen.

The existing rates of fatalities and the rate of increase in accidents are both unacceptably high. It is not necessary that accident rates increase with increase in transportation volumes in any mode of transportation if appropriate safety systems are put in place. It is imperative that we give much more importance to transportation safety in India, and this will only happen if the whole system is improved and strengthened on an urgent basis. At present, there is very little expertise, data or information available in India to address issues of safety scientifically for any mode of transport.

Significant reductions in accident rates were seen in all modes of transport in Western Europe and USA starting about the same time in the 1960s and 1970s. The reduction was probably not due to any single factor in isolation but to a wide variety of improvements in design of vehicles, operating environment and infrastructure, and enforcement of safety regulations and standards.

Transportation safety management is a systematic process in which we consider infrastructure, users and vehicles as integral components of a complex

interactive system. The transport system has to be developed in a way that does not jeopardise the environment or public health and welfare. In this approach, it is essential to create an ecology that minimises the risk of transport users making mistakes and prevents serious human injury when designing, operating and maintaining the system. The entire traffic and transport system must be designed to account for the limitations and capabilities of users and operators. Since each accident is a result of a combination of human, technology and environmental factors, one cannot understand the risk factors associated with an event unless a sophisticated systems approach is followed.

SAFETY MANAGEMENT

Transportation safety management has seen a shift from action based on experience, intuition, judgement, and tradition, to action based on scientific research, empirical evidence, and from consideration of safety that is tacit and qualitative to consideration of transportation safety that is explicit and quantitative. The requirements of a safe system approach are:

- (a) Institutional structure that creates a demand for scientific work in safety issues.
- (b) Legislation and regulation-formulation and enforcement of laws and regulatory requirements
- (c) Monitoring and measurement--national databases with relevant information to monitor and assess various aspects of safety policies, technologies and knowledge needs
- (d) Assuring and improving the quality of safety services provided through professionals, individual

It is estimated that the cost of road traffic crashes alone may be about 3 per cent of the GDP. The situation is quite serious and unless policies and evidence-based countermeasures are put in place urgently the situation is likely to worsen

institutions and with the use of specific technologies and devices

All countries that have been successful in reducing transport-related injuries and deaths have set up relatively large professional national safety agencies for each mode of transport. These agencies have different structures owing to different political and administrative systems in different countries, but are generally kept independent of the operating departments. However, most countries adhere to the following principles:

- Establishment of agencies professionally staffed for designing and implementing data collection systems
- Ensuring compatibility of data formats between different departments and users
- Responding to the demand of lead agencies for special needs regarding availability of data
- Ensuring that all non-proprietary and non-personal data are publicly available to all concerned stakeholders

The national agencies have to be supported at four levels:

- a. State level
- b. Departmental organisations at the local level
- c. University departments
- d. Civil society organisations

Demand for better knowledge and technologies in the transport sector can only be provided by public bodies: central and state governments, and local bodies like municipalities and transit authorities. It is the responsibility of the public sector to create long-term stable demand for safety work, with the implicit understanding that progressive employment for a well-trained workforce will be available for some time to come. If respectable professional jobs become available with promising and secure career paths in safety research and operations, talented professionals will gravitate to the field. This in turn will encourage educational and training institutions to provide the necessary programmes. Thus, the problem is structural.

Institutions for road, railway, water and air transport safety need to be set up to (a) ensure that safety professionals in the country are abreast of international knowledge and findings, (b) provide information about the size and severity of these problems, (c) help improve our information to help prioritise problems and measure progress in solving them, (d) gather information about strategies in situations similar to India's, and about their effectiveness, (e) ensure that evidence of the effectiveness of safety countermeasures is made part of decisionmaking at different stages, rather than just reacting to problems or political demands.

WE RECOMMEND...

National Boards/ Agencies for Road, Railway, Water/Marine and Air Safety should be established.

A National Database and Statistical Analysis Systems should be set up.

Establishment of multidisciplinary safety research centres at academic institutions should be funded.

The government must announce safety policies with measurable indicators for evaluation in each sector for a five-year and 10-year period before the end of 2015.

Each state must establish a Road Safety Board on the lines suggested by the Committee on Roads Safety and Traffic Management.

States dealing with significant amount of water transport must set up State Water Transport Safety Boards.

Establish Safety Departments within operating agencies at different levels for ensuring day-to-day compliance with safety standards, studying effectiveness of existing policies and standards, conducting safety audits, collecting relevant data, etc.

13.

PROMOTING INTERNATIONAL TRANSPORT CONNECTIVITY BETWEEN INDIA AND THE SOUTH AND SOUTH EAST ASIA REGIONS

Due to its strategic geographic location and size, India needs to play a central role in taking forward regional cooperation initiatives. It is in a position to provide key support for establishing an effective Asian institutional architecture

India is also at a centre of a web of dynamic bilateral and regional FTAs within South Asia and between South Asia and East Asia and Southeast Asia. India will reap large benefits from Asian integration. The overall forward strategy needs to link the soft and hard aspects of transport infrastructure development. This is only possible through a combination of initiatives at all levels. The various actions and measures indicated need to be elaborated and appropriate legislative procedures need to be adopted and an impact assessment of each of the proposals will need to be undertaken.

LOWERING THE PHYSICAL BARRIERS

India's connectivity with its neighbours needs to involve all modes of transportation, namely, land (including road and railways), maritime (including inland waterway transport), and air. Cross border multimodal transport has been identified as an efficient way of transporting international cargo. In this system of transportation with one transport document, one tariff rate and a single through-liability are applied.

ROADS

The reclassification of the last few km of all road corridors up to international borders along identified corridors is needed so they are treated as part of National Highways. This will promote upgrades to these often minor roads and thereby improve access to the border posts, as well as reduce transport costs. The development of modern border crossing facilities (on both sides), including immigration, parking and cargo handling facilities, will facilitate the smooth movement of both passengers and freight.

A major impediment to smooth flow of international transport is the existence of conflicting national laws and regulations. The modification of these domestic laws and regulations to the needs of international traffic is a challenging task, particularly since international traffic in general constitutes a small proportion of the total traffic within a country. A greater understanding of the domestic regulatory regimes affecting international transport is essen-

tial to create a harmonised regulatory regime at the regional level. Formalisation of Asian Highway and Trans-Asian Railway agreements can set the stage for more collaborative efforts in bringing greater uniformity in national transport laws, regulations and practices.

Internationally agreed technical standards have a strong symbolic value, and can potentially exert a strong influence on national transport planning, particularly when these standards are an integral part of formal, legally binding international agreements. A coordinated effort in the medium term to develop agreements along important identified corridors is required as a next step. For roads, the development and adoption of bilateral transport agreements between Bangladesh and India, as well as India and Pakistan, will enable through transport to travel directly between the countries, thus eliminating the costly and time-consuming process of transshipment at the borders on all of the SAARC road corridors.

RAILWAYS

A standardisation of technologies, including track, signaling and rolling stock, in order to introduce commodity specific freight wagons capable of hauling longer and heavier axle load freight trains will eliminate avoidable marshaling, lower speeds and longer transit times is required. The development of additional container terminals connecting major commercial centres and ports along the corridors will enable movement of containerised cargo via the shorter routes in the region compared to the much longer road/rail/sea routes at present and thereby bringing down the unit transport costs. Stress should also be laid on development of the railway network of India with Bangladesh and Nepal. Coordination of the standardisation/ rationalisation of the gauge conversion programs of Indian and Bangladesh Railways will achieve seamless operations of intra-regional freight and passenger trains without the need for transshipment due to gauge differences. The uniformity of prevailing systems and procedures at interchange points, simplification of documentation, elimination of double customs checks,

A joint assessment needs to be undertaken by Bangladesh and India of the future role that inland waterways can play in regional connectivity. To make inter-country traffic movement by IWT attractive, more ports of call in Bangladesh should be allowed under the bilateral agreement

introduction of IT-enabled data transfer facilities and introduction of round-the-clock working for trade facilitation will enhance the performance of the international rail freight services throughout the SAARC region.

IWT

A joint assessment needs to be undertaken by Bangladesh and India of the future role that inland waterways can play in regional connectivity and whether this would justify investment in dredging and vessels replacement. To make inter-country traffic movement by IWT attractive, more ports of call in Bangladesh should be allowed under the bilateral agreement. Further, installation and maintaining navigational aids to provide 24-hour travel to enhance transit times and attract new traffic; and upgrading jetties and replace old cargo handling equipment and craft needs to be undertaken.

MARITIME GATEWAYS

Improvement of port and trade facilitation measures through simplification of procedures and introduction more EDI/IT to reduce dwell times at all ports has to be surveyed and undertaken.

AVIATION

For enhanced aviation connectivity, bilateral agreements with emphasis on direct capital-to-capital air connections; and development of low cost carrier operations to actually reduce the cost of air transport for those unable to afford the benefits of scheduled services will encourage regional traffic.

NORTH EAST INDIA

The development strategies for Myanmar and North-east India can be the core of the regional strategy to enhance ASEAN-India connectivity.

EFFICIENT LOGISTICS SYSTEMS

Among others, an efficient logistic system includes a network of inland container depot (ICDs) and container freight stations (CFSs). First, the development of ICDs is of critical for India. ICDs/ CFSs are interfaces between connecting different modes of cross border transports and offer a total package of activities to handle export and import containers and general cargo flows between road, rail, and waterways in a cost effective manner with logistic services such

as storage, grading, sorting, packaging, repair, and clearing activities, including custom clearance

Benefits of connectivity are limited if India does not have a functional ICD network. This is largely because a major amount of India's exports is generated in the northern states which are located far away from sea port gateways. Second, these ICDs and CFSs have to be connected by rail and road networks to the sea ports to enable smooth and seamless movement of containers. India's Container Corporation (CONCOR) has developed a number of ICDs and CFSs, which are connected with the broad rail network. However, there is still a need for development and strengthening of more ICDs, and CFSs, especially in the Northeast region to connect with ASEAN.

Second, freight forwarders and shipping lines play important roles as multimodal transport operators. Indian shipping companies are however relatively small both in terms of vessels and in terms of cargo transported with the sole exception of the state owned. Despite support from India's government, Indian shipping companies carry less than 10 per cent of total Indian container trade.

DEVELOPMENT OF INDUSTRIAL CLUSTERS

ASEAN economies show a high level of integration with the global supply chain, and this has significantly driven the development of physical connectivity, particularly maritime trade with East Asian countries. For ASEAN India connectivity to become more commercially and economically viable, it is important to develop industrial clusters / production networks along the main road, rail, maritime, and inland water ways of ASEAN and India. For example Bangkok-Chennai can develop industrial agglomerations to lead the regional economy by providing large markets of final and intermediate goods and raw materials. Other potential regional production networks such as Chiang Mai-Kolkata-Dhaka-Kunming; Yangon-Mandalay; and Dawei-Kyaukphyu-Guwahati can be developed.

SUB-REGIONAL APPROACH

A three-level approach is proposed, where, at the national level, it is led by individual countries; at the bilateral/ sub-regional level, by two or more countries, and regionally by the entire group of countries. In the longer run, smooth flows between countries will come with development and adoption of regional transport and transit agreements to allow through movement of vehicles, goods and passengers across the region on a door-to-door basis; widening the existing visa exemption schemes to promote regional travel by citizens; undertaking a study to identify gateways that have potential to become regional aviation hubs and finally move towards a regional aviation agreement for open skies for passengers and freight transport to promote more air services.

LOWERING NON-PHYSICAL BARRIERS

Institutional connectivity refers to linking various international or regional agreements and protocols to facilitate international transactions of goods and services as well as the movement of natural persons across borders. Most of the costs and delays along India's main economic corridors with South Asia and ASEAN are due to complex trade documents and procedures. Complicated documents and procedures in custom clearance, quarantine certification, import and export licenses, transshipment, physical inspection, terminal handling, and transit causes trade delays and increase costs. Trade and transport facilitation measures therefore play crucial role for cost and time reduction for trade.

POLITICAL COMMITMENT FOR REFORM AND ADJUSTMENT OF DOMESTIC LEGISLATIONS

Before entering into any regional transport agreement, countries in South Asia have to consider the required reform and adjustment of domestic legislations that are enforced by the signed regional agreements. The lessons from ASEAN and CAREC have clearly demonstrated that the negotiation and the domestic legal process to bring a regional transport agreement into force can be very lengthy. This can be counterproductive as it may trigger a retreat to bilateral agreements if countries are frustrated with the regional process. The SAFTA is a good example. Exhausted by the sluggish process of the SAFTA, South Asian countries have entered into various bilateral trade agreements.

WELL-DEFINED RELATION BETWEEN TRANSPORT AND TRADE FACILITATION

It is important to define the scope of a transport agreement if it should also cover trade facilitation measures or it will only be confined to transport facilitation. The CBTAs of GMS and CAREC have built-in trade facilitation measures such as transit custom, temporary admission regime for containers, custom insurance, transshipment, joint sections, and quarantine. The advantage of this is that the CBTAs are comprehensive. However, problems arise at the implementation level due to a lack of a national body that can bring together national transport, custom, and quarantine authorities. Because of this, custom cooperation in the GMS is moving slowly. Therefore, it is crucial to define at the design stage of any bilateral or regional transport agreement how trade facilitation measures will be covered; and if trade facilitation measures have to be addressed, these should be directly related to supporting transport facilitation rather than applying across-the-board trade facilitation measures.

CONSISTENCY WITH INTERNATIONAL CONVENTIONS

Regardless of what form that a legal instrument for transport cooperation may take in South Asia, it is important to ensure the consistency of the legal

instrument with the standards set forth in international conventions. It is particularly important for bilateral agreements to be consistent with international standards as it can facilitate a greater harmonisation of bilateral transport agreements.

THE WAY FORWARD

The implementation of recommendations made in this chapter will be difficult to achieve in a business-as-usual context. If there is general agreement with the kind of transport investments and agreements that have been proposed as desirable to be achieved over the next couple of decades, it will be necessary for the government to take up this task in a focused manner. NTDPCC therefore recommends that the Government of India initiate this process by forming a dedicated Joint Task Force to Promote International Transport Connectivity within the South Asia Region. Such a Task Force should have technical participation from all the neighbouring countries, along with representation from agencies such as UNESCAP, ADB and SAARC, which have already done extensive work in this area.

WE RECOMMEND...

India must initiate process of enhancing transport connectivity through all modes with all its neighbouring countries.

The last few km of all road corridors up to international borders along identified corridors should be reclassified so they are treated as part of National Highways.

Railway technologies, including track, signaling and rolling stock, should be standardised in South Asia.

For enhanced aviation connectivity, bilateral agreements should be worked out, with emphasis on direct capital-to-capital air connections.

India should develop an efficient network of inland container depot and container freight stations.

Industrial clusters should be developed along the main road, rail, maritime, and inland water ways of ASEAN and India.

The Government of India should form a dedicated Joint Task Force to Promote International Transport Connectivity within the South Asia Region.

SECTOR REPORTS

1. RAILWAYS

Indian Railways (IR) is the third largest railway network in the world under a single management. IR has played a critical role in integrating markets and connecting communities throughout the length and breadth of the country

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 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 suffering from severe capacity constraints and remains underinvested, the road sector has witnessed a surge in investments (both public and private).

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 loss in the railways' transport share will accelerate, leading to greater pollution and environmental degradation.

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.

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 the required organisational changes, and certain strategic decisions in terms of the relative allocation of resources between rail and road.

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, *NTDPC 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 NTDPC recommends widespread consultation with major stakeholders, including the staff and unions of the railways system. This process may take upto five 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.

To facilitate these reforms, the NTDPC 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 since it has already been

done on a pilot basis twice: first by the Railways Capital Restructuring Committee of 1994 and the Expert Group of 2001.

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 as separate profit-centres.

All activities falling outside the core transportation operations should be critically reviewed from the perspective of either retention or outsourcing.

Organisational and institutional deficiencies inhibiting PPP need to be identified and addressed. 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

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 must aim 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 should institutionalise a strategic planning process taking a forward view over the next 20 years. 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 should aim to capture a significant share of the fast-growing FMCG, Consumer Durable and Information Technology (CDIT), containerised cargo and other freight 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.

A focused business organisation must be set up for multimodal transport of non-bulk commodities (e.g. parcels) under the PPP mode, combining the efficiency and advantages of rail and road. A few

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; the Railway Board essentially performs all the three roles. This causes confusion about vision and mission

selected corridors for heavy-haul operations need to be developed. Running of freight trains at 100 km per hour must be an objective. Premium freight services with differential pricing and assured deliveries should be introduced. Rakes should be supplied on demand with differential pricing for different demand lead times.

Trains must be run on schedule with guaranteed transit time. Cargo parcel size should be reduced to 1,000 tonnes and aggregation mechanism for even smaller parcel sizes should be organised.

Indian Railways should 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.

Redesign of coaches to enhance travel comfort.

Conversion of all stopping passenger trains to EMUs/DMUs or railcars; invite state governments to manage uneconomic and unpatronised services.

Augment supply (more trains and longer trains) to ensure full satisfaction of demand.

CAPACITY CREATION

Construction of six Dedicated Freight Corridors must be top priority. The Eastern DFC must be given the highest priority among the DFCs, and should be completed within the 12th Five Year Plan. 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

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

of about 2,340 km must be completed on the highest priority within the 12th Five Year Plan.

Improve 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.

Develop 15 to 20 logistics parks at the main network hubs such as 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 by shifting away from carbon steel to stainless steel and aluminium/ other light-weight bodies.

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.

Consider development of select High Speed Corridors (speed potential 350 kmph) on a pilot basis, only 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.

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 transport, as compared to projects such as HSR network which require continuous fiscal support.

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.

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 maybe 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 closure may be introduced for each project.

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 the 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, 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

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 two 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 Chairman, Railway Board. It should target recruiting close to 300 researcher professionals by the end of the 13th Plan, with a healthy mix of PhDs, engineers, architects, professors from national and international universities etc.

Establish **Academic Centres of Excellence or 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 should 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.

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 topmost 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.

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–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.

Recruitment of highly qualified PhDs from IIMs/IITs and lateral recruitment from market should 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.

WE RECOMMEND...

Massive capacity expansion of the railways for both freight and passenger traffic in a manner that has not taken place since Independence.

Increase in investment in Railways from 0.4 percent of GDP in 11th Plan to 0.8 per cent in the 12th Plan and 1.1 per cent in the 13th Plan and beyond.

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.

Railways should undertake recasting of its accounts in a company account format consistent with accounting norms under the Indian GAAP. years.

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.

Augmentation of supply (more trains and longer trains) to ensure full satisfaction of passenger demand.

Construction of six Dedicated Freight Corridors on top priority.

Improved connectivity to industry clusters as well as significant ports, based on their current and projected traffic volumes.

Development of 15 to 20 logistics parks at the main network hubssuch as Mumbai Bangalore, Cochin, Hyderabad, Kolkata, Delhi NCR, Ahmedabad, Nagpur, Vishakhapatnam, Siliguri, etc.

Setting up a National Railway Construction Authority, partially independent of the Ministry of Railways, to expedite the delivery of projects.

As the overall railways reform proceeds, creation of a Railways Regulatory Authority which would encompass tariff setting, along with other regulatory functions.

Establish a National Board for Rail Safety

Establish a Railway Research and Development Council, a Railway Research and Development Institute, and Academic Centres of Excellence or 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 IR should expedite the execution and operationalisation of identified inter-country connectivity projects.

Multiple services and cadres of Railways at the management level need to be rationalised and coalesced into fewer services

2. ROADS AND ROAD TRANSPORT

India has the world's second-largest road network, and the densest amongst countries of similar size. However, our roads are also capacity constrained, slow, unsafe, environmentally unfriendly, not maintained or non-maintainable, and patchily administered.

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 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.

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.

POLICY AND PLANNING

TRAFFIC SURVEYS AND DATA CENTRE

Road development should not be seen in isolation but as part of an integrated multi-modal system of transport. It is therefore necessary to undertake detailed regional traffic and transport surveys on a regular basis—preferably every five years. Database for the road sector is virtually absent. Setting up of a dedicated Road Data Centre managed through a high level institution is an urgent need. This will help in reducing the current ad-hoc decision making in the road development planning process.

CAPACITY AUGMENTATION

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.

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

Access-controlled highways 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

the road sector. Then, there is huge deficit in availability of skilled construction workers in the road sector.

RURAL CONNECTIVITY

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.

ROAD CLASSIFICATION

The road network is currently 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.

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.

STANDARD ROAD SIGNS

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. Side by side, a mechanism for enforcement needs to be in place. This is a serious gap at present.

EXPRESSWAYS

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.

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.

AUTO INDUSTRY

There is need for continuous upgradation of technology in the auto industry, especially the commercial vehicle sector, to meet the objectives of better comfort, productivity, energy efficiency, safety and emission standards in line with international practices and standards.

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.

ROAD DEVELOPMENT

It will be advisable to continue multiple strategies for development of the road network during the next two decades, building on the current focus during the 12th Five Year Plan (2012-17). Private sector financing in the highways will 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 AND STATE HIGHWAYS)

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. 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.

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.

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.

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.

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.

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.

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.

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 2011-12 constant prices, spread over 20 years upto the year 2032 could be required. Targets for private sector financing are also proposed.

STRATEGIES FOR SECONDARY ROADS (MAJOR DISTRICT ROADS)

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 devel-

opment 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, a large percentage of these roads is reported to be in bad shape. 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.

As per a broad assessment, an investment of Rs 6,000 billion, at 2011-12 constant prices, spread over the next 20 years, is envisaged. 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 TERTIARY ROADS (OTHER DISTRICT ROADS AND VILLAGE ROADS)

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.

Implementation of the rural roads programmes needs 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.

These roads can stay as single-lane roads in view of the low volume of traffic likely to prevail. However, some roads under this category could witness traffic volumes that may justify widening to intermedi-

ate or two-lane. Provisions should be made accordingly.

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.

An investment of Rs 5,700 billion, at 2011-12 constant prices, spread over the next 20 years, 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 2.1. 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.

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 assess-

Table 2.1
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 SARDP-NE + Arunachal Package (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

ment 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.

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.

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

Currently, the IRC mandate is to evolve standards, specifications, manuals, guidelines for planning, design, construction and maintenance of different

There is a 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 Expressways to NHAI, and only planning, policy and budget functions should remain with the MoRTH

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.

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 the 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.

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 serve the intended purpose.

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

With the NHAI having become operational through successful implementation of the NHDP, there is a 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.

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. 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.

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.

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.

CONTRACTORS AND CONCESSIONAIRES

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 sub-standard 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.

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.

FINANCING FOR CAPACITY BUILDING

A provision of 1 per cent of the total road investments should be earmarked for capacity building of 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 central and state governments, national road agencies, 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 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

We must recognise that contractors and concessionaires are partners in progress. A healthy decision support system and dispute resolution mechanism would contribute a great deal in improving performance of contractors and concessionaires

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. 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

The wide-ranging recommendations of the Sundar Committee on Road Safety 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

and resettlement of people affected, environment clearances, shifting of utilities.

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 the 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 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.

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.

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.

WE RECOMMEND...

Roads should not be looked at in isolation, but as part of an integrated multi-modal system of transport. 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.

The current programme of PMGSY should be expanded to achieve universal connectivity to all habitations on a time-bound basis.

There is need for continuous upgradation of technology in the auto industry, especially the commercial vehicle sector, to meet the objectives of better comfort, productivity, energy efficiency, safety and emission standards in line with international practices and standards.

Private sector financing in the highways will remain confined to the commercially viable and high traffic density stretches. It will be prudent, therefore, to enhance the availability of public sector funding.

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.

For capacity augmentation of state highways, every state should formulate and implement programmes on the lines of NHDP.

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 per litre, which was fixed in the year 2005. This may be enhanced to Rs.4 per litre to enhance accruals to the CRF.

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.

Special needs of connectivity to ports, airports, mining areas and development of power plants should be factored in development of the road programmes.

States should encourage citizen and user oversight through undertaking road user satisfaction surveys.

A dedicated road design institute that should function under the umbrella of MoRTH should be set up. Similar institutes should be set in each state PWD and Rural Roads Agency.

The MoRTH should entrust all National Highways and National Expressways to NHAI, and only planning, policy and budget functions should remain with the MoRTH.

Establish Road Safety and Traffic Management Board as recommended by the Sundar Committee, within the 12th Plan period.

3. CIVIL AVIATION

The past 20 years have brought dramatic changes to Indian aviation. New airlines are inaugurating new routes, both domestically and internationally. Airports are being modernised and expanded. 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. 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.

THE FLIGHT PATH

Aviation is 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. Network-centric thinking should prevail in planning air transport infrastructure. Efforts should be directed at building complementary regional, national and international air networks.

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. 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

Indian airports processed about 144 million passengers in 2010-11. Airport capacity sufficient to process 1,150 million passengers per annum (mmpa) is required by 2031-32. This will require the creation of

additional capacity at a total cost of Rs 5,900 billion.

Substantial investment will be required to ensure that the Air Navigation Services (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. 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 billion 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.

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.

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.

A National Master Plan should be devised and main-

tained 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 air-space issues or the potential for airlines to operate there.

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.

An Airport Approval Commission should be established within MoCA to review the business plans of proposed airports prior to granting clearance.

There is an urgent need to build airport capacity to process cargo. At the larger airports, capacity can be added 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 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 manage secure bonded facilities off-airport to facilitate the rapid sorting, handling, collection and break-bulk of air cargo.

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.

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.

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 air-space management, environment,

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.

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.

INSTITUTIONAL ARRANGEMENTS AND POLICY

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.

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.

The DGCA should be replaced with a Civil Aviation Authority (CAA) responsible for the operational regulation of airlines and aircraft covering areas such as air-worthiness, safety and licensing, with

separate divisions for air-space management, environment, competitiveness, and consumer protection.

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 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.

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. This would essentially create a new airline, while Air India's liabilities are separated out and dealt with

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.

Greater cooperation between the authorities, civic agencies, and the administrators of other transport modes should also be mandated.

The taxation regime that applies to the entire indus-

try 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.

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.

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.

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.

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.

AIRLINES AND MARKET COMPETITIVENESS

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. An estimate of the number of aircraft that will be required over the next 20 years suggests that 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, costing about US\$ 260 billion, including replacements for ageing aircraft.

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.

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.

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.

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 DGCA should establish a dedicated Division to deal with General Aviation through, for example, the appointment of a Director for General Aviation.

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.

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 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 gov-

ernment'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.

FUNDING

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.

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.

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.

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.

The government must decide clear and stable rules governing foreign ownership and operation of domestic airlines. Foreign ownership may be expected to bring benefits of access to cheaper debt finance, technology transfers, management knowhow and access to international markets

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

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.

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.

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.

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.

PRICING

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.

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.

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. Com-

petition in the ATF market should be encouraged and any efforts at cross-subsidising (as with other fuels) should be avoided.

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

MANAGING THE ENVIRONMENTAL IMPACT

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.

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.

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 2030-31.

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, train-

ing institutes for pilots and engineers, maintenance organisations, and airport service providers. 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. The NTDPDC endorses the ICAO’s recommendation that the DGCA be transformed into a Civil Aviation Authority with the necessary autonomy.

HUMAN RESOURCES

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. 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 five-fold upto 2032

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.

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.

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.

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.

An institute for training civilian helicopter pilots should be set up.

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.

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.

Foreign participation or investment in an Indian university for aviation management should be encouraged.

AIR CONNECTIVITY IN REMOTE AREAS

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.

The current arrangement for ensuring essential air services is not satisfactory. Air connectivity in remote areas is largely concentrated on routes con-

necting state capitals. Meanwhile, the Route Disbursal Guidelines (RDG) 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.

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.

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.

STATISTICS AND DATA

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.

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.

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.

WE RECOMMEND...

A National Master Plan should be devised and maintained which identifies clear economic reasons for building airports in generally specified locations.

An Airport Approval Commission should be established within MoCA to review the business plans of proposed airports prior to granting clearance.

Capacity at airports to process cargo should be augmented urgently.

Substantial investment will be required to ensure that the Air Navigation Services can continue to deliver on an exceptional record of aviation safety.

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.

The DGCA should be replaced with a Civil Aviation Authority (CAA) responsible for the operational regulation of airlines and aircraft covering areas such as air-worthiness, safety and licensing, with separate divisions for air-space management, environment, competitiveness, and consumer protection.

State governments should play a much more active role in the airport sector since aviation is a key enabler of local economic development.

The AAI should be separated into two distinct functions: Airport Operations and Air Navigation Services. Each function should be corporatised.

Conditions should be created that allow the Indian MRO industry to grow rapidly. India has strong comparative advantages to become a world-leading centre for MRO.

The taxation regime that applies to the entire industry from aircraft purchase to aviation turbine fuel to insurance and lease rentals should be revised.

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.

Aviation Turbine Fuel pricing should be reformed.

New standards of safety should be established to keep pace with the demands of increased traffic.

The sector's training infrastructure needs to be urgently improved.

4. PORTS AND SHIPPING

There are positive signs of progress in India's ports sector and the potential for growth and development is enormous.

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

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 though at a somewhat slower pace. Thus, from a long-term transport policy perspective, 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 government 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 land-

lord 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.

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 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 environment-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 USD 45 billion annually.

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 is typically funded through public investment.
- Relatively large minimum initial capacity of port infrastructure is required from a tech-

nical 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.

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 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.

SHIPPING

Even for a business as usual case, India will have to make an investment of about 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 fertilizer 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 rail and reduce CO₂ emissions. In order to support the cargo growth expected by the end of 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 trillion is projected for desired development of the ports and shipping sector till the end of the 15th Plan.

KEY CHALLENGES

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.

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: DEVELOPMENT OF MEGA PORTS

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.

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:

India should create four to six Mega Ports over the next 20 years, with two to three on each coast. 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; and so on), India has none

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.

TRANSHIPMENT 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.

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 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 poten-

tial 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.

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.

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 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.

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

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

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 REGULATORY AUTHORITY

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.

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 trans-

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

form 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 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 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 that need to be implemented on a time-bound basis, involving investments above Rs 500 crore and upto Rs 1,000 crore, or any other project identified as 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 in the ports/ shipping ministries and departments at the Centre and in the maritime states 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-lowest cost—approach.

SHIPPING

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.

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.

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.

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.

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. 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.
- Developing separate wings in development financial institutions to fund coastal shipping
- Suitably amending the Merchant Shipping Act or enact separate legislation for coastal shipping to provide different specifications and lower manning scales.
- 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.

INLAND WATER TRANSPORT

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 for round the year navigation).

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.

Providing 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.

IWT terminals need to have sufficient connectivity with road and preferably with rail for last mile connectivity on the lines of bi-modal and tri-modal concept of developed waterways of other countries.

WE RECOMMEND...

Four to six Mega Ports should be created over the next 20 years, with two to three on each coast.

There is immediate need to make appropriate legislative and policy changes to move the Major Ports to the landlord port model and to transform the port trusts to statutory landlord port authorities. All the terminal operations of port trusts would need to be corporatised as public sector corporations.

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.

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.

Priority should be accorded 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.

Adequate road and rail connectivity must be provided to these coastal terminals.

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).

5. URBAN TRANSPORT

The rapid economic growth over the last two decades has entailed a significant structural transformation of the economy away from agriculture and toward 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 2030. 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.

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 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 Railways. 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 generally 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 NTD-PC 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 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 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

At present, there is little data on the modal share distribution across city types and sizes in India. Information is also limited on urban freight movement. What is clear, however, is that very few Indian cities currently, have organised and regulated public transport systems

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 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.

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 convenient. 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 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.

INSTITUTIONAL FRAMEWORK FOR URBAN TRANSPORT

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 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.

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.
- Metropolitan Urban Transport Authorities (MUTA). NTDPC, 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 NTDPC 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.

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 REQUIREMENTS AND FINANCING

We have 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.

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—footpaths and dedicated cycle lanes—should be developed on an urgent basis

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. 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.

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) 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 1,860 billion in the first four years and reaches Rs 22 trillion in 20 years.

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 discretion of the central government. This proposal could be examined by the Finance Commission, perhaps beginning with the 14th Finance Commission.

Metropolitan Urban Transport Authorities should be set up as holistic and integrated decision making and coordinating bodies, with adequate technical staff.

Dedicated non-lapsable and non-fungible Urban Transport Funds should be set up at the national, state and city levels.

WE RECOMMEND...

Urban transport policies and strategies should be formulated within an 'avoid, shift, and improve' framework.

Bus priority ways, busways, bus rapid transit (BRT) etc should be integrated early into cities' expansion and development plans.

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.

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 ten years.

Energy efficiency of vehicles should be improved to decrease impacts of distances travelled and reduce the greenhouse gas footprint.

Emission and safety standards should be set up under the Motor Vehicles Act.

Cities should move from a 'closed permit systems' to an 'open permit system' for para-transit/intermediate public transport modes.

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.

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.

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 NER 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.

ROADS

Roads are going to be the mainstay for bringing transformational changes in infrastructure of the region.

It is necessary to form a separate body under the aegis of MODONER to monitor the construction activities in the sector.

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.

While four-laning of many routes has 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 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.

There is a need for changing the technology being used for construction of roads to improve their longevity.

Training institutions are necessary to develop skills in the local population for good maintenance of roads constructed both with the present technology and the superior technology whenever adopted.

There is a need for foot suspension bridges in abundance.

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

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, are considered essential to improve transportation in the region.

Indian Railways now has extensive knowhow of tunnel construction. It 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 to develop a viable civil aviation network in the region. Bringing in private opera-

tors may change the scenario so much that cheap air travel may become possible through induction of smaller aircraft with better technology for which one-time 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 aircraft but also 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. A few of these airports should be made operative within a time frame for civilian use to provide better connectivity not only for people but also for cargo. These would help establish connectivity required for horticulture/ floriculture/ aquaculture common in the region.

INLAND WATERWAYS

Large infrastructure 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-term treaty with Bangladesh 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 and Trade is extended for at least 10 years at a time to attract investment.

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.

Inland water transport should be utilised for movement of over dimensional consignments to avoid congestion on roads especially in the Chicken's Neck corridor between North Bengal area and Assam.

Barak River should be utilised for inland water transport in the NER and also for connecting it to Bangladesh. This should be taken up as a National Project on similar lines as has been done for river Brahmaputra.

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.

DEVELOPMENT OF MULTIMODAL HUBS

The geography and demography of the region is spread in such a manner 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 a 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.

WE RECOMMEND...

It is necessary to form a separate body under the aegis of MODONER to monitor the construction activities in the sector.

State governments should draw up of five years. This master maintenance plan shall then form the basis on which the funding agencies will release funds.

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.

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, are essential to improve transportation in the region.

Guwahati Airport must be developed as a major international airport as a gateway to ASEAN countries.

PPP should be used to develop a viable civil aviation network in the region.

The Indo-Bangladesh Protocol on Inland Water Transit and Trade should be extended for at least 10 years at a time to attract investment.

Barak River should be utilised for inland water transport in the NER and also for connecting it to Bangladesh. This should be taken up as a National Project on similar lines as has been done for river Brahmaputra.

Multi-modal hubs should be developed at Dhubri and Badarpur.

India should develop a strategic long-term view on intensifying international transport linkages from the NER to its neighbours like Bhutan and Bangladesh as also ASEAN countries, Myanmar in particular.