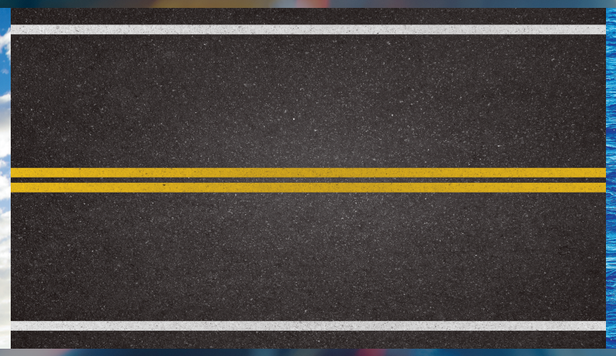
VOLUME III
SECTOR REPORTS
PART II

INDIA TRANSPORT REPORT

NTDPC INDIA TRANSPORT REPORT



MOVING INDIA TO 2032

SECTOR REPORTS

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LONDON NEW YORK NEW DELHI

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Government of India
National Transport Development
Policy Committee
भारत सरकार
राष्ट्रीय परिवहन विकास नीति समिति

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 NTDPC, the staff of the secretariat, and many other colleagues.

With warm regards,

Yours sincerely,

(Rakesh Mohan)

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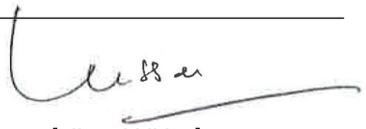

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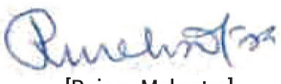

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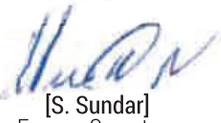

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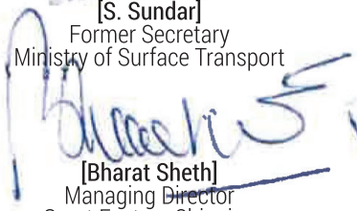

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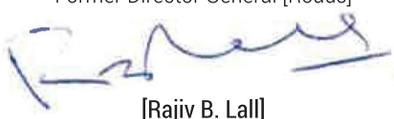

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31 December 2013

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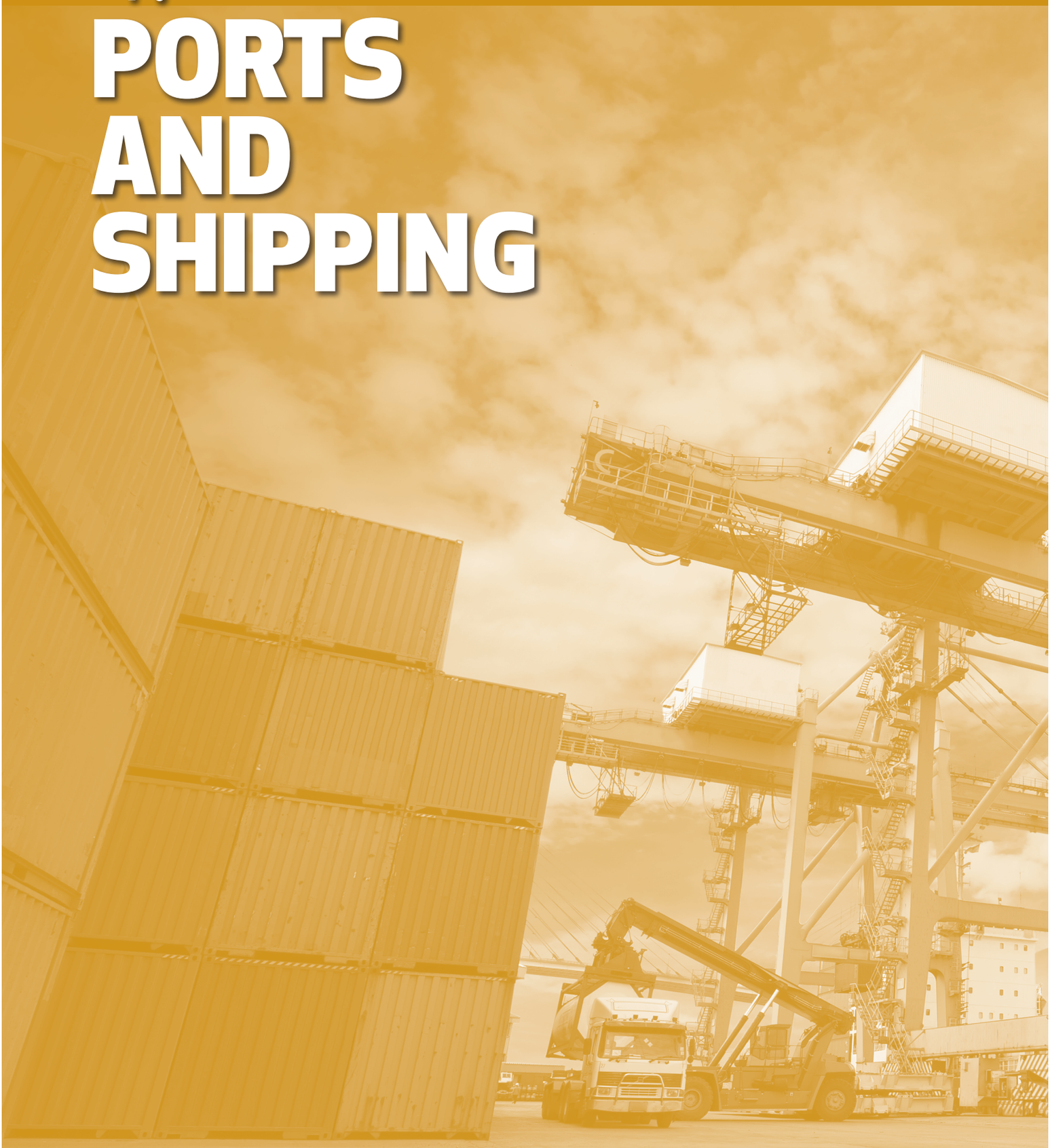
PART II

4. PORTS AND SHIPPING



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4. PORTS AND SHIPPING

India's current transport modal mix is dominated by road and rail that account for nearly 94 per cent of freight transport; the share of water is about 6 per cent[1]. This is low when compared to other large economies such as China (47 per cent), US (12.4 per cent) and Japan (34 per cent)[2].

The most important reason why development of ports is critical to India's economy is that Indian ports handle over 95 per cent of the country's total international trade volume and around 70 per cent of total trade value. India's 7,517-km coastline has 212 ports, and the quality of our ports has a significant influence on the cost structure of India's exports and defines its competitiveness in the global market.

Best-in-class ports can also help India emerge as a transhipment 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 environmental-friendly as compared to road. Balancing the modal mix will also significantly contribute to reducing the waste caused by poor logistics infrastructure, estimated to be as high as $45 billion annually[3].

CURRENT STATUS

PORTS

India's 12 Major Ports are administered by the Union Government, while the 200 notified Non-Major Ports are under the state governments and union territories.

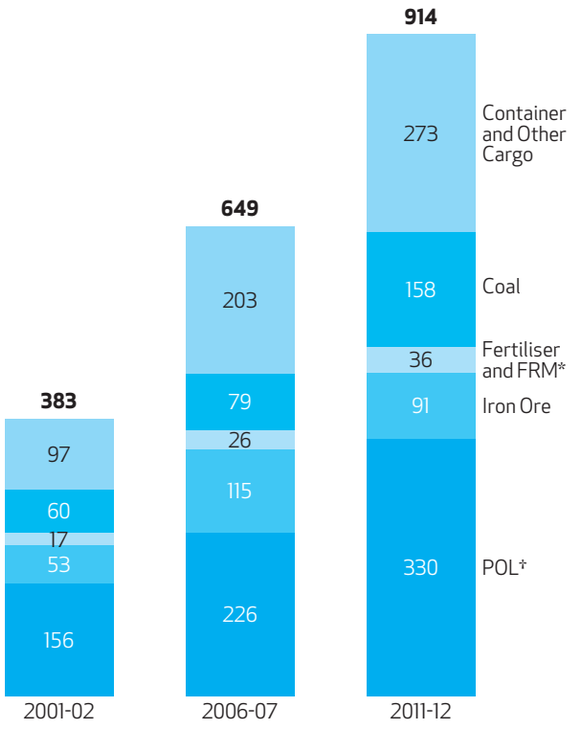
In 2011-12, total cargo handled by Indian ports was 913.9 million tonnes. The CAGR since 2006-07 had been 7.1 per cent, down from 11.1 per cent between 2001-02 and 2006-07. The drop reflects the effects of the global economic crisis and consequent slowdown in global and domestic growth.

During the 10th Plan, growth in cargo handled by Major and Non-Major Ports was 10 per cent and 14.1 per cent per annum respectively. In the 11th Plan, however, Major ports grew very slowly, at 3.8 per cent a year, while Non-Major ports grew at about 14 per cent. The year 2011-12 was challenging for Major Ports.

Growth in major industrial countries which are significant markets for Indian merchandise decelerated from 3 per cent in 2010 to 1.6 per cent in 2011. India's own GDP growth slowed from 8.4 per cent in 2010-11 to 6.2 per cent in 2011-12. While growth in manufacturing slowed from 7.6 per cent in 2010-11 to 2.5 per cent in 2011-12, the mining sector did a U-turn, from 5 per cent in 2010-11 to -0.9 per cent in 2011-12. Figure 4.1 shows the growth in traffic at Indian ports between 2001-02 and 2011-12.

1. NTDPC Research.
2. Note: The share of different countries pertains to different years: US – 2008, Japan – 2010, China 2009. Source: EU (2012).
3. For details, see McKinsey report (2010).

Figure 4.1
Commodity-wise Overall Port Traffic, 2001-02 to 2011-12
[Million Tonnes]



TRAFFIC	CAGR [Per cent] 2001-02 to 2006-07	2006-07 to 2011-12
Container and Other Cargo	15.9	8.1
Coal	5.5	14.9
Fertiliser and Fertiliser Raw Material [FRM]	8.7	6.9
Iron Ore	16.5	-4.4
Petroleum, Oil and Lubricants [POL]	7.8	7.8

* FRM: Fertiliser Raw Material
† POL: Petroleum, Oil and Lubricants

Source: NTDPC (2012b).

MAJOR PORTS

India's Major Ports, with the exception of Ennore, are structured as trust ports under the Major Port Trusts Act, 1963, functioning as semi-autonomous bodies under the administrative wing of the Ministry of Shipping. These are Kandla, Mumbai, Jawaharlal Nehru Port Trust (JNPT), Mormugao, New Mangalore, Kochi and Port Blair on the west coast; and Kolkata, Paradip, Vishakhapatnam, Ennore, Chennai and Tuticorin on the east. Ennore, a satellite port of Chennai, has been corporatised with the Government of India holding a two-third stake, and the Chennai Port Trust the rest.

TRAFFIC TRENDS

The 12 Major Ports handled 560 million tonnes of cargo traffic during 2011-12, more than 60 per cent of the country's total seaborne cargo. This figure comprises cargo loaded, cargo unloaded and transhipped to the tune of 194 million tonnes, 341 million tonnes and 25 million tonnes respectively. The capacity utilisation—560 million tonnes against 697 million tonnes—was approximately 80 per cent.

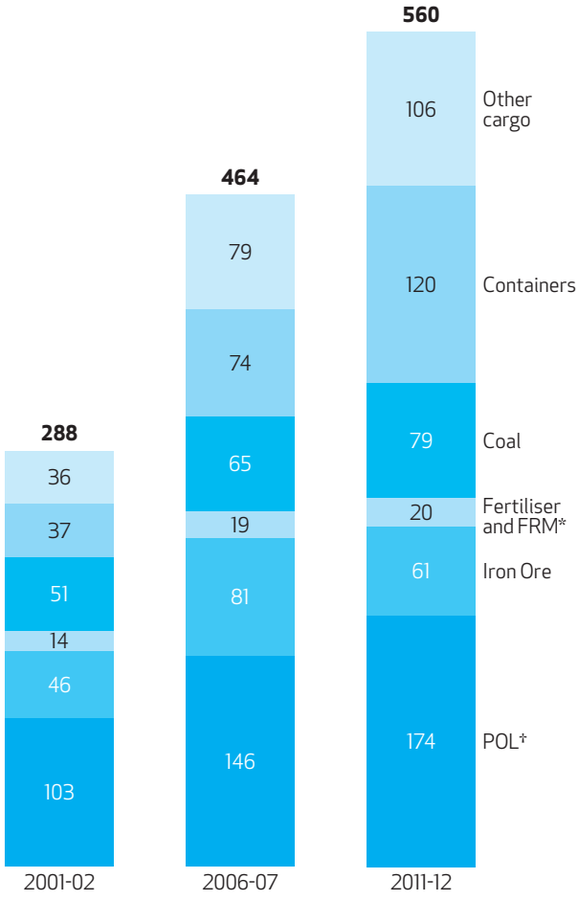
The CAGR of traffic at Major Ports for the period 1950-51 to 2011-12 has been 5.7 per cent, whereas during the post-liberalisation period—from 1990-91 to 2011-12, it was 6.4 per cent. During the 11th Plan, the CAGR has been 3.8 per cent, sharply lower than the 10 per cent seen during the 10th Plan.

In the last 10 years (see Figure 4.2), the highest CAGR—12.4 per cent—has been noticed in container cargo, followed by other cargo traffic (11.4 per cent), POL (5.3 per cent), coal (4.4 per cent), fertiliser and fertiliser raw material (3.9 per cent) and iron ore (2.9 per cent). During 2011-12, POL maintained a predominant share of 31 per cent in total cargo traffic followed by container cargo (21 per cent), other cargo (19 per cent), coal (14 per cent), iron ore (11 per cent) and fertiliser and FRM (4 per cent).

DRAFTS

The very low draft at Indian ports does not match international standards as per the Maritime Agenda 2010-20. This is a major constraint in traffic handling. Most Major Ports in India have a minimum draft

Figure 4.2
Commodity-wise Traffic for Major Ports, 2001-02 to 2011-12
[Million Tonnes]



TRAFFIC	2001-02 to 2011-12 CAGR [Per Cent]	Commodity-wise Share of Traffic in 2011-12 [Per Cent]
Other Traffic	11.4	19
Container	12.4	21
Coal	4.4	14
Fertiliser and Fertiliser Raw Material [FRM]	3.9	4
Iron Ore	2.9	11
Petroleum, Oil and Lubricants [POL]	5.3	31

* FRM: Fertiliser Raw Material
† POL: Petroleum, Oil and Lubricants

Note: Iron ore handled by major ports in the last 5 years (2006-07 to 2011-12) grew at a CAGR of -5.5 per cent.
Source: NTDPC (2012b).

under 10 m, except for a few newer ports which have drafts of more than 14 m (Annex 4.1). The world's top 20 container ports have drafts exceeding 15 m. Some ports in China and other countries have enhanced drafts still further to accommodate Super Post Panamax and larger vessels.

Dredging plays an important role in facing the challenges of increased vessel sizes and handling port operations. Total volume of capital and maintenance dredging for all ports during the 11th Plan was projected at of 675.25 million cubic metres (mcm) and 429 mcm respectively. Against these targets, only 278.93 mcm (41.31 per cent) and 291.63 mcm (67.82 per cent) were achieved. In Major Ports, the actual capital dredging was only 32 per cent of target. The shortfall was mainly due to delay or failure in implementing port development projects, financial and environmental constraints, paucity of engineering studies to assess the quantum and type of dredging to be performed, and poor response from bidders to undertake the work. Overall, the ports had done better in achieving the targets relating to maintenance dredging as opposed to capital dredging.

Inadequate draft at Indian ports entails extra time and costs as cargo originating from and bound to India is routed through transhipment ports like Colombo and Singapore. As vessels keep getting bigger, Indian ports need much deeper drafts, which calls for increased investments on capital dredging.

RAIL/ROAD CONNECTIVITY

Ports are nodes for interchange amongst various modes of transport and a vital element in the global logistics chain. It is thus critical to provide connectivity and other infrastructure for enabling quick evacuation within the ports as well as to the external hinterland, and to also enable the commodity to reach the consumer from the source of production in the shortest possible time and in the most cost-effective way.

Connectivity to a port can be through all three modes—rail, road and inland waterways. To a limited

extent, inland waterway connectivity exists in Kolkata, Mormugao and Kochi. As far as rail and road connectivity are concerned, a Committee of Secretaries (CoS) under the chairmanship of Member Secretary (Planning Commission) recommended that each Major Port should have minimum four-lane road and double-line rail connectivity within a fixed timeframe.

Four-lane road connectivity has already been achieved or is in an advanced stage of completion at JNPT, Paradip, Tuticorin, Kochi, New Mangalore, Kandla and Haldia. At Mumbai, Vishakapatnam, Chennai and Ennore, four-laning is in progress. At Mormugao, certain sections of the planned stretch remain to be four-laned, but work has been stuck since 2004. Kolkata is the only port where four-lane connectivity has not been provided. Overall, all Major Ports have reasonable road connectivity linking various highways. But special focus is needed on the reorganisation/overhauling of approach roads of Mumbai and Kolkata ports and their linkage with the national highway network.

The JNPT, Vishakapatnam, Tuticorin, Haldia, Chennai and Paradip are connected to double-line rail tracks, whereas at Kandla and Cochin, the connectivity work is on. Although Mumbai, Ennore and Kolkata ports are linked by double-line rail tracks, the lines require doubling. New Mangalore and Mormugao are connected only to single-line rail tracks. A serious effort is needed to improve hinterland connectivity, especially by rail.

NON-MAJOR PORTS

The 200 Non-Major Ports are located in the maritime states of Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, West Bengal and union territories of Puducherry, Daman and Diu and Lakshadweep. Out of these, only a few ports are well-developed and provide all-weather berthing facilities. In 2011-12, only 61 ports—including ports at the Andaman and Nicobar Islands—were reported to have handled cargo traffic.

TRAFFIC TRENDS

Non-Major Ports in India collectively handled 354 million tonnes of traffic in 2011-12; up from 96 million tonnes in 2001-02. The CAGR in traffic during the decade was 14 per cent; double that for Major Ports.

The Non-Major Ports' share of the total cargo traffic handled by all ports increased from 25 per cent in 2001-02 to 39 per cent in 2011-12. This has largely been due to lower levels of regulatory and financial control compared with Major Ports. Non-Major Ports have been more successful in attracting higher private investment, because they are perceived to be more business-oriented, customer-friendly, cheaper and in general, more efficient.

POL and its products (44 per cent) was the single largest commodity handled at Non-Major Ports in 2011-12 and its share has ranged up to 55 per cent (in 2001-02). In the last 10 years, the relative shares of commodities in the cargo basket have not shown any pronounced shift (see Figure 4.3).

DRAFTS

Non-Major Ports achieved only 47 per cent of their capital dredging targets during the 11th Plan; 177 mcm against 377 mcm. This was however much better than that of the Major Ports (32 per cent).

RAIL/ROAD CONNECTIVITY

Of the 200 Non-Major Ports, 61 handle export-import cargo and the others are mainly fishing harbours. Even out of these 61, only six enjoy rail connectivity up to the port. Another eight to 10 need last mile connectivity. There is an urgent need to improve rail connectivity. Even road connectivity is a serious bottleneck. This is bit one illustration of the necessity for integrated planning of port location along with rail and road investments.

The existing projects and those in the pipeline will provide reasonable road connectivity to ports like Mundra, Hazira, Machilipatnam, Dighi and Jaygad. The others may have only skeletal kachcha (unpaved) road networks; they are not connected through two-lane highway-quality roads to the nearest national highway. As for rail connectivity, a few projects have been launched and are in the pipeline for Dehaj, Gangavaram, Dhamra, Mundra, Krishanapatnam, Rewas, Dighi and Jaygad.

CURRENT REGULATORY SCENARIO

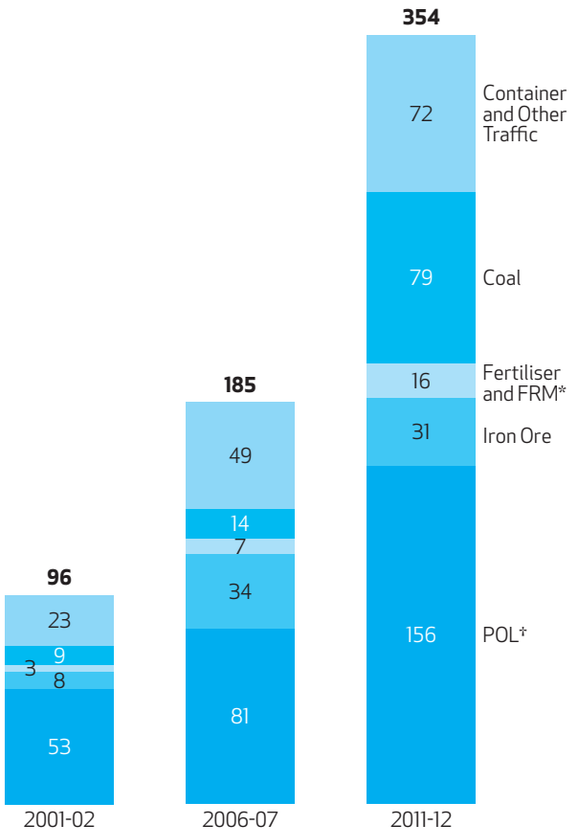
All Indian ports are regulated under the Indian Ports Act, 1908. This Act defines the jurisdiction of central and state governments over ports, and lays down general rules for safety of shipping and conservation of port facilities. It regulates matters pertaining to the administration of port dues, pilotage fees and other charges.

KEY AGENCIES

The Ministry of Shipping Ports Wing under the Department of Shipping covers all development and management aspects of Major Ports. Its key powers and responsibilities are:

- Administration of the Indian Ports Act, 1908, and the Major Port Trusts Act, 1963
- Formulation of infrastructure policy for ports, shipping and inland waterways
- Shipping policy and legislation, implementation of various international conventions relating to safety, prevention of pollution and other mandatory requirements as laid down by the International Maritime Organisation (IMO), promotion of maritime education and training
- Planning, development and regulation of inland waterways

Figure 4.3
Commodity-wise Traffic for Non-Major Ports, 2001-02 to 2011-12
[Million Tonnes]



TRAFFIC	2001-02 to 2011-12 CAGR [Per cent]	Commodity-wise Share of Traffic in 2011-12 [Per cent]
Container and Other Traffic	11.9	20
Coal	24.4	22
Fertiliser and Fertiliser Raw Material [FRM]	17.8	4
Iron Ore	14.9	9
Petroleum, Oil and Lubricants [POL]	11.5	44

* FRM: Fertiliser Raw Material
† POL: Petroleum, Oil and Lubricants

Note: Iron ore handled by Non-Major Ports in the last five years (2006-07 to 2011-12) grew at a CAGR of about -2.0 per cent.
Source: NTDPC (2012b).

Ministry of Finance mainly handled by the Infrastructure and Investment Division of the Department of Economic Affairs, the key port-related functions are:

- Examination of investment proposals which require approval of the Public Investment Board and the Cabinet Committee for Economic Affairs
- Matters related to infrastructure financing and promotion
- Policy matters related to public-private partnerships (PPP)
- All proposals for foreign direct investment (FDI) to be approved by the Foreign Investment Promotion Board (FIPB)

Maritime States Development Council (MSDC) MSDC was constituted in 1997 to have an integrated approach for development of both Major and Non-Major Ports. MSDC consists of ministers in charge of ports in all maritime states and union territories. MSDC functions as a policy coordinating body between the central government and the maritime states.

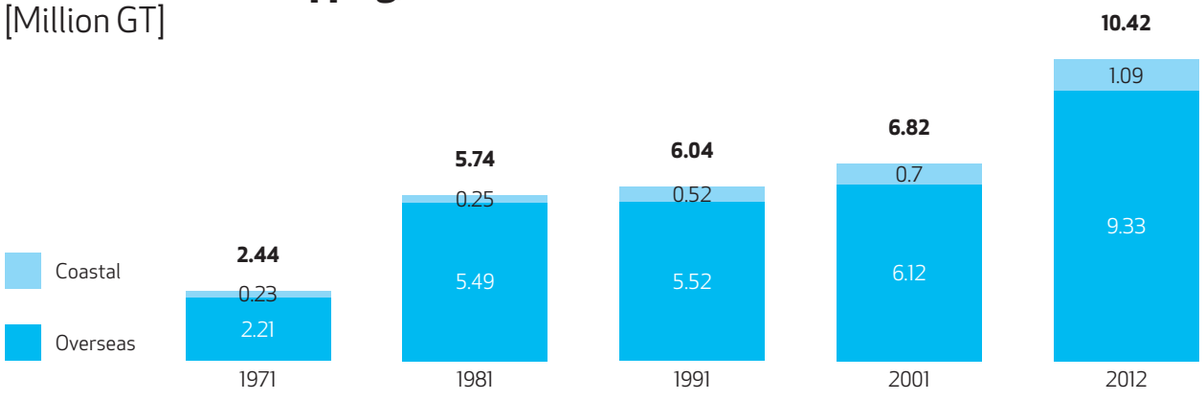
Tariff Authority for the Major Ports (TAMP) TAMP is the economic regulator for the Major Ports and is charged with fixing and revising tariffs, including tariffs of privately owned terminals. Guidelines issued in 2008 comprise a tariff cap, which is set upfront, prior to inviting bids for a PPP project. With respect to tariff increases of existing terminals, a cost-plus approach is applied as per 2005 guidelines.

MANAGEMENT OF MAJOR PORTS

Every Major Port is governed by a Board of Trustees constituted by the central government.

The members of the trust are in principle selected to represent various interests. The Trustees follow the government's policy decisions within their delegated financial powers. Port dues and port and terminal

Figure 4.4
Growth of Indian Shipping, 1971 to 2012
[Million GT]



	NO. OF SHIPS				
	1971	1981	1991	2001	2012
Coastal	66	59	163	316	804
Overseas	184	331	255	230	350

Source: GoI (2012).

services rates are externally fixed by TAMP. There is a ceiling for capital expenditures; amounts above such ceiling have to be approved by the government.

MANAGEMENT OF NON-MAJOR PORTS

The responsibility for the development of Non-Major Ports vests with the concerned state government. No permission is required from the central government to establish a Minor Port. They are placed in the Concurrent List of the Constitution and are administered under the Indian Ports Act, 1908.

The department in charge of ports or the State Maritime Board is responsible for formulation of waterfront development policies and plans, regulating and overseeing the management of state ports, attracting private investment in the development of state ports, enforcing environmental protection standards and so on. Maritime boards have so far been constituted in Gujarat, Maharashtra and Tamil Nadu.

KEY POLICY DEVELOPMENTS

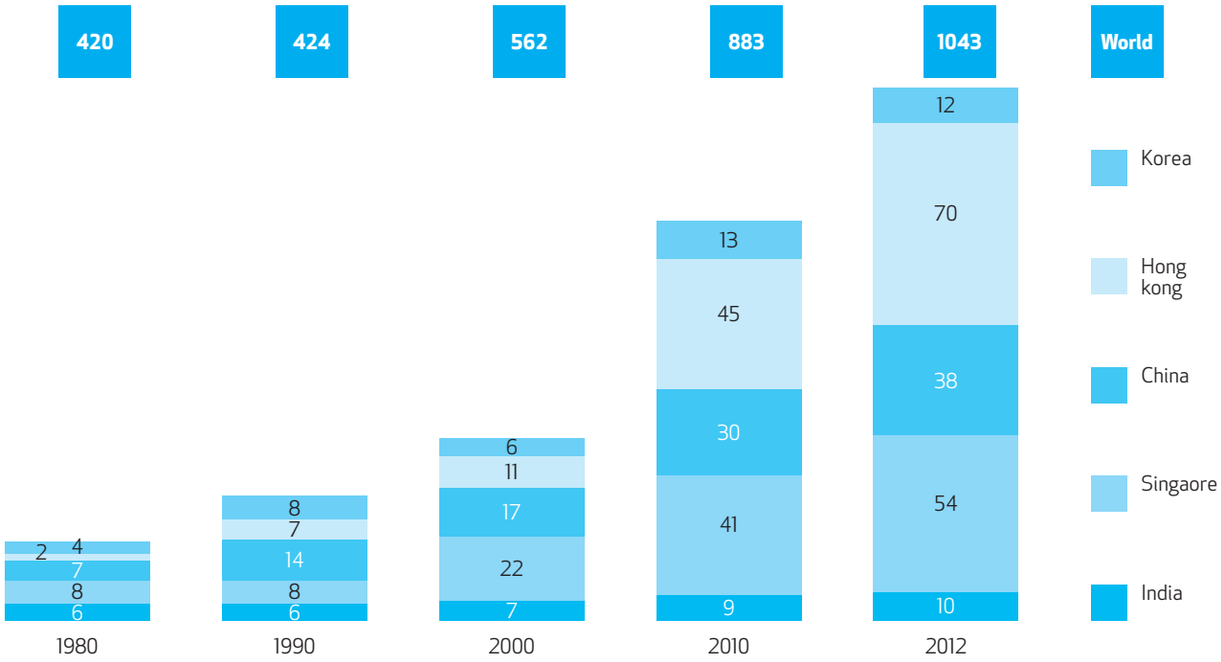
The Indian government has long recognised the need to operate ports on commercial lines. In 1996, the sector was opened for private participation in select areas based on the expectation of improved service delivery for users and commercial viability for the private investor. The government decided to move towards the Landlord Port concept, where new ports would be established as companies under the Companies Act, and existing port trusts would be corporatised. However, this plan has not been implemented, with the exception of Ennore Ltd (2001). However, many isolated initiatives have been taken by the central government and the maritime states since then.

National Maritime Development Programme (NMDP): Formulated in 2005 by the Ministry of Shipping to provide guidelines for capacity augmentation and hinterland connectivity improvements at Major Ports, the programme mandates that over 60 per cent of the required funds be raised from private sector. The government has also shown intentions of delegating powers to port trusts for speedier decision making and implementation. In addition, a series of measures have been announced recently to promote foreign investment in the sector:

- No approval required for foreign equity up to 51 per cent in projects providing supporting services to water transport
- Automatic approval of foreign equity up to 100 per cent in construction and maintenance of ports and harbours. However, the proposal needs to be referred to FIPB for investments exceeding Rs 15 billion.
- Open tenders to be invited for private sector participation on build-operate-transfer (BOT) basis
- Permission granted for formation of joint ventures between Major Ports and foreign ports, Major Ports and Non-Major Ports, and Major Ports and companies

Model Concession Agreement (MCA): Approved in 2008, MCA governs the functioning of Major Ports with respect to PPP projects. It consists of all the elements and issues that usually form part of an international terminal concession. The tariffs cannot be adjusted by the concessionaire but are dependent on the decisions of TAMP. The new MCA approved by the government in 2009 allows a port trust to directly

Figure 4.5
Gross Tonnage for Select Countries, 1980 to 2012*
[Million GT]



* As of January, 2012.
Source: UNCTAD (2012).

approach the inter-ministerial PPP Appraisal Committee for final project approval without having to first acquire in-principle approval.

B. K. Chaturvedi Committee Report: The Committee observed that the tariff fixing process by TAMP sometimes led to delays that slowed down the entire procurement process of PPP projects, and that performance standards as used by TAMP for tariff fixing and those agreed between the parties in concession agreements could differ. The Committee proposed the following policy changes regarding TAMP:

- Short term: Expanding tariff setting capabilities through in-house capacity building and streamlining of procedures
- Medium term (1-2 years): Delegation of tariff setting to the Major Port Trusts while TAMP acts as the appellate authority
- Long term (2 years): Leave tariff setting to market forces. Port terminals where competition already exists may be left to market forces immediately.

SHIPPING

India has a fleet strength of 1,154 vessels with gross tonnage (GT) of 10.42 million tonnes. Of these vessels, 804 (70 per cent) with 1.09 million GT (10 per cent) were engaged in coastal trade and the remaining 350 vessels with 9.33 million GT were deployed for overseas trade. Indian shipping tonnage, which had been stagnating at 6-7 million GT till June 2004, increased to 10.42 million GT by December 2012. One of the reasons attributed for the upswing was the introduction of tonnage tax in 2004. The major share of Indian tonnage belongs to Shipping Corporation of India, a public sector undertaking whose share is 32.5 per cent (3.39 million GT with 86 vessels). Figure 4.4 provides an overview of the growth in Indian shipping between 1971 and 2012.

INDIAN TONNAGE: GROWTH, AGE STRUCTURE, COMPOSITION

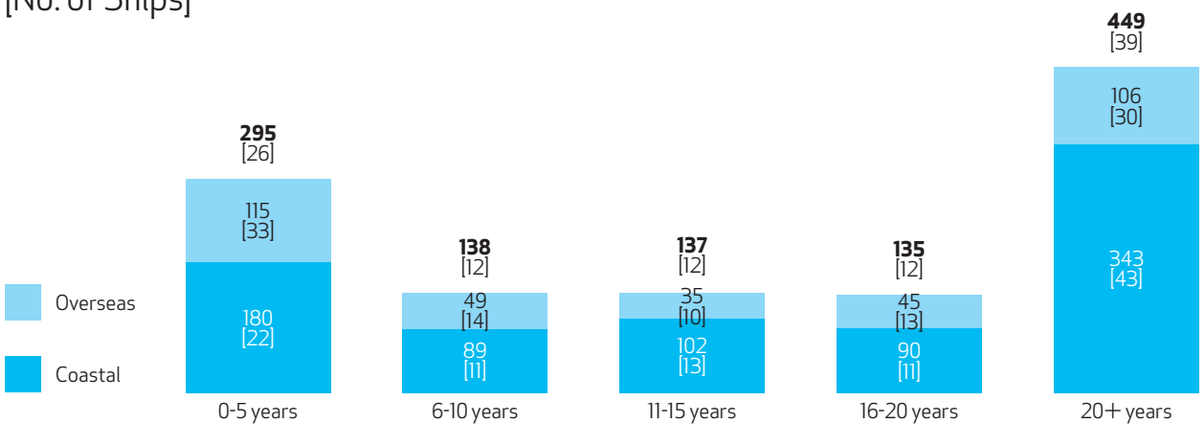
The maximum number of vessels (635) in the Indian fleet are dry cargo liners[4] followed by oil tankers (139), dry cargo bulk carriers (128).and off-shore supply vessels (117). In terms of GT, 53 per cent of the Indian tonnage (5.54 million GT) was in the oil tanker[5] category, followed by dry cargo bulk carriers (32 per cent). Dry cargo liners which accounted for highest number of vessels in Indian fleet (55 per cent) contributed a mere 11 per cent (1.2 million GT).

India's CAGR in shipping as per the national flag registrations (in terms of GT) from 1980 to January, 2012 has been much lower than growth in tonnage at the global level, for Asia and particularly competitors like Korea and China (see Figure 4.5).

The Indian fleet is clearly over-aged; more than 39 per cent of the fleet is above 20 years old, and about

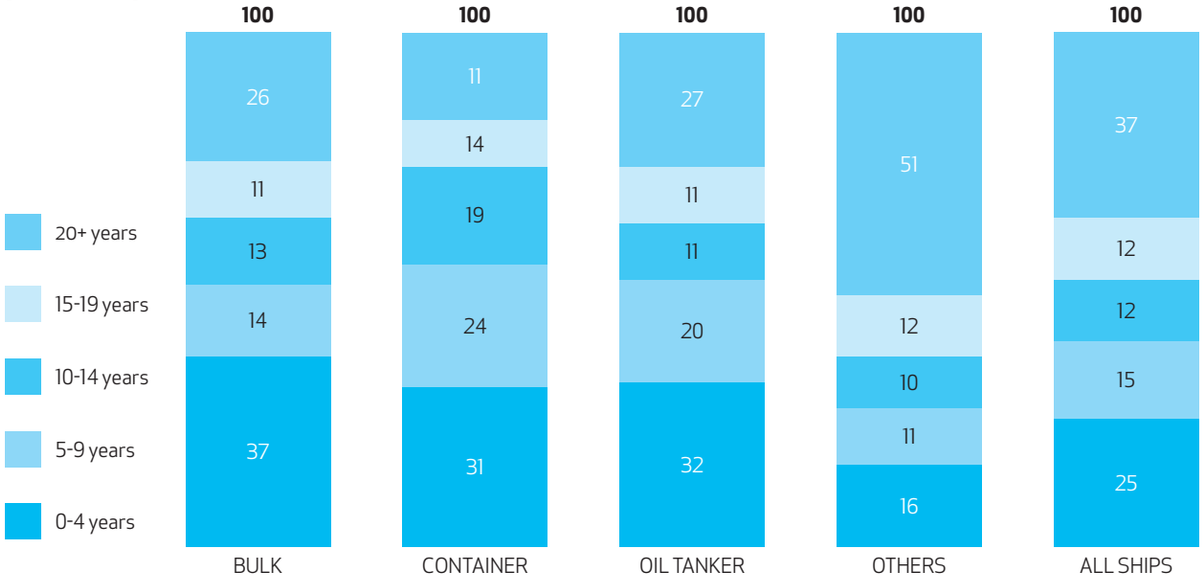
4. Includes cellular containers, tugs, ro-ro vessels, dredgers, barges, motor launch and supply vessels.
5. Includes acid, LPG and gas carriers.

Figure 4.6
Age Composition of Indian Fleet, December 2012
[No. of Ships]



Note: Figures in parentheses indicate percentage shares.
Source: Indian National Ship Owners Association.

Figure 4.7
Age Composition of World Shipping Fleet, January 2012
[Per cent]



Source: ISL (2012).

26 per cent in the age group of below five years (Figure 4.6). In contrast, age profile of the world fleet reflects that 40 per cent of global tonnage was less than nine years of age (Figure 4.7). The share of vessels in the age group 20 years and above was around 37 per cent. A younger age profile leads to higher efficiency and productivity of the tonnage.

Figure 4.8 is a comparison of the composition of tonnage of fleets of various countries, plus global tonnage.

In India, 'flagging out' or migration to flags of convenience or open registries has been rather limited. The share of vessels under foreign flags in the Indian fleet as of January 2012 was around 19 per cent compared to 85 per cent for Taiwan, 82 per cent for Japan, 45 per cent for China, and 40 per cent for Korea[6].

COASTAL SHIPPING

Despite a 7,517-km-long coastline, coastal shipping is still in its infancy in India, with 804 ships accounting for just over 10 per cent of the total Indian tonnage. The average age of the coastal fleet is much higher than that of the overseas fleet (Figure 4.6). Coastal cargo was about 159 million tonnes or about one-fifth of the export-import cargo in 2011-12. Figure 4.9 provides an overview of the tonnage and composition of coastal vessels.

6. UNCTAD (2012).

Figure 4.8
Composition of Merchant Fleet, January 2012
[Thousand GT]

COUNTRY	BULK CARRIER	CONTAINER	GENERAL CARGO	OIL TANKERS	OTHERS	GT
INDIA	2,952	224	342	5,016	1,228	9,762
China	18,435	5,268	3,941	7,389	2,890	37,924
Hong Kong	38,712	12,827	3,370	14,061	1,236	70,206
Korea	7,337	779	1,487	846	1,635	12,084
Malaysia	212	65	431	3,465	3,439	8,197
Developing Countries of Asia	92,144	34,755	25,263	62,900	21,571	236,633
Developing Countries	34,350	40,264	24,117	51,816	39,090	189,638
Open Register	209,586	95,586	48,236	155,541	61,731	570,680
World	343,524	171,741	109,685	281,950	136,132	1,043, 033

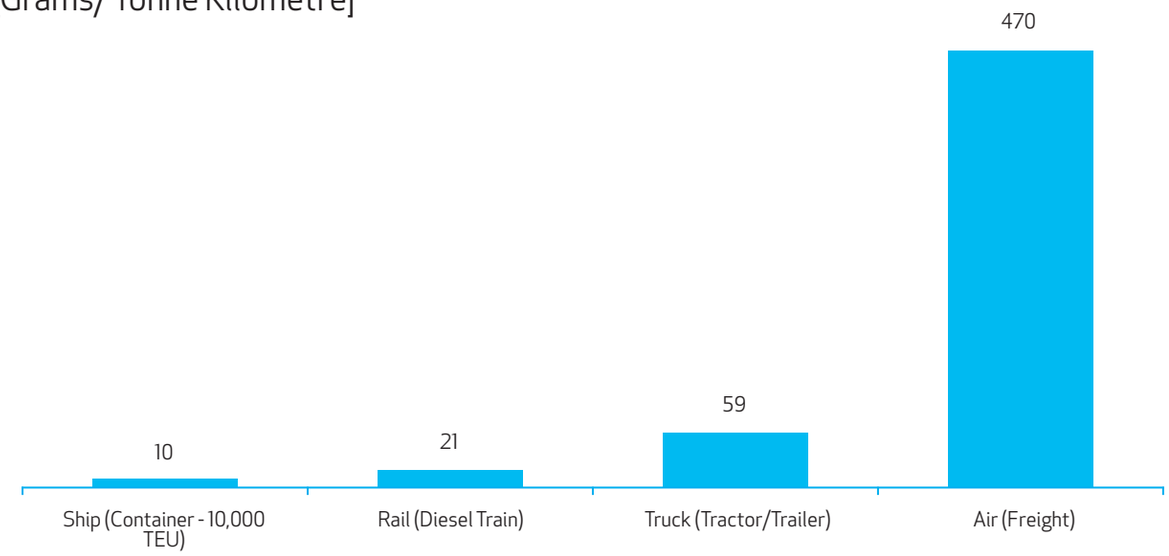
Source: UNCTAD (2012).

Figure 4.9
Tonnage and Composition of Indian Coastal Vessels, December 2012
[No. of Ships]

TYPE OF VESSELS	NO. OF VESSELS	G.T. (THOUSANDS)
Tug	277	92
Offshore Supply Vessels	111	121
Port Trusts & Maritime Boards	95	46
Dry Cargo Liners	74	120
Passenger Services	59	22
Specialised Vessels for Offshore Services	38	88
Passenger-cum-Cargo	33	90
Dredgers	30	128
Dry cargo Bulk Carriers	26	240
Tankers (Product Carriers)	13	40
Ethylene Gas Carriers	3	9
Tankers (Crude Oil Carriers)	2	50
Ro-Ro	1	1
Grand Total (Vessels) Coastal Trade	**804**	**1,087**

Source: GoI (2012).

Figure 4.10
Carbon Dioxide Emission
[Grams/ Tonne Kilometre]



Source: World Shipping Council (2009).

The need to promote coastal shipping has been increasingly deliberated within government and policy makers. The National Action Plan of the Prime Minister's Council on Climate Change identified promotion and use of coastal shipping and inland waterways as the first action point for the transport sector. Some of the key reasons as to why coastal shipping in India needs to be promoted are:

- Cost of transportation significantly lower than conventional modes by 25 per cent, according to some studies
- Lower carbon emissions vis-à-vis other modes of transport
- Coastal shipping can help reduce concentration of traffic on the already strained road network
- It can lead to optimal use of India's natural advantage and resource a long coastline.

The interim Planning Commission report on low carbon strategies for inclusive growth, while discussing possible interventions in the transport sector that would lead to increased efficiency accompanied by lower emissions, specifically made a mention of the usage of smarter options such as inland and coastal waterways as alternative modes of transport. Figure 4.10 is a comparison of CO_2 emissions across transport modes with ships being the lowest. Figure 4.11 is a summary of emission data for various types of ships compared with a truck.

India needs a viable scheme to incentivise and support a modal shift of cargo to water transportation from road and rail. The European Union has set a target of moving more than 50 per cent of its road and rail transport to short sea shipping by 2030.

For any policy intervention to be effective, a careful assessment and cognisance of several issues specific to the sector are required.

INADEQUATE INFRASTRUCTURE AT NON-MAJOR PORTS

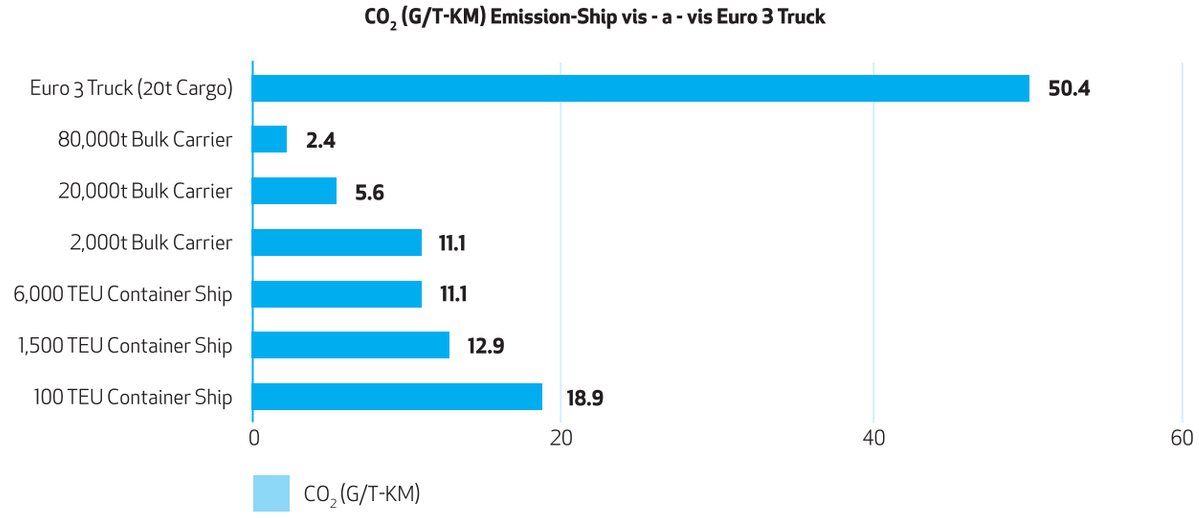
Draft: Presently, most coastal shipping operations in India are centred around a Major Port as the Non-Major Ports suffer from inadequate draft and large inventories of dysfunctional equipment. Ship owners currently prefer to operate coastal vessels having a draft of 7-9.5 m due to their economic feasibility. Adequate depth for such vessels is not available at the Non-Major Ports. Even a river-sea vessel would require a draft of around 3.5 m to carry out coastal operations economically.

Berthing: Lack of adequate berthing facility, number of berths, sufficient length for proper berthing of the vessels at the Non-Major Ports is another problem, which forces incoming vessels to keep waiting idly. Further, Major Ports usually provide priority to foreign-going vessels, as they operate in a competitive environment and would want to project a better revenue and cargo performance. Therefore, coastal vessels end up with step-motherly treatment.

Cargo handling equipment: Most Non-Major Ports do not have proper material handling equipment in place which could facilitate a quick turnaround. This discourages coastal vessels.

Space for infrastructure development: Availability of space for infrastructure development is a huge concern at most Non-Major Port locations,

Figure 4.11
Carbon Dioxide Emission: Ships vs Euro 3 Truck
[Grams/T-Km]



Source: Ebert (2005).

Last mile connectivity: This is indispensable for attracting cargo traffic at any port. National Highways Authority of India (NHAI) has the mandate to provide road connectivity to Major Ports while Rail Vikas Nigam Limited (RVNL) is the nodal agency to increase rail connectivity to ports and development of corridors to the hinterland including multi-modal corridors for movement of containers. However, Non-Major Ports do not have the requisite hinterland connectivity. Roads leading to ports are too narrow for containers/cargo movement. The inefficient and underdeveloped supply chain is a bottleneck in the development of coastal shipping and renders the end-to-end logistics costs uneconomical while also increasing total transportation time.

Several small players currently dominate coastal shipping, and the resultant divided capacity hampers economies of scale. Further, most players operate on wafer-thin margins which are not commensurate with the risks and capital involved.

INLAND WATER TRANSPORT

Till the first half of the 20th century, inland water transport (IWT) played a significant role in trade and commerce. The Inland Waterways Authority of India (IWAI) was constituted for development and regulation of the sector. However, IWT has remained underdeveloped; in part because public investment has been very low compared to other modes of transport.

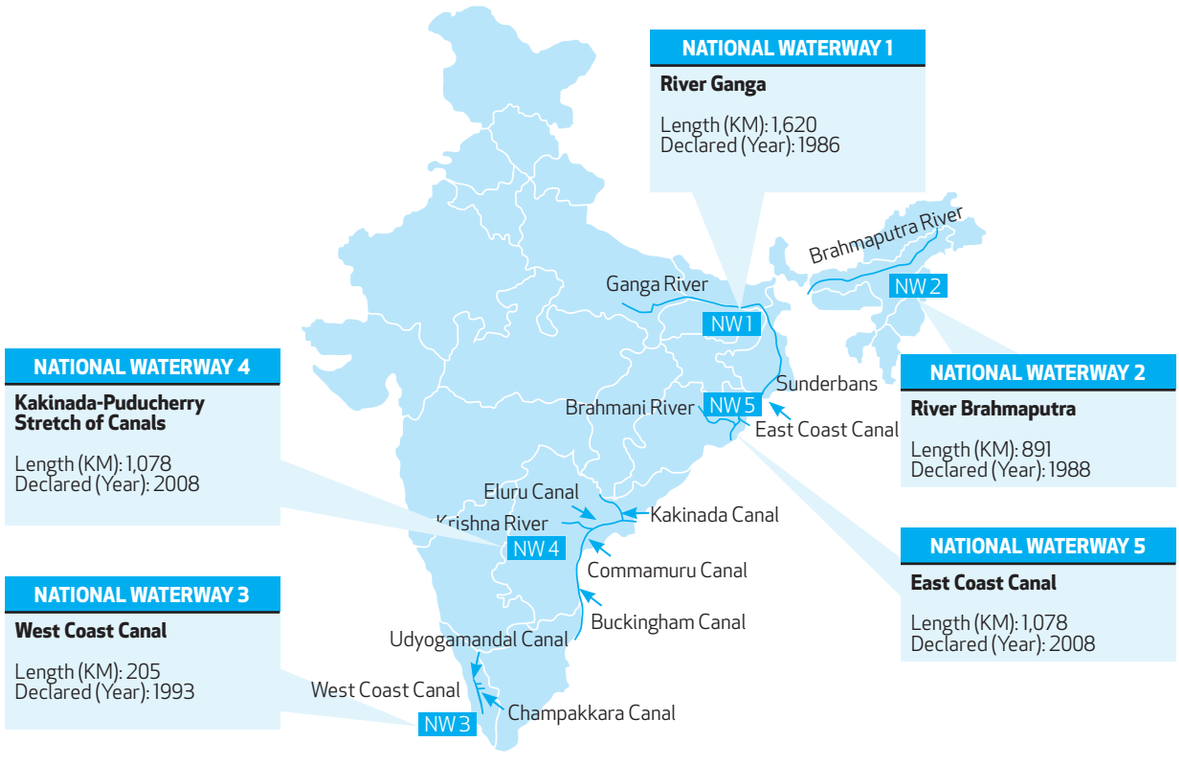
NATIONAL WATERWAYS

India has five National Waterways (NW): the River Ganga (NW-1), River Brahmaputra (NW-2), West Coast Canal (NW-3), Kakinada to Puducherry Canal System along with River Godavari and River Krishna (NW-4); and the Brahmani and Mahanadi delta along with East Coast Canal (NW-5). Figure 4.12 provides basic details. River Barak is likely to be declared as the sixth NW. Development and regulation of NWs is in the purview of the central government while the rest of the waterways come under respective state governments.

IWAI has been mandated to develop and maintain infrastructure for fairway, navigational aids and terminals to develop an enabling environment for private investment in cargo vessels and operational services. It has been successful on NW-1, NW-2 and NW-3 to a reasonable extent. It has developed systems and procedures for regular operation and maintenance (O&M) of the critical infrastructure and also strived to ensure dissemination of information. Since its inception in October 1986, IWAI spent about Rs 10.36 billion till 2010-11, which included about Rs 8.86 billion on NW-1, 2 and 3, and the balance amount on subsidies, training, technical studies and so on.

The average yearly expenditure of IWAI has gone up substantially from Rs 70 million during the 8th Plan to Rs 1.08 billion during the 11th Plan. However, the total expenditure on infrastructure in 25 years (1986 to 2011) is only Rs 10.36 billion, which, though dependent on demand, is insignificant compared to what has been invested in the road and rail sectors. In fact, with respect to NW-4 and 5, which were

Figure 4.12
National Waterways in India



Source: NTDPC (2012b).

declared as NWs in 2008, the Planning Commission could not allocate any funds; so development works on these waterways could not commence.

OTHER IMPORTANT WATERWAYS

Besides NWs, other waterways extensively used for IWT includes Goa Waterways for transportation of iron ore for export, and Mumbai Waterways for coal, steel and so on.

Goa Waterways: These comprise 50 km stretches each of river Mandovi and Zuari, and a 20 Km stretch of the Cambarjua canal. These waterways provide connectivity to Mormugao Port and Panaji Port and carry 50 MMT of iron ore for exports. The cargo movement on Goa Waterways increased from 36 MMT in 2005-06 to 43 MMT in FY 2011-12, an overall growth of around 19 per cent. Cargo movement has increased from 1.8 btkm in 2005-06 to 2.2 btkm in 2011-12.

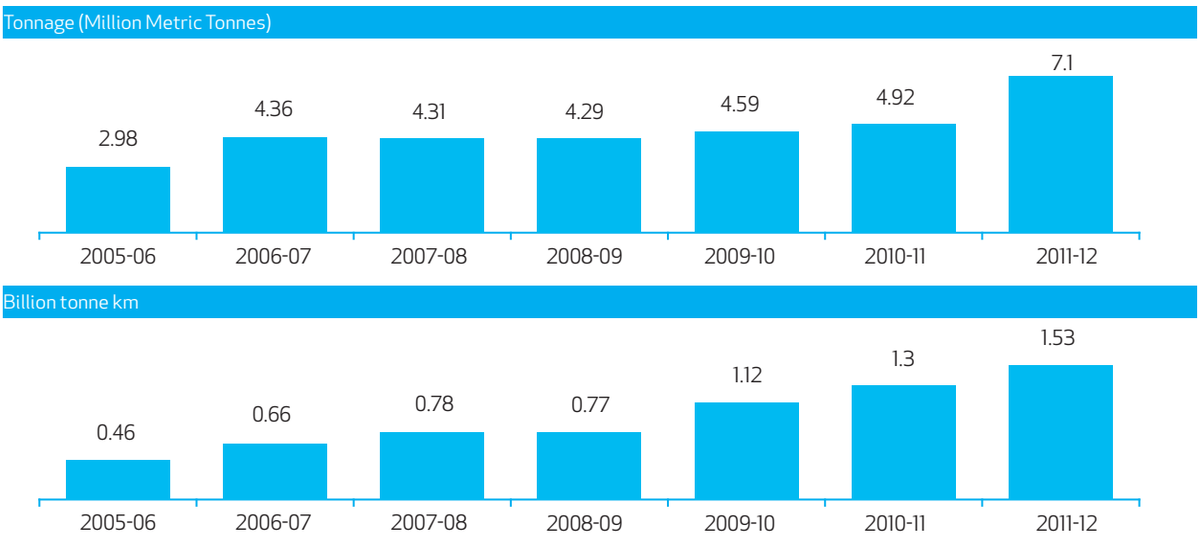
Mumbai Waterways: The tidal inland waterways of Mumbai, such as River Amba, River Ulhas and Dharamtar creek carry mainly coal and steel. The cargo increased from 11.2 MMT in the FY 2005-06 to 20 MMT in FY 2011-12, a strong growth of almost 79 per cent. In terms of btkm, cargo movement rose from 0.603 btkm to 1.1 btkm.

Indo-Bangladesh protocol on IWT: An Inland Water Transit and Trade Protocol exists between India and Bangladesh, under which inland vessels of one country can transit through specified routes of the other. The existing protocol routes are: Kolkata-Silghat-Kolkata, Kolkata-Karimganj-Kolkata, Rajshahi-Dhulian-Rajshahi, Silghat-Karimganj-Silghat.

The protocol also allows trade through IWT. Five ports of call have been designated in each country. These are: Haldia, Kolkata, Pandu, Karimganj and Silghat in India, and Narayanganj, Khulna, Mongla, Sirajganj and Ashuganj in Bangladesh. More than 1.5 million tonnes of fly ash is transported between Kolkata/Haldia and Bangladesh every year under the protocol. Recently, more than 90 consignments of project material for the Palatana power plant of ONGC, being constructed near Agartala in Tripura, have been transported from Kolkata/Haldia through the protocol route up to Ashuganj in Bangladesh, and thereafter by road to Palatana, 40 km away.

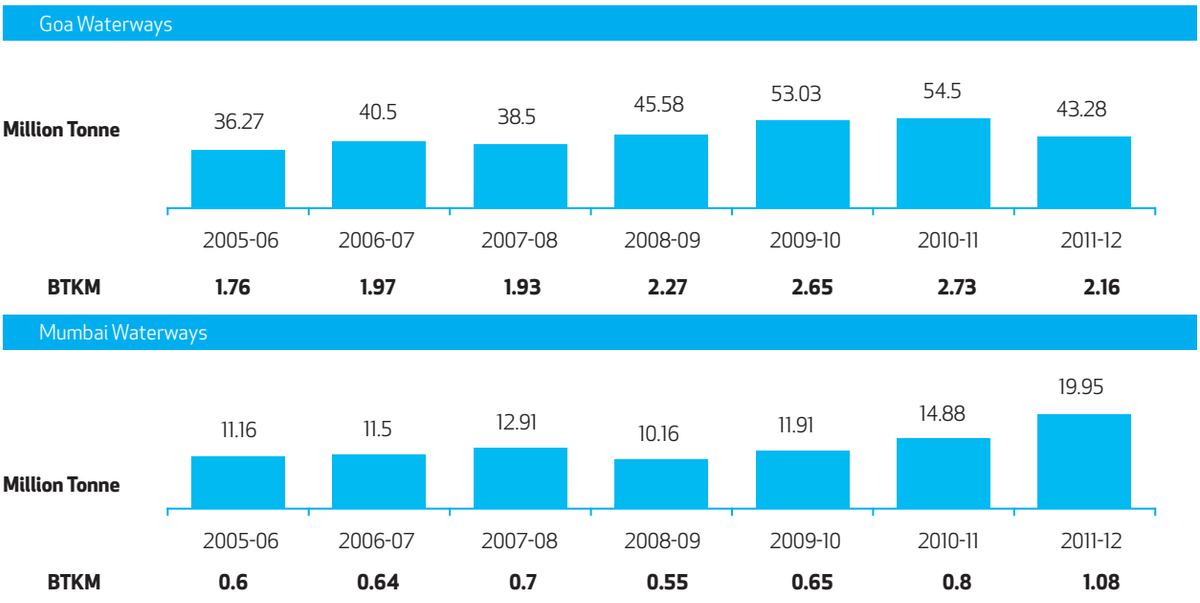
Kaladan Multimodal Transport Project: The project, conceptualised by the Ministry of External Affairs (MEA) to provide alternative connectivity of Mizoram with Kolkata/Haldia ports through River Kaladan in Myanmar, envisages coastal shipping/ maritime shipping from Haldia to Sittwe, IWT from Sittwe to Paletwa in Myanmar, and thereafter by road from Paletwa to Mizoram. The project is piloted and funded by the Ministry of External Affairs (MEA) which appointed IWAI as the project development consultant (PDC). Construction of Sittwe port is in progress.

Figure 4.13
Cargo Movement on National Waterways



Source: NTDPC (2012a).

Figure 4.14
Cargo Movement on Goa and Mumbai Waterways



Source: NTDPC (2012a).

TRAFFIC TRENDS

Cargo transportation by IWT has been steadily increasing. Movement on NWs 1, 2 and 3 has increased from 3 MMT in 2005-06 to 7.1 MMT in FY 2011-12, an overall growth of around 137 per cent. In btkm terms, it has risen from 0.46 btkm to 1.53 btkm.

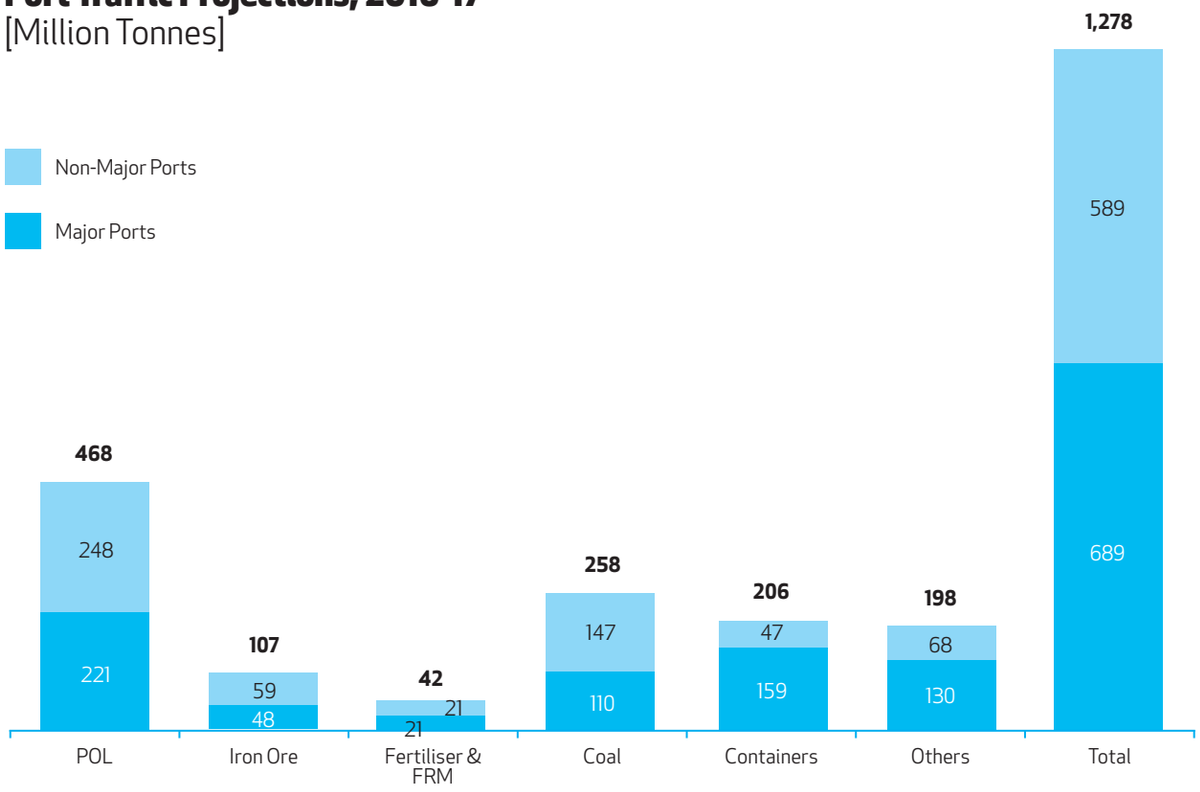
Tables 4.13 and 4.14 provide growth in traffic on National Waterways and Goa/Mumbai Waterways respectively.

FUTURE OUTLOOK

PORTS

As stated earlier, Indian ports handle over 95 per cent of the country's total trade volume and around 70 per cent of total trade value. It is thus imperative to build adequate capacity at our ports over the next two decades.

Figure 4.15
Port Traffic Projections, 2016-17
[Million Tonnes]



Source: NTDPC (2012b).

TRAFFIC PROJECTIONS

A sharp slowdown in world trade and domestic growth hit cargo traffic handled by Major Ports in 2012-13; growth was -2.6 per cent. Considering weak global growth prospects and weakening of domestic growth dynamics, this is expected to grow at about 6 per cent for the remaining four years of the 12th Plan. For Non-Major Ports, the annual growth in cargo traffic is assumed at about 11 per cent. Keeping in view the trends in the share of commodities, total cargo traffic at Indian ports is estimated to increase from 914 million tonnes in 2011-12 to 1,278 million tonnes by 2016-17 (Figure 4.15).

Cargo traffic for subsequent years upto 2031-32 (Figure 4.16) has been projected using expected growth rates for various commodity groups, based on perceptions of user Industries and long-term growth rate trends.

CAPACITY REQUIREMENTS

The international practice for ports is to plan for cargo handling capacity of 30 per cent more than the projected traffic so that pre-berthing detention of ships is minimised. Capacity needs to be planned separately for each commodity group as each requires different facilities. The total capacity required at Major and Non-Major Ports at the end of the 12th Plan period is estimated at 1,662 million tonnes (Figure 4.17).

MAJOR PORTS

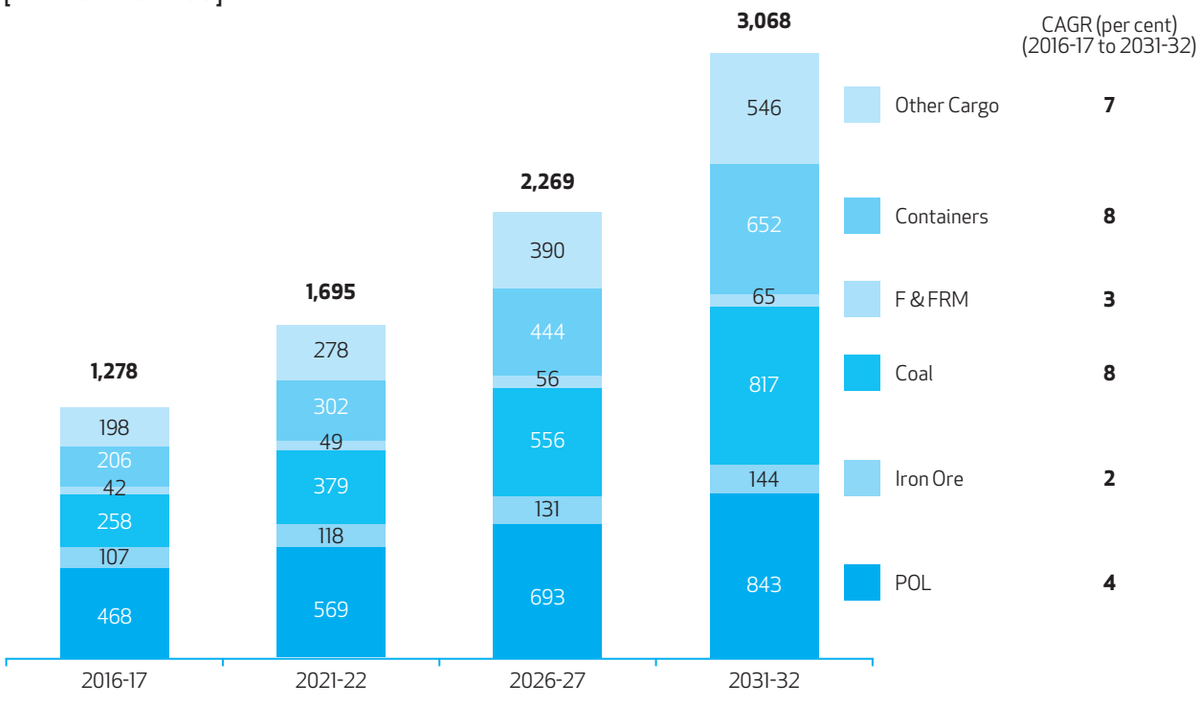
The capacity at the end of the 11th Plan period at Major Ports was 697 million tonnes, while traffic handled was 560 million tonnes. The Major Ports plan to increase capacity to 896 million tonnes during the 12th Plan to meet traffic demand of 689 million tonnes.

It is envisaged that ports in India should achieve draft of at least 14 m by the end of the 12th Plan and 17 m in the first half of the 13th Plan for some ports. Presently, 14 m drafts are available at four ports: Paradip, Kochi, New Mangalore and Mormugao. Efforts are being made to increase the draft to 14 m at Vishakapatnam, Ennore, Chennai, Tuticorin, JNPT and Kandla. At present, only Paradip Port has a draft of 17 m available in the inner channels/berths. While for some ports such as Tuticorin, JNPT and Kandla, the feasibility to increase the draft to 17 m is still to be studied, there is no 17-m plan at Mumbai port. It is a very difficult and impractical proposition to increase the draft to 17 m or even 14, at both Kolkata and Haldia.

NON-MAJOR PORTS

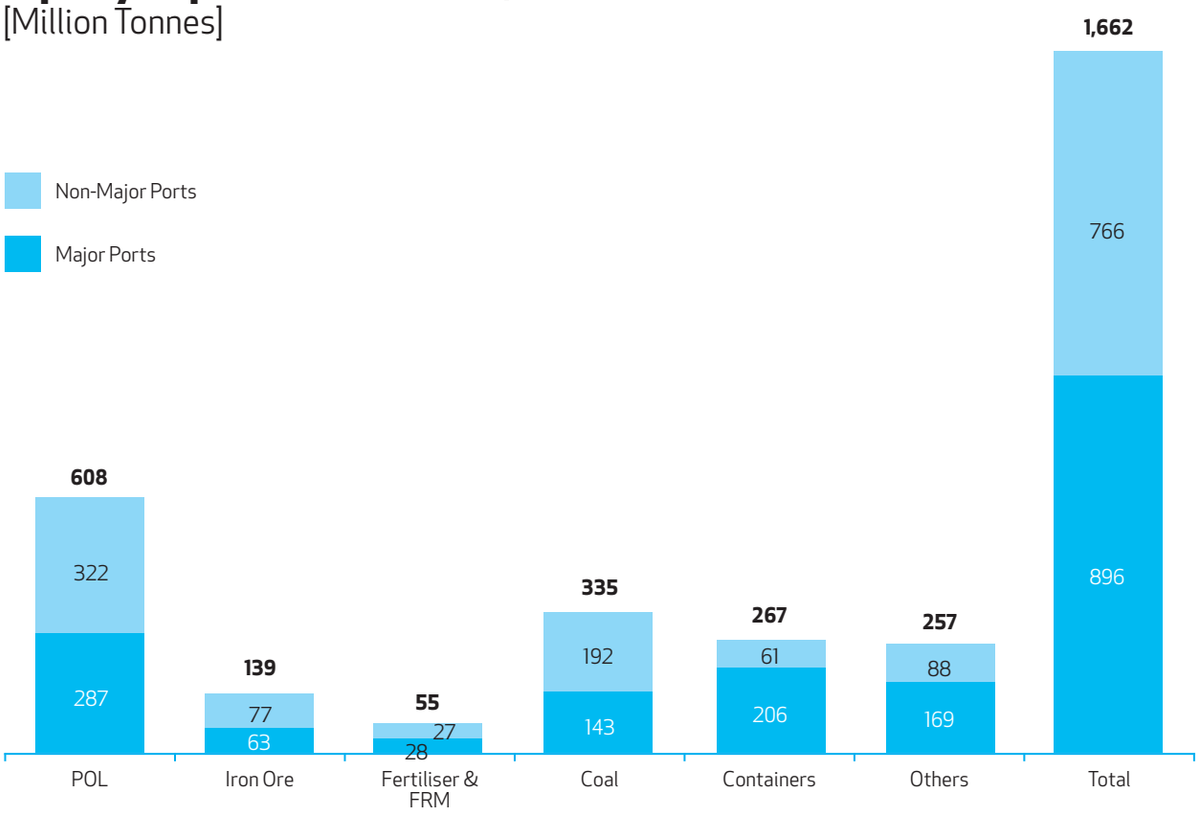
The maritime states plan to increase the capacity of Non-Major Ports from 445 million tonnes in the 12th Plan period to 766 million tonnes to meet the traffic demand of 589 million tonnes.

Figure 4.16
Commodity-wise Traffic Projections, 2016-17 to 2031-32
[Million Tonnes]



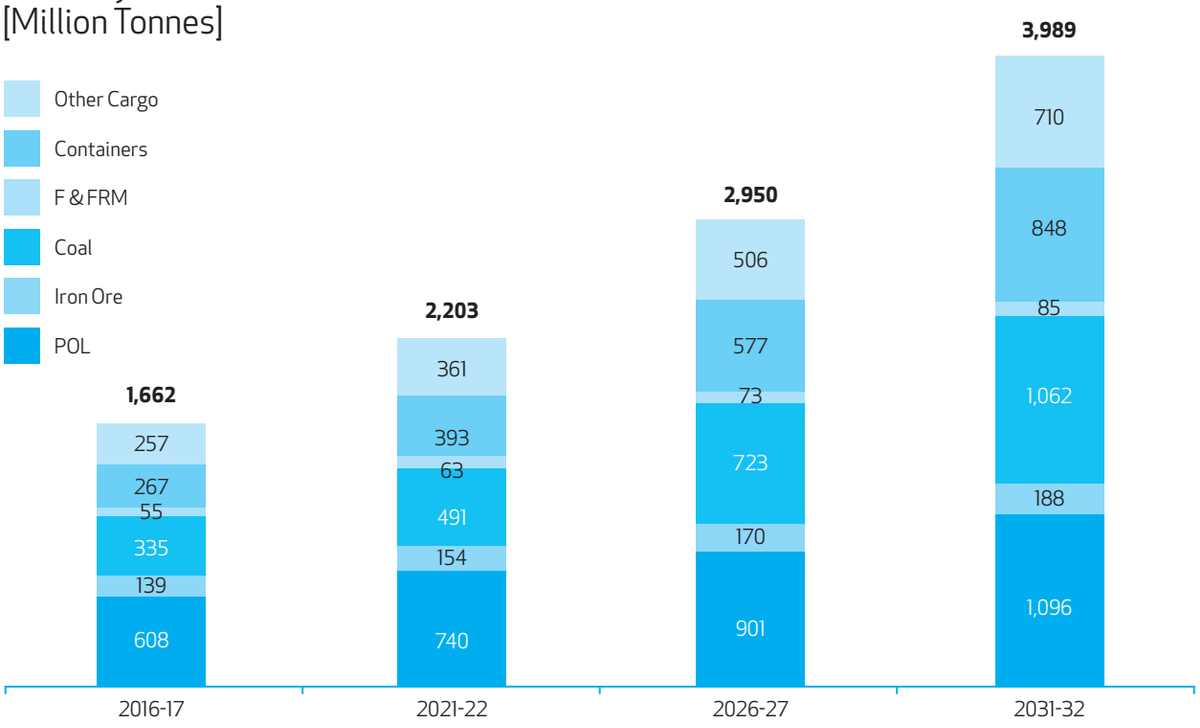
Source: NTDPC (2012b).

Figure 4.17
Capacity Required at Indian Ports, 2016-17
[Million Tonnes]



Source: NTDPC (2012b).

Figure 4.18
Commodity-wise Cargo Capacity Projections, Major and Non-Major Ports, 2016-17 to 2031-32
[Million Tonnes]



Source: NTDPC (2012b).

Non-Major Ports have projected a total requirement of 544 mcm during the 12th Plan, of which 418 mcm is capital dredging and 129 mcm is maintenance. The requirements of the states of Odisha, Andhra Pradesh and Gujarat constitute 58 per cent of total capital dredging due to development of Gopalpur and Dhamra ports in Odisha, development of Machilipatnam, Krishnapatnam, Kakinada and Gangavaram ports in Andhra Pradesh, and Hazira in Gujarat.

INVESTMENT REQUIREMENTS AND SOURCES OF FUNDING

The investments required to create capacity for cargo handling in a port depends on several factors such as type of cargo, port topography, channel depth and width, and type of equipment. The cost of creating additional capacity also depends on the commodity or group of commodities to be handled. Moreover, investment required to create additional capacity through brownfield expansion at an existing port is markedly different from greenfield capacity creation through new ports. Thus, it is a challenging task to arrive at exact investment figures corresponding to projected capacity requirements. This report attempts to arrive at broad estimates through aggregation of investment estimates received from various port trusts and maritime boards.

A number of development projects have been identified by Major Ports and states to be taken up by the final year of the 12th Plan (2016-17). Most of these projects have been conceptualised as public-private partnerships.

THE 12TH PLAN

Estimated investments and sources needed to increase capacity of Major and Non-Major Ports are shown in Figures 4.19 and 4.20.

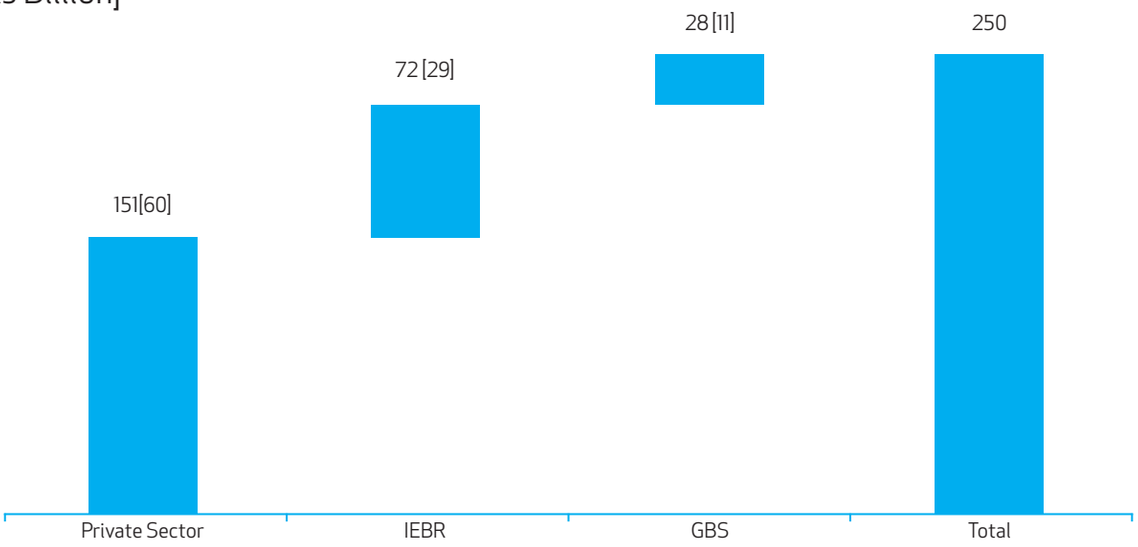
BEYOND THE 12TH PLAN

Considering the constraints in estimating investment required during 2017-18 to 2031-32 to create capacity at ports for handling the projected cargo, the following methodology has been adopted.

The projected cargo for 2017-18 to 2031-32 has been estimated separately for different commodities or groups. Here, it is pertinent to note that investment required to create one million tonnes of capacity varies from commodity to commodity. And as stated previously, the investment necessary to create capacity in an existing port is different from what is needed for greenfield capacity expansion.

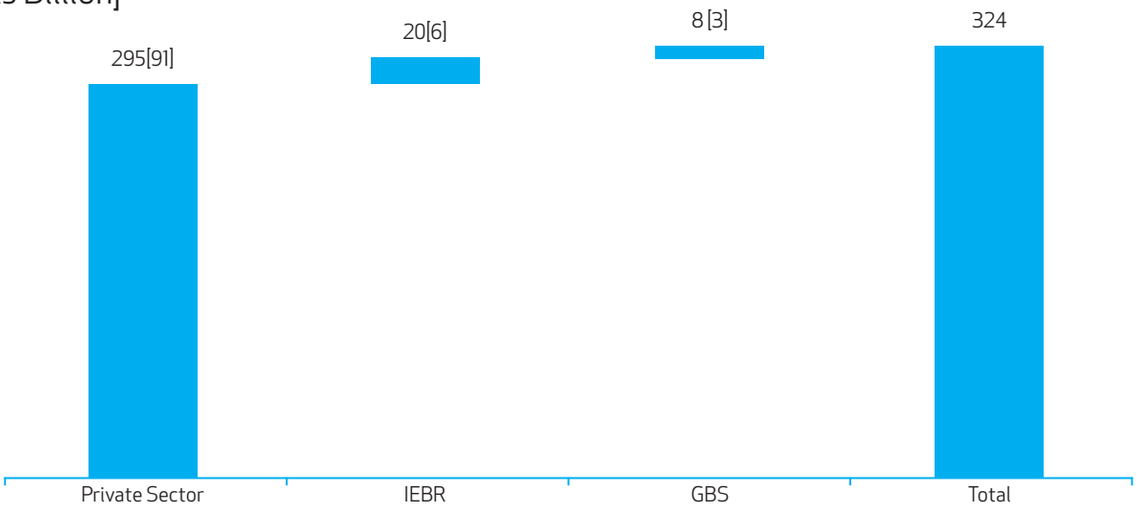
TAMP decides upfront tariffs based on capital cost to be incurred for creating capacity at an existing Major Port. Based on TAMP-approved tariffs for projects from 2011-12 onwards, the average capital cost to be incurred by Major Ports for handling one tonne of cargo for different commodity groups at

Figure 4.19
Investment in Major Ports during the 12th Plan
[Rs Billion]



Note: The figures in parentheses are percentage shares.
Source: NTDPC (2012b).

Figure 4.20
Investment in Non-Major Ports during the 12th Plan
[Rs Billion]



Note: The figures in parentheses are percentage shares.
Source: NTDPC (2012b).

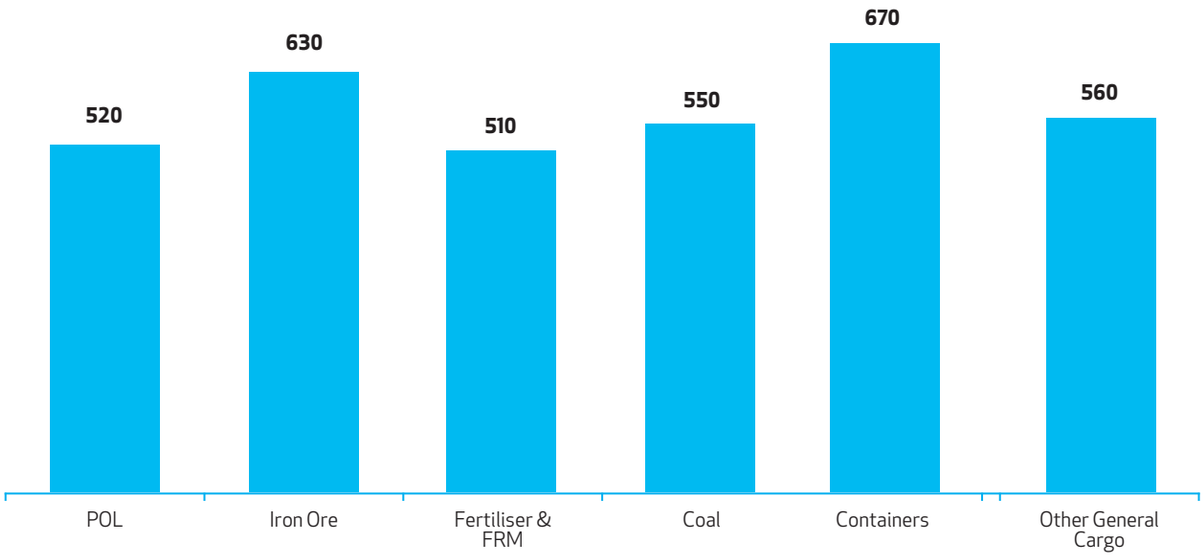
2011-12 prices have been calculated and listed in Figure 4.21.

Ports also require investment for creating facilities like deepening and maintaining of channels, rail and road connectivity and other infrastructure. Figure 4.22 outlines Investment needs during various plans. The assumption is that capacity expansion is achieved through brown field expansion at existing ports. In case capacity addition is done through greenfield projects, investment requirement could be higher by 40-50 per cent.

SHIPPING

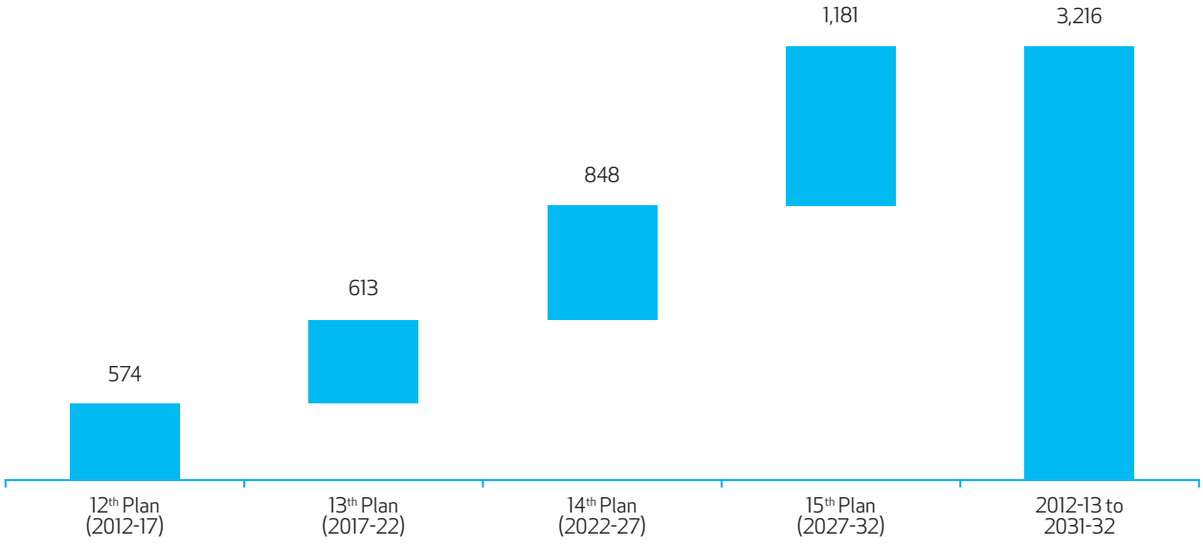
The potential for the shipping industry to cater to India's import-export trade is phenomenal. In this context, there is a great need to increase the Indian fleet strength.

Figure 4.21
Commodity-wise Capital Cost Incurred for Capacity Addition
[Rs Million Per Tonne]



Source: NTDPC (2012b).

Figure 4.22
Investment Requirements in Ports, 2012-13 to 2031-32
[Rs Billion]



Source: NTDPC (2012b).

Further, India has an ageing fleet: around 39 per cent of vessels are already above 20 years old. This calls for early replacement of ships. The fund requirement for acquisition of new tonnage has been estimated by the Sub-group (Finance) of the Working Group on Shipping and IWT (Ministry of Shipping) for the preparation of 12th Plan under two scenarios Business as Usual and Accelerated Growth (Table 4.1)

INVESTMENT REQUIREMENT

The two growth scenarios assumed (Table 4.1) would require major changes in the fiscal environment. The Indian shipping industry needs cheaper funding avenues to boost acquisition of tonnage. However, the government is pressed to curtail or optimally allocate additional expenditure, considering India's fiscal pressures. Therefore, possible mechanisms

Table 4.1
Investment Requirements in Shipping during the 12th Plan
[Rs Billion]

PARTICULARS	EQUITY	DEBT	TOTAL	TOTAL GT
Business as Usual				
Tonnage remains at the existing percentage, i.e., 1.1 per cent of the world tonnage	7.5	17.5	25.0	12.4M*
Accelerated Growth Scenarios				
Indian tonnage expands to 2.5 per cent of world tonnage	96	224	320	26.6M
Indian tonnage expands to 5 per cent of world tonnage	240	560	800	53.3M

Source: 12th Plan.
Note: *12.4 MGT is as per 12th Plan. However, based on Indian tonnage of 10.42 MGT as of 31 December 2012, the projected tonnage at the end of 12th Plan under Business as Usual (being the same percentage as at present, i.e., 1.1 per cent of the world tonnage) case would be 11.0 MGT.

to facilitate easier access to international funding sources may need to be considered.

The remittance of interest on external commercial borrowings (ECB) taken on or before 1 June 2001 did not suffer any withholding tax. However, this exemption has been withdrawn post this date. Currently, interest paid by Indian shipping companies to foreign lenders on acquisition of ships attracts a withholding tax of 20 per cent plus surcharge.

As observed in the 2002 report of the Expert Committee to Review Indian Shipping chaired by Dr Rakesh Mohan, Advisor to the then Finance Minister, ship acquisition costs to the tune of 60 to 80 per cent are financed through ECBs. As a rule, lenders require interest payment to be effected net of all Indian taxes. Subsequent to the withdrawal of exemption, interest costs have increased substantially, and this is passed on by the lenders to the borrowers. Accordingly, the Rakesh Mohan Committee recommended that it would be appropriate to restore the exemption.

INLAND WATER TRANSPORT

Currently, the share of water in India's modal mix is a mere 6 per cent. Even though IWT is the most economical mode of transportation, especially for bulk cargo like coal, iron ore, cement, food grains and fertiliser, it remains severely underutilised in India.

TRAFFIC PROJECTIONS

The traffic projections for inland waterways are done from a commodity-wise demand standpoint and do not factor in any capacity constraints, as was done for ports and shipping:

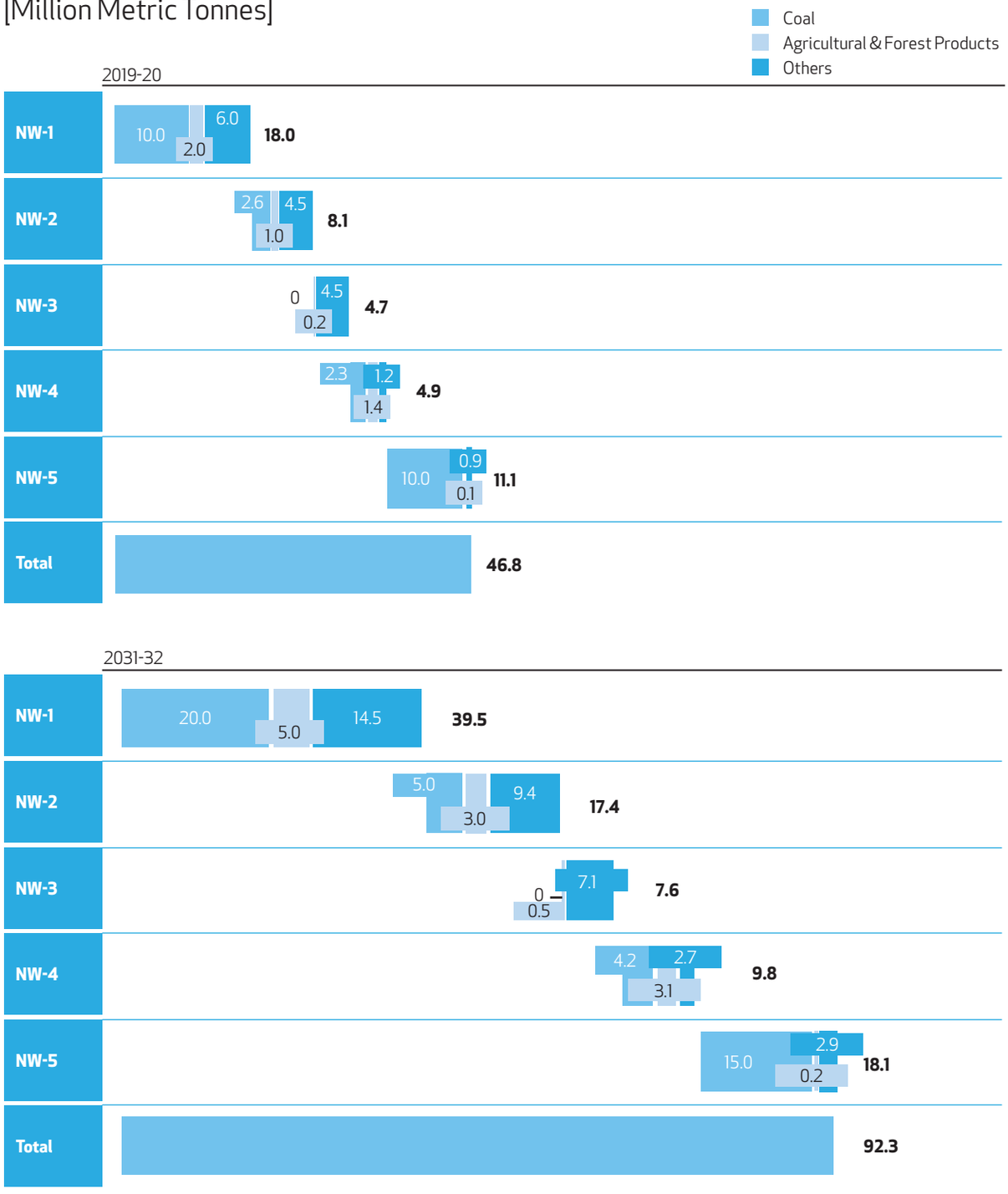
NW-1: The main commodities that could potentially be moved on NW-1 are:

- **Coal:** A 1,000 MW thermal plant needs 5 MMTPA of coal and 100 cusecs water. Due to their high water requirement, they ought to be located along large water bodies. As of now, 10 thermal power stations are operational in proximity of NW-1. Further, 11 more stations are expected to come up in Bihar and Uttar Pradesh in the next five to eight years with a total installed capacity of over 15,000 MW. The total requirement of coal is estimated to be around 70 MMTPA. Around 14 MMT of imported coal would need to be carried to these power stations from Haldia. Hence all the existing and proposed thermal power plants along River Ganga are potential shippers for IWT if IWAI can provide assured channels of 2.5 m depth or more (a study to provide 3 m deep channel in the Allahabad-Ghazipur stretch of River Ganga by river training/barrage-cum-lock approach is already underway by IWAI). Up to 25 MMT of coal could be transported by IWT mode on NW-1 every year.

- **Over Dimensional Cargo (ODC):** With 11 more power plants scheduled to be commissioned in the next five to eight years, the requirement of ODC is expected to be around 2 MMT.

- **Fly Ash:** With average ash content of 25 per cent in coal, total production is estimated to be around 17.50 MMTPA. With the likely use of fly ash in the manufacturing of cement and in construction of road, waterways could be utilised for evacuation of fly ash from power plants on the banks of NW-1 and thereafter moved to respective destinations through multimodal transport systems.

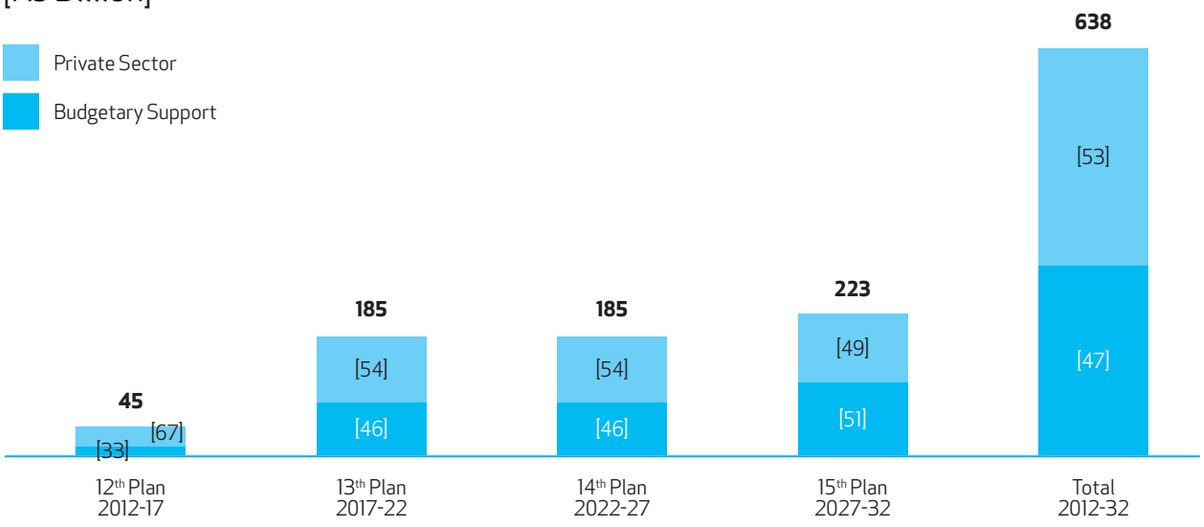
Figure 4.23
Projected Cargo Potential on National Waterways
[Million Metric Tonnes]



Source: NTDPC (2012b).

- **Fertiliser:** There is substantial potential to transport fertilisers from plants located near Allahabad (IFFCO at Phulpur amd Indo Gulf at Jagdishpur) and Haldia (Tata Chemicals) to various locations in Uttar Pradesh, Bihar and West Bengal. The total consumption of fertiliser in India is estimated to be around 25 MMTPA, of which around 10 MMTPA are consumed in these three states. A part of this could be moved by inland waterways.
- **Foodgrains:** The foodgrain surplus is mainly confined to the northern states; transportation involves long distances. There is a huge requirement of foodgrains in Uttar Pradesh, Bihar, West Bengal and the North Eastern states, which are transported by road/rail as of now.

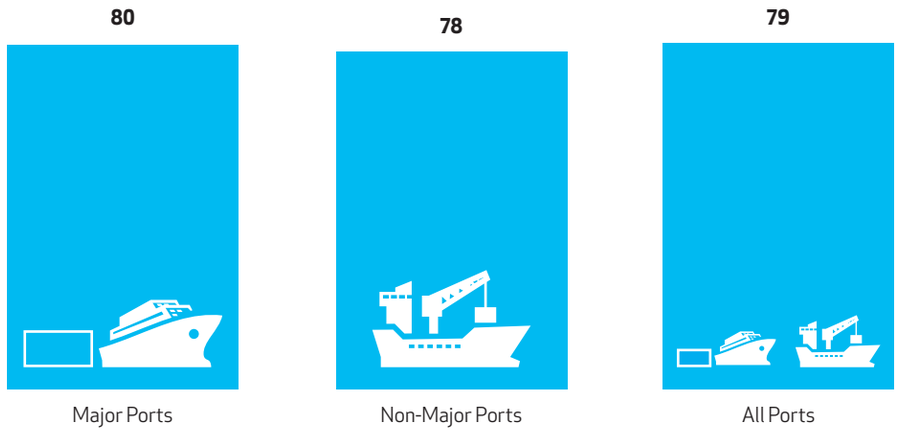
Figure 4.24
Investment Requirements in IWT and Sources of Funding
[Rs Billion]



Note: The figures in parentheses are percentage shares.
Source: NTDPC (2012b).

Figure 4.25
Capacity Utilisation at Ports, 2011-12
[Per cent]

INDIAN PORTS ARE CAPACITY CONSTRAINED WITH HIGH UTILISATION AND REQUIRE ADDITIONAL INVESTMENTS



Source: GoI (2011-12).

However, as the IWT sector in India is still in an early stage of its development, it needs to gain the confidence of the user.

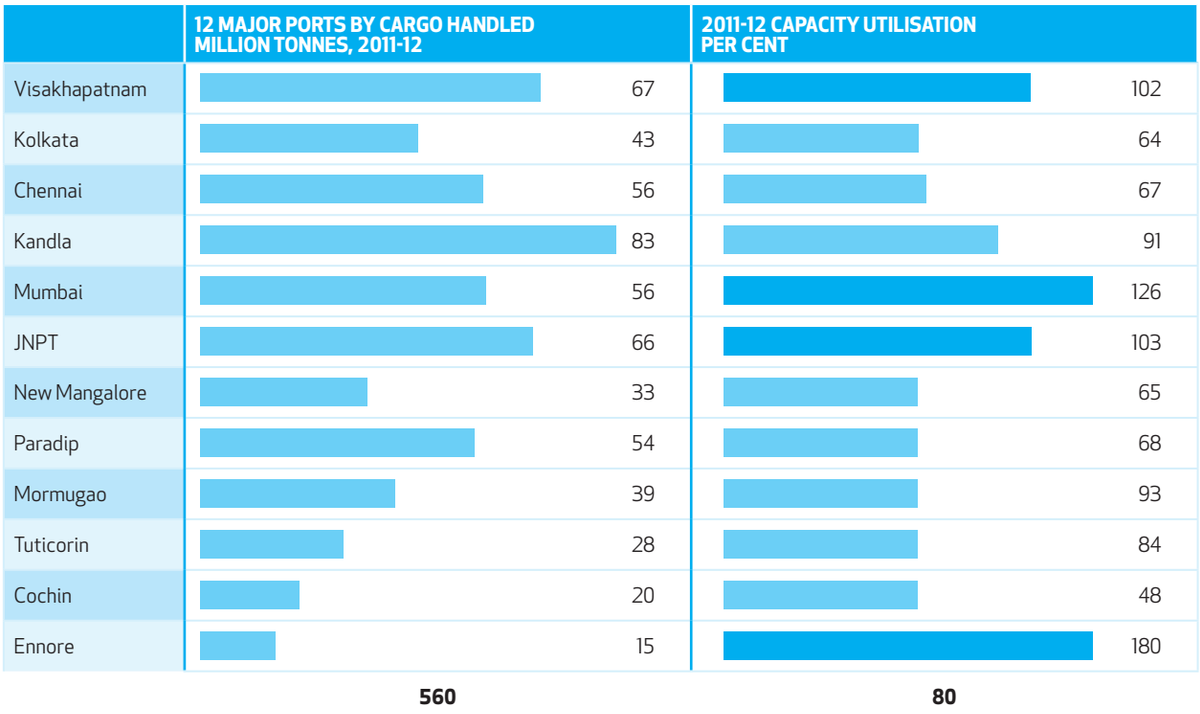
NW-2: The main cargo identified to be moved on this waterway include coal, limestone, cement, fertilisers, iron and steel and building materials.

NW-3: This could be an efficient channel to transport project cargo, foodgrains, bulk goods, fertilisers and POL. Container traffic, which has commenced from February 2011 and is of the order of 200 containers per day, could also pick up substantially.

NW-4: The hinterland of NW-4 could be divided into four cargo belts—Kakinada, Krishna, South Andhra and Chennai. Coal, cement, fertiliser and foodgrains account for a majority of the total traffic in the hinterland. The main cargo identified to be

Figure 4.26
Capacity Utilisation at Major Ports, 2011-12
[Per cent]

ALMOST ALL MAJOR PORTS ARE CAPACITY CONSTRAINED WITH HIGH UTILISATION AND REQUIRE ADDITIONAL INVESTMENTS



Source: GoI (2011-12).

moved on this waterway comprise coal, limestone, cement, fertiliser, iron and steel, building materials, paddy, tobacco, oil seeds, pulses, cotton, timber, bamboo, firewood, beedi leaves, chillies, general merchandise and civil supplies.

NW-5: Figure 4.23 projects the quantities of cargo that could be moved through the NWs, including NW-5, in case the requisite infrastructure is provided. The proposed NW-5 waterway passes through major towns like Talcher, Paradip and Dhamra in the river section, and Bhadrak, Balasore, Jaleswar and Haldia in the canal section. The river section of the waterway is rich in minerals coal and iron ore and industrial products such as ferro-chrome, steel alloys, tyres, granites and forest produce. The canal section of the waterway carries mainly agricultural products, handicrafts and textiles.

Investment requirements and sources of funding are indicated in Figure 4.24.

CHALLENGES

PORTS

India's ports are highly constrained for capacity and are expected to remain so in the near future. Port usage was at an average of 80 per cent in 2011-12, despite slowdown following the global recession, and four of the 12 Major Ports had utilisation rates above 100 per cent (Figure 4.25 and 4.26).

Development of port infrastructure has traditionally been driven largely by public investment. The limited number of private investors that port development and expansion has attracted has been due to the unique economic characteristics of seaports.

- Provision of basic port infrastructure such as sea locks, breakwaters, port basins, common areas, and main hinterland connectivity entails large fixed costs. Such infrastructure is common to all port terminal operations and is typically funded through public investment.
- Relatively large minimum initial capacity of port infrastructure is required from a technical standpoint. Moreover, port infrastructure is frequently indivisible, implying that increase in port capacity can only be realised in quantum chunks.
- The initial development costs cause large capital investment opportunity losses as a result of underutilised capacity during the initial phases of the port lifecycle.

Consequently, private investors invest primarily in port terminal facilities but not in the underlying

infrastructure. Typically, private investors develop terminal infrastructure under the BOT model on behalf of the public port authority under a concession of 30-40 years.

In the Indian situation, problems emerge at each stage. All stakeholders lose time and money due to two major reasons: pre-tendering delays and weak implementation of projects.

PRE-TENDERING DELAYS

There are significant delays in regulatory approvals, security, environmental clearances during the pre-tendering phase, due to lack of defined timelines during this phase. In addition, the approvals across various departments and levels happen sequentially rather than in parallel. Delayed approval at one stage can therefore stall the entire process. Hence PPP projects take time to move from conceptualisation to the tendering stage.

WEAK IMPLEMENTATION OF PROJECTS

Even after uptake, most projects suffer from time and cost over-runs due to several factors.

Low quality design and engineering: The detailed project report (DPR) forms a much smaller percentage of project costs in India compared to global benchmarks. This is because engineering consultants are chosen for a project primarily based on price, with some small weightage for quality. Such consultants might cut corners, leading to inaccurate surveys and low quality DPRs. This can often result in surprises during construction and a change in project scope or plans, adding to delays and costs.

Shortage of skilled manpower: The pool of skilled and semi-skilled manpower, such as welders and fitters, has not kept pace with the construction needs of infrastructure. In effect, 70 to 80 per cent of the existing workforce is untrained. This affects the quality of project implementation.

Some of the other reasons behind delays in project execution are absence of specified financial institutions, delay in financial closures, involvement of multiple parties and inadequate hinterland connectivity.

REGULATORY FRAMEWORK

Multiple attempts have been made over the last two decades to modernise the port sector and introduce an appropriate regulatory framework including the right port management structure.

While Non-Major Ports have been relatively successful under the management of maritime states, and have attracted significant private participation, there is still no consistent national ports policy aimed at transforming the Major Ports into viable and autonomous undertakings which can function properly within a market-oriented economy. Some basic elements of the Landlord Port model have been implemented for Major Ports, such as introduction of privately owned terminals, but it can be rightly argued that partial implementation of the model creates more problems than it solves.

While Non-Major Ports have been relatively successful under the management of maritime states, and have attracted significant private participation, India still lacks a consistent national ports policy aimed at transforming the Major Ports into viable and autonomous undertakings which can function properly within a market-oriented economy.

GOVERNANCE MODEL

All Major Ports operate on the Public Service Port model predominant till the 1990s, with the exception of the corporatised Ennore. Since then, globally, most ports have been converted to the Landlord model or in some cases such as the UK, been completely privatised. While the Service Port model in India was consistent with a centralised economy, it does not fit well in a market-oriented economy.

- Service ports are generally less efficient, not commercially oriented and often characterised by severe over-manning, sub-standard equipment, congestion and chronic service failures.
- All investments in port infrastructure, superstructure and equipment need to come from public sources. Private funds would become available only if the terminal operations could be performed by the private sector on a long-term basis.
- Container handling, which now dominates the break-bulk sector, is significantly faster and more efficient than traditional (manual) cargo handling. Publicly managed terminals are less able to benefit from the productivity improvement associated with this as compared to private terminals.
- Service ports are prone to political interference which often disrupts professional port management. Frequent changes in government also have a negative impact, introducing an element of instability in the system.
- Service ports are particularly vulnerable to labour problems.
- In service ports, the port trust is both the landlord and the terminal operator. When private terminals come up alongside port trust-run terminals, there is a conflict of interest.

Even a corporatised port does not serve the function of a landlord port, where the landlord authority oversees port administration and is separated from all terminal operations.

It is a common assumption that cargo moves to the nearest port from the origin because of distance advantage, but it has been seen that in reality, exporters' preference for a particular port is governed by efficiency in port operations, freight advantage, connectivity and port tariff. Thus, cargo from Kerala is transported to distant Mumbai instead of Kochi port.

ROLE OF REGULATORY AUTHORITY

Tariff regulation, in general, is a controversial issue in the international port sector. The objective of tariff regulation is to limit monopoly profits through regulation of price and rate of return. However, in the current Indian situation, where the key challenge is to dramatically increase port capacity, this may not be the foremost consideration. The primary objective of regulation must be to encourage accelerated development of new port and terminal infrastructure through greater public-private participation with optimal risk sharing and to ensure that terminal operators meet minimum performance standards through provisions in the concession agreements.

Not only is the notion of tariff regulation by a central authority unsuitable for development of the port sector, but the methodology followed for tariff setting also needs to be re-examined. TAMP had issued a new set of guidelines for PPP projects for Major Ports in February 2008. These aim at providing comfort to investors by announcing the tariff in advance, before they submit their financial bids, thereby reducing regulatory uncertainties. But since a normative approach is adopted to fix tariff, the tariff does not necessarily account for the actual costs of an individual operator. The underlying expectation is that the revenue share to be offered by the bidders will be the leveller between the standards assumed and the actual cost of an operator. Nonetheless, the efficacy of the upfront tariff system hinges upon the reasonableness of the norms adopted and reliability of the capital estimates considered. Investors may desire that these issues are addressed and a foolproof procedure is evolved for implementation.

In particular, there are two issues with the current tariff fixation methodology:

- The major pitfall is keeping the same tariff base unaltered for the whole concession period of 30 years. Indexation of tariff at WPI-X alone may not provide adequate comfort to investors as it does not capture the additional financial commitments which they might have to make in view of the environmental, market and technological changes that may take place after commencement of the concession. Most importantly, the seaward services at Major Ports are not offered for PPP and the related services and facilities continue to be provided by the port trusts.

- On the other hand, the 2005 TAMP guidelines for tariff fixation follow a cost plus method. Consequently, cost of inefficiency and redundancy seeps into tariff computation in the name of the actual. Inadequate maritime infrastructure and high marine cost at the ports may adversely affect the business of private terminal operators providing land side services. There is, therefore, an immediate need to review the cost plus regime of tariff fixing. Further, a significant part of the demurrage costs should be borne by ports.

In an effort to address the issues with tariff regulation and therefore lack of private investment, the Ministry of Shipping, in 2013, has issued draft guidelines for tariff setting in Major Ports. They propose a shift to a more progressive market-driven tariff regime, that would enable Major Ports to compete with other ports, including those operated by private players, by allowing them to fix tariffs based on market conditions. As per the draft guidelines, though TAMP will fix the reference tariff for each port for different commodities, the Major Port Trusts (MPTs) can set their own tariff, which can be higher or lower than the reference tariff. TAMP will also specify minimum efficiency standards for cargo terminals. If the actual tariff proposed to be levied is higher than the reference tariff, a proposal including the upgraded efficiency standards to be maintained by the private operator or government-owned port shall have to be submitted to TAMP in advance. Government aims to boost investor confidence with the market-driven progressive tariff regime, though with certain riders.

HINTERLAND CONNECTIVITY

The fact that Indian ports are constrained for capacity indicates that cargo evacuation facilities are under great strain, warranting effective quick evacuation within the ports as well as to the external hinterland.

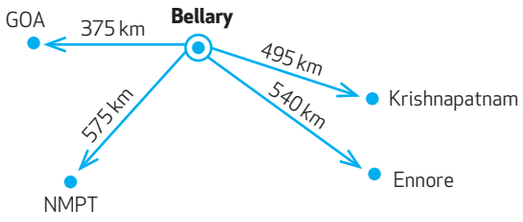
FLOWS: ACTUAL VS IDEAL

It is a common assumption that cargo moves to the nearest port from the origin because of distance advantage, but it has been seen that in reality, exporters' preference for a particular port is governed by efficiency in port operations, freight advantage, connectivity and port tariff.

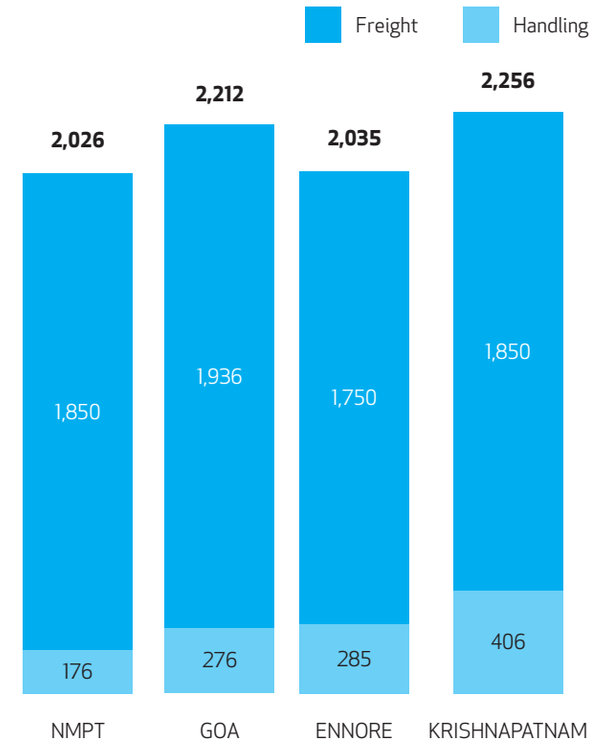
Thus, cargo like umbrellas from Kerala is transported to distant Mumbai instead of Kochi port. Similarly, cashew moves over a longer distance to Tuticorin rather than Kochi. Textile units situated in and around Bangalore transport their products in various directions up to Mumbai, New Mangalore, Tuticorin and Kochi despite the longer distances.

Figure 4.27

Lead Distance between Ports in South India and Bellary-Hospet



Consolidated Charges for Handling Iron Ore Rs per Tonne



Source: NTDPC (2012b).

Tobacco processed in Andhra Pradesh moves to Chennai rather than Visakhapatnam. Actual flows do not conform to the ideal flows.

The same holds true for container cargo. Cargo from the northern hinterland destined for China and South East Asian countries moves through JNPT and other west coast ports rather than the East coast, resulting in longer sailing distance and higher cost. One of the reasons for this imbalance is lack of adequate/dedicated rail connectivity between production centre and gateway port.

Further, freight costs by railways/road for containers are exorbitant in India and more often, the ocean freight for bringing cargo from the Far East and South East Asia are much less than the land freight within the country by rail. Unless proper rationalisation of freight structure is undertaken to make the rate more affordable, a shift may not make economic sense. Ideally, flows should conform to distance advantage, and connectivity plays an important role in making the ideal flows possible.

The phenomenon of traffic shifting from one port to another is even more common in situations where several ports are present in neighbouring states. Consider iron ore transported from Bellary in Karnataka. A comparison of lead distance between the various ports and Bellary reveals that Goa is the closest, followed by Krishnapatnam, Ennore and New Mangalore, respectively. However, connectivity to Goa port is through a mountain road with steep grades, which gives other ports a competitive advantage. The railway freight from Bellary to Goa is Rs 1,936 per tonne whereas the rate per tonne for Ennore is Rs 1,750. In case of New Mangalore and Krishnapatnam, the rail freight is Rs 1,850 per tonne. This is, however, still an incomplete picture. This railway freight charges are to be seen in conjunction with port handling charges while determining the competitive advantages of each port. Figure 4.28 shows that New Mangalore is the most favourable destination for iron ore from Bellary despite the distance disadvantage.

Another important factor in determining the flow of container cargo is the distribution and location of CFSs and ICDs. It is possible to alter hinterland–port linkages for ideal flows by changing the CFS locations. Containerisation has changed the flow pattern of cargo through ports. All over the world, most break-bulk cargo is being containerised, along with some liquid and project cargo. Thus, CFS and ICD have emerged as key nodes in handling and transportation of cargo within the hinterland. Availability of CFS and ICD facilities in a region attracts container cargo. In India, at present, there is surplus

Figure 4.28
Transport Modal Share in Evacuation of Cargo at Major Ports
[Lakh Million Tonne]

*Only aggregate import and export volumes available for New Mangalore and Ennore ports.
Source: NTDPC (2012b).

capacity in some of the CFS clusters at Mundra, Kandla, JNPT and Chennai, and deficit capacity at the remaining clusters in the eastern ports. Of all the regions, the container traffic handled at ICDs/ CFSs in the northern region (including north-central region) is predominant at 54 per cent. Region-wise analysis of ICDs reflects:

- Northern and north-central region—Jammu and Kashmir, Punjab, Haryana, Delhi, Uttaranchal, Himachal Pradesh—has the highest ICD container volume. The major cargo centres are Amritsar, Jalandhar, Ludhiana, Panipat, Delhi, and Dadri. Top two ICDs in the country, namely Tughlakabad (Delhi) and Dhandarikalan (Ludhiana) are in this region. Long lead distances of cargo generating centres in the region generate high container volumes at ICDs.
- The second highest volumes are observed in the southern region, with Bangalore, Chennai, Coimbatore, Madurai and Tuticorin being the major cargo centres. ICDs at Bangalore and Chennai handle large volumes. Though the cargo centres are close to gateway ports, extensive rail network is one of the reasons for high container volumes at ICDs.
- Eastern and central regions have very low ICD movement , since the states in this region—

Table 4.2
Leading KPIs to Monitor Port Objectives

Operations Related KPIs

PORT OBJECTIVES (HIERARCHICAL)	LEADING KPI
1 Low Cost of Import/Export	■ Cost Per Tonne of Import/Export
2 Fast Cargo Transit	■ Cargo Dwell Time
3 Fast Vessel Turnaround	■ Vessel Turnaround Time
4 Optimum Asset Utilisation	■ Asset Utilisation/Productivity
5 Contribution to Employment and Economic Value for Nation	■ Number of Jobs or Amount of Value Added Per Tonne of Goods Handled
6 Maximum Shareholder Return	■ Return on Invested Capital
7 Minimum Environmental Impact	■ Emission Per Tonne of Goods Handled

Table 4.3
KPIs Derived from Operations-Related Performance Indicators

LEADING KPI	PERFORMANCE DRIVERS	DERIVED KPIS	PARTIES INVOLVED
1 Cargo Dwell Time (excluding vessel related time)	■ Terminal management system (IT system and yard operating system) ■ Dwell-time incentives (free storage time)/ customer preferences (to use port as forward storage location) ■ Customs clearance process	■ Vessel pre-berthing time ■ Yard dwell time ■ Gate transit time	■ Customs/port authority ■ Terminal operator, customs, cargo owner ■ Customs, shippers
2 Vessel turnaround time	■ Amount of traffic to be loaded/unloaded ■ Distance from anchor point to berth ■ Efficiency of port service operators (tugs/pilots) ■ Efficiency of terminal operator (working hours, number of cranes, crane speed)	■ Pre-berthing time (hours) ■ Berthing time/unit of cargo handled ■ Post-berthing time	■ Customs/port authority (serviceproviders) ■ Terminal operator
3 Asset Utilisation	■ Handling equipment (number of cranes, crane spacing, crane speed, operating hours) ■ Yard storage system (RMG, RTG, straddle carrier, forklifts, etc.) ■ Amount of cargo throughput	■ Cargo throughput (TEU/ tonne) per quay metre ■ Cargo throughput (TEU/ tonne) per hectare of land	■ Terminal operator (quay design parameters) ■ Terminal operator (yard design)

Source: NTDPC Working Group Analysis.

Uttar Pradesh, Madhya Pradesh, Bihar and West Bengal are primarily agricultural states which do not lend themselves to container-based movement.

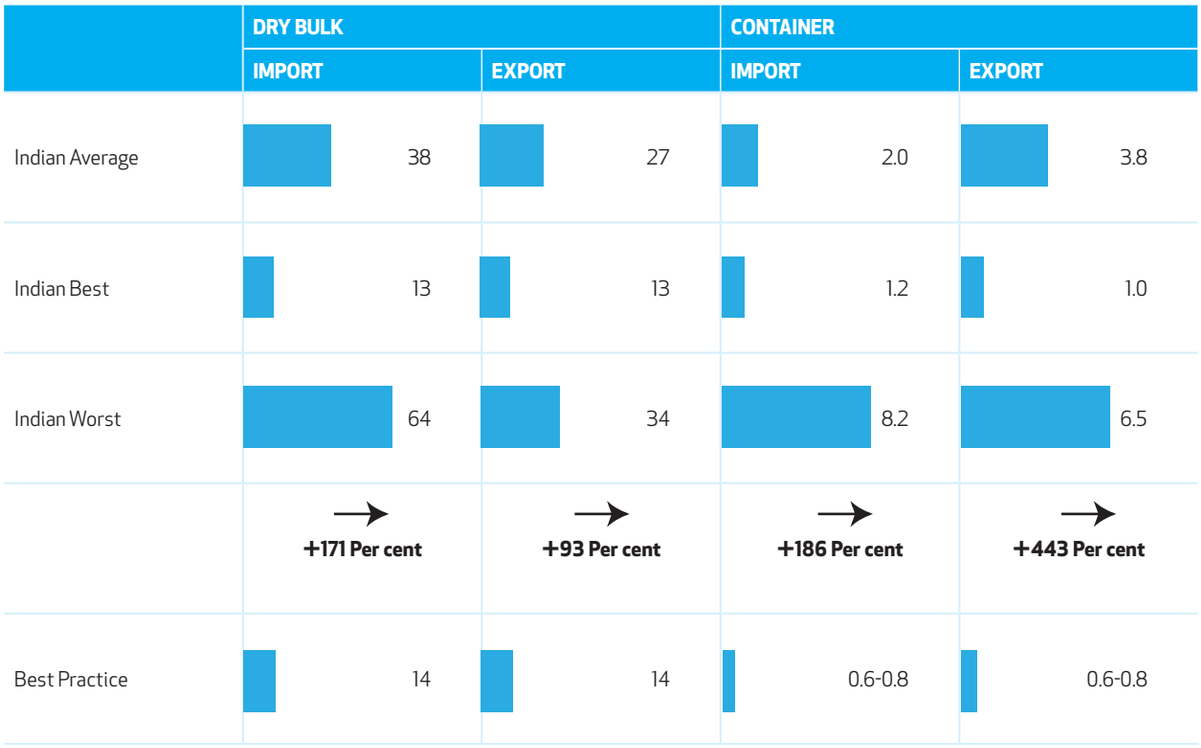
Hence, the policy of setting up of CFS and ICDs may need a constant review to ensure balanced distribution within different regions, and to ensure optimal connectivity to ports from the originating centres through these nodes.

MODAL SHARES: ACTUAL VS OPTIMAL

Port traffic within India is carried largely by railways and road transport, with pipelines carrying some crude oil and petroleum products. Alternative modes such as inland waterways have remained

Figure 4.29
Dwell Time at Indian Ports in Comparison with Global Best Practices

Indian ports have much higher dwell times than global best practices
Number of days, 2006



Note: Based on best practices at Rotterdam and Singapore ports.
Source: GoI (2009).

largely undeveloped and the situation is unlikely to change substantially in the medium term. Figure 4.28 gives modal shares at various transport modes in evacuation of cargo at Major Ports during 2010-11.

These modal share estimates are based on some assumptions on commodity-wise optimal mode of transport, the geographical features of the regions, certain cargo characteristics, and distances travelled from the hinterland. For instance, cargo such as coal and iron ore would preferably be transported by railways unless alternative arrangements such as conveyors are available. The estimates[7] suggest that while the railways should have carried 34 per cent of port traffic, it actually moved only 24 per cent. Roads, by contrast, presently carry 36 per cent of the traffic as compared with the 22 per cent they should ideally carry.

Therefore, it is not just important to have overall sufficient levels of hinterland connectivity. It is important to have the necessary connectivity within each preferred mode for a particular port for a particular commodity.

PORT OPERATIONS

Operational performance indicators can help enhance port performance by identifying areas for closer attention. The next step is to collaborate with all stakeholders to facilitate the working of operational areas under their control.

KEY PERFORMANCE INDICATORS

Ports serve different objectives during various stages of maturity (Table 4.2). Certain operations-related key performance indicators (KPIs) help measure and improve operational performance at ports.

Three of these leading KPIs are relevant in port operations: fast cargo transit, fast vessel turnaround and optimum asset utilisation. Each has its own performance drivers and parties involved in the outcome. And each can be broken down to a set of derived KPIs for better and easier monitoring (Table 4.3).

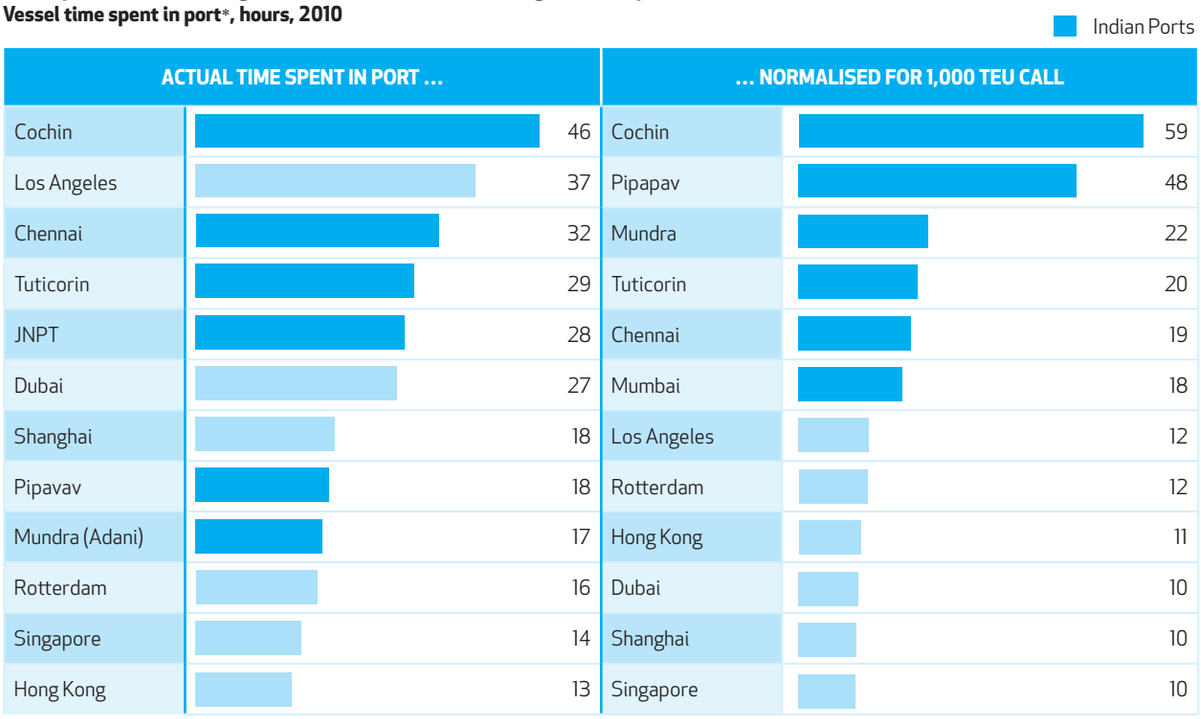
Cargo dwell time, or transit time, consists of the time before the ships are allowed to berth, the time they spend unloading and loading, and the time the cargo spends in the yard before being picked up or dropped off by shippers in the port. Parties involved

7. World Bank Report (2007).

Figure 4.30

Vessel Turnaround Times at Indian Ports in Comparison with Global Best Practices

Indian ports have much longer vessel turnaround times than global best practices
Vessel time spent in port*, hours, 2010



*Derived from several months of Maersk Line's recorded statistics of port entry and exit times of their vessels.
Source: www.maerskline.com (accessed 3 March 2013).

in the overall dwell time of the cargo are the customs authority (clearance process), port authority (vessel planning), terminal operations (load handling) and shippers (port as inventory stock). Any cuts in cargo dwell time can reduce the inventory cost of shippers. Good information management systems, incentives to limit extra storage time and smooth customs processes are all drivers of shorter dwell time.

The average Indian port lags far behind on international best practices in this KPI the dwell times of both container and bulk cargo are at least double that of international best ports (Figure 4.29). While the best performing Indian ports are in line with international best practices, the worst performers in India are two to 10 times worse.

Vessel turnaround time. This is the time needed for loading, discharging and servicing a vessel from berthing until its departure. The main parties involved in vessel turnaround are the port authority and the terminal operators. Seamless communication between these parties and the ship operators is essential for a quick vessel turnaround process.

Important drivers of vessel turnaround time are the amount of traffic to be loaded or unloaded, distance from anchor point to berth, efficiency of port authority in pilotage/tugging and the efficiency of terminal operator in handling the vessel.

Indian ports have huge potential to reduce the average time a vessel spends in the port as compared to international best practices (Figure 4.30). To a certain extent, scale plays a role here, but even ports of the scale of JNPT and Chennai have 50 to 100 per cent higher turnaround times than international best practice ports like Singapore and Rotterdam.

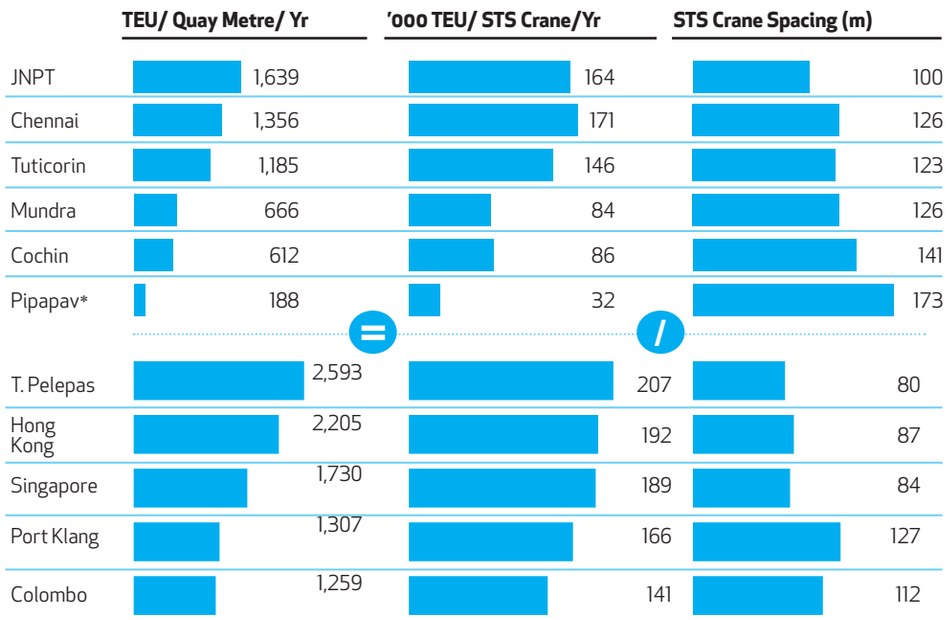
Asset utilisation. High productivity of port assets such as quay and land plays an important role in vessel turnaround time and cargo dwell time. Asset productivity is also important given the ultimate public ownership of ports and therefore the return on capital of assets.

Productivity, however, can be constrained by bottlenecks, which usually lie in quayside operations—the most expensive element of overall costs. On rare occasions, the bottleneck can also lie in yard layout or extreme water and soil conditions that hamper berth construction.

Figure 4.31

Terminal Quayside Productivity at Indian Ports in Comparison with Other Countries

Terminal quayside productivity at Indian ports is far below global figures
2008



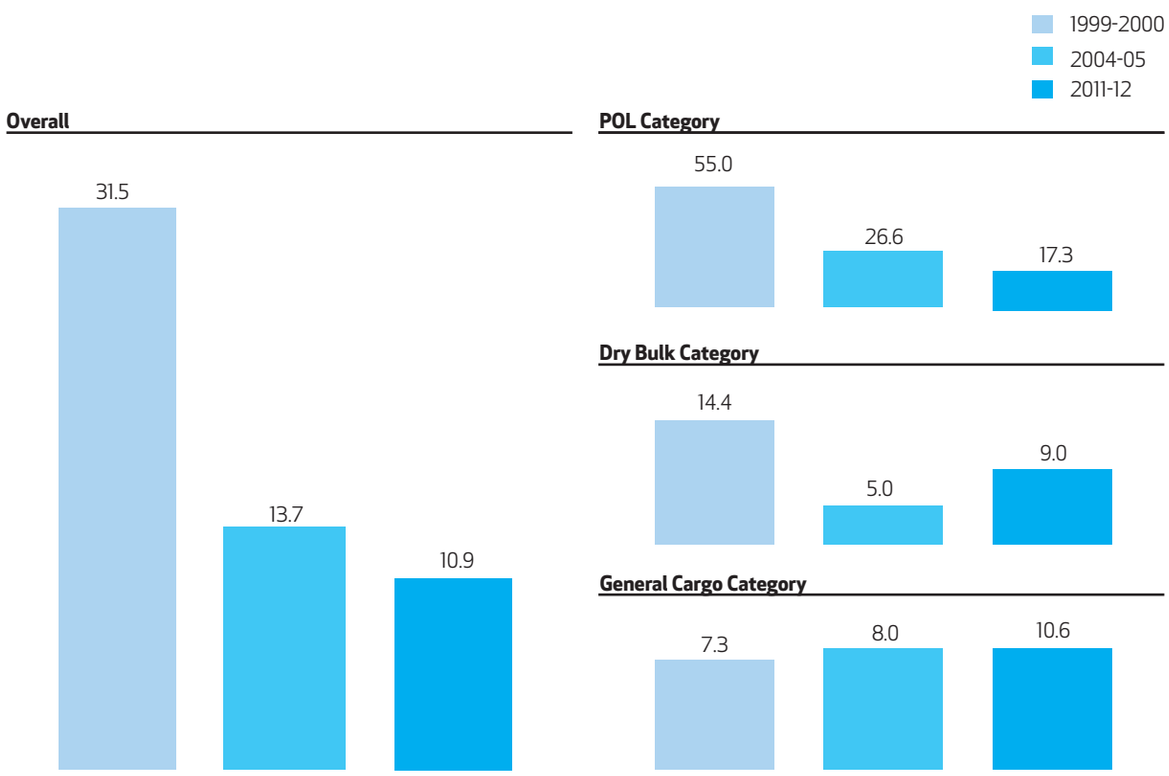
- JNPT is the only port that comes close to quayside performance of best practice ports
- Quayside performance partially affected by scale

*Pipapav is in ramp-up phase.
Source: Containerisation International.

Figure 4.32

Share of Indian Tonnage

[Per cent, 1999-2000 to 2011-12]



Source: NTDPC (2012b).

The main parties that manage asset productivity are the terminal operator and the port authority. While the port authority is principally involved in the design phase around the layout of the port and the location of the terminal, the terminal operator is responsible for the terminal layout and production system quay and yard cranes.

Indian container terminal operators are lagging behind their international peers in operational efficiency, in terms of Twenty-feet Equivalent Unit (TEU), representing a container of 20 feet length) throughput per metre of quay (Figure 4.31). This is due to a combination of crane spacing average distance between cranes and the productivity of individual cranes. Large-scale Indian container terminal cranes should be able to run at 170,000 to 190,000 TEU per crane per year, whereas smaller ones should at least be able to achieve 100,000 TEU. Crane spacing in India should be reduced to approximately 80 m for larger operations and 100 to 120 m for smaller terminals.

SHIPPING

India has one of the largest merchant shipping fleets among developing countries and is ranked 16th in the world in terms of gross tonnage under its flag.

DECLINING SHARE OF INDIAN BOTTOMS IN OVERSEAS TRADE

The overall share of Indian ships in the carriage of the country's overseas seaborne trade has been declining over the years. From about 40 per cent in the late 1980s, it is currently around 10.87 per cent (Figure 4.32)

TAX REGIME

The current treatment of indirect tax (service tax) on voyage and time charter makes Indian shipping expensive. Given the far greater tax advantage available to a majority of foreign players, it is felt that the rather restrictive regime in India fails to provide a level playing field to national shipping lines.

COASTAL SHIPPING

Coastal shipping is an ideal solution to help de-bottleneck India's infrastructure and logistics challenge.

It is the cheapest and least polluting mode of transport (Rs 0.55 per tonne-km versus Rs 0.90 for rail and over Rs 1.50 for road). With India's road and rail infrastructure in most high traffic areas running at over 100 per cent utilisation, there is urgent need to create additional capacity. Given land acquisition problems and other challenges, coastal shipping offers a relatively easier option. It can significantly help improve energy security and carbon footprint of India.

Yet, coastal shipping remains underdeveloped, because it faces the following challenges:

Coastal shipping is the cheapest and least polluting mode of transport (Rs 0.55 per tonne-km versus Rs 0.90 for rail and over Rs 1.50 for road). India's road and rail infrastructure in most high traffic areas are running at over 100 per cent utilisation. Coastal shipping can significantly help improve energy security and carbon footprint of India.

- Penetration of container shipping is low, with the east coast at zero penetration. As on 31 December 2012, monthly container capacity of Indian shipping companies' is 14,287 TEUs/ month (all of it on the west coast) according to the Director General of Shipping.

- Lack of port infrastructure leads to higher turnaround times. This is primarily due to low priority for berthing of coastal container ships. Even a two-day wait for a coastal container ship increases the cost of the movement by close to 10 per cent given the short voyage durations.

- Duties are higher for coastal vessels. The total duty on bunkering for coastal ships is presently over 30 per cent. This makes shipping on the Indian coast more expensive relative to international shipping, as well as coastal shipping in other countries. This adds 10 per cent to the overall cost of movement. Further, the inconsistency in provision of fuel subsidy (diesel subsidy of Rs 9.28 per litre) between road/rail and shipping (no subsidy) creates price distortion.

- Evacuation infrastructure is poor, including road and rail connectivity at many key ports, leading to increased land bridging costs and reduced service levels.

- Coastal vessels are unable to attract adequately qualified sailors, given preference for ocean going vessels due to tax exemption. Personal tax exemption for sailors alone can reduce operating cost by 5 per cent.

- Getting adequate financing for coastal ships is difficult due to lack of dedicated agencies and inability to leverage the ECB route for lack of foreign currency earnings.

- A judicious view must be taken on cabotage law with a longer perspective. Indian cabotage restrictions may discourage the growth of coastal shipping insofar as Indian tonnage is not adequate. It is also argued that international competition would bring about greater efficiency. A counter-argument is that relaxing cabotage laws will tilt the scales against Indian

The choice of port management model adopted in a country is influenced by the socioeconomic structure of a country, the historical development of the port, the location (urban area or isolated region), and the types of cargo that are typically handled (liquid or dry bulk, containers).

shipping. However, if the primary objective is to increase coastal shipping and make coastal tonnage competitive, it might be desirable to allow foreign vessels to compete for coastal cargo. A stricter cabotage law can be enforced later when there is sustained growth in coastal shipping. There is also a view that cabotage on carriage of empty and/or transhipment containers should be partially relaxed with certain conditions. This may facilitate the efficient movement of containers as well as ease congestion at ports and port storage.

- Considering that coastal vessels do not have to conform to the different conservancy and safety requirements in different foreign ports and face the hazards of the high seas, there is a strong case for revisiting the issue of safety. Coastal vessels are constructed to specifications of oceangoing vessels even though they are not subject to the same stress and turbulence. This needlessly increases capital costs.

INLAND WATER TRANSPORT

India's IWT sector is relatively under-developed compared to other large economies due to a mix of natural reasons (such as inadequate depth and seasonal siltation) and policy lacunae (among them, lack of public investment and preferential treatment of other modes).

NAVIGATIONAL INFRASTRUCTURE

Absence of adequate navigation infrastructure is one of the biggest challenges facing the sector.

Inadequate depth: Large parts of Indian Waterways have inadequate depth for commercial movement of cargo. Sufficient depth or Least Available Depth (LAD) is required to enable navigability of larger vessels, essential to make IWT commercially viable through economies of scale. Moreover, Indian rivers (especially rivers in the northern plains) face severe problems of siltation round the year. The river bed rises, impeding movement of cargo during non-monsoon months.

Inadequate air draft: Multiple bridges with low vertical clearance obstruct the passage of bigger IWT vessels on waterways such as NW-3. There are several navigable canals in the states of Uttar Pradesh, Bihar, West Bengal, Tamil Nadu and Andhra Pradesh: Sarada canal, Ganga canal, Yamuna canal, the delta canal systems of the Krishna, Godavari, Mahanadi and Brahmani. But these cannot be utilised for cargo movement due to air draft restriction.

Shortage of IWT vessels: Vessel building is highly capital intensive and faces difficulties in obtaining project finance from banks and financial institutions since it does not enjoy 'infrastructure' status. The private sector is reluctant to invest in barges unless long-term cargo commitments for onward/return trips are made from user industries.

Lack of night navigation infrastructure: Rudimentary night navigational facilities and markings are also a major issue.

Shortage of MRO facilities: There is severe shortage of MRO (Maintenance, Repair and Overhaul) facilities for IWT vessels.

POLICY PARITY

The government needs to establish a level playing field between the various transport modes. While IWT is cost competitive in general with other transport modes such as rail and road, the situation is sometimes distorted by preferential treatment offered to other modes. An example is freight subsidy for transportation of fertilser being extended to rail and road but not to IWT. This artificially makes rail and road more competitive on the cost curve and drives traffic away from IWT. Road and rail also enjoy preferential tax treatment.

MODAL INTEGRATION

Lack of intermodal IWT terminals on inland waterways inhibits door-to-door connectivity. There are IWT terminals on NW-1, NW-2 and NW-3, but most of these terminals are not properly linked with road/rail networks.

Given that IWT terminals are not final destinations in themselves but nodes in a larger logistics chain, it is imperative to establish good road and rail last-mile connectivity.

LACK OF PUBLIC INVESTMENT

While considerable emphasis has been laid on development of rail and road infrastructure in successive Five Year Plans, IWT has received scant attention. Consequently, public investment in IWT has been far below the levels in other modes.

To illustrate the case in point, while development/maintenance cost of road is about Rs 50 million per km, the amount spent in the last 24 years on development of the fairway of 2,716 km of the existing three National Waterways is only about Rs 8 billion Rs 3 million per km only. To put the total investment figure in perspective, the corresponding investment in the road sector the NHDP programme for widening and upgrading of National Highways is Rs 3,000 billion and that for railways, Rs 593.60 billion for 2011-12 alone. At this

Table 4.4
Port Governance Models

	INFRASTRUCTURE	SUPERSTRUCTURE	PORT LABOUR	OTHER FUNCTIONS
Public Service Port	Public	Public	Public	Majority Public
Tool Port	Public	Public	Private	Public / Private
Landlord Port	Public	Private	Private	Public / Private
Private Service Port	Private	Private	Private	Majority Public

Source: World Bank (2007).

rate of investment, the possibility of IWT becoming viable as a mode of transport is limited.

Since the extent of public investment is limited in the transport sector, this situation poses a choice for the government. Do funds need to be redirected towards IWT to make it a commercially viable mode? Or should the funds instead be used for the modes of transport that have the maximum potential impact because of the sheer volume of cargo and passenger traffic they carry? The answer is as important as the other decisions on technical, regulatory and operations issues in the ports, shipping and IWT sector.

PORTS

Port governance is structured by ownership and administration models and regulatory frameworks. A short summary of these models and frameworks may be useful before moving on to describing international case examples for a selected set of countries.

GOVERNANCE MODELS

During the past three decades, discussions on port reforms focused particularly on the relevance of a number of port management or administration models. The choice of model adopted in a country is influenced by the way the ports are organised, structured and managed. These factors include the socioeconomic structure of a country, the historical development of the port, the location (urban area or isolated region), and the types of cargo that are typically handled (liquid or dry bulk containers).

These models differ by whether the services are provided by the public sector, private sector or mixed ownership providers; their orientation (local, regional or global); who owns the superstructure and capital equipment; and who provides dock labour and management.

SERVICE PORT MODEL

This is a predominately public model in which the Port Authority owns the land and all available assets—fixed and mobile, and performs all regulatory and port functions. All cargo handling operations are performed by labour directly employed by the Port Authority. This model is used in a (decreasing) number of developing countries.

A Service Port is usually controlled by the Ministry of Transportation (and/or Communications). The Chairman of the Port Authority is usually a civil servant who directly reports to the appropriate Minister. In some cases, cargo handling services are performed by separate public entities; this division of operations between separate public entities can present unique management challenges.

Under this model, the same organisation has the responsibility for performing regulatory functions, developing infrastructure and superstructure, and executing operational activities. In general, there is no private sector involvement.

The strength of this model is that facilities development and operation are the responsibility of only one entity, making for a streamlined and cohesive approach. On the other hand, the dearth of internal competition can lead to inefficient administration, lack of innovation, and services that are not user- or market-oriented. Dependence on government for funding may lead to wasteful use of resources or under-investment.

TOOL PORT MODEL

Here, operational responsibilities are divided. The Port Authority owns, develops and maintains the port infrastructure and superstructure, including cargo handling equipment. Port Authority equipment is usually operated by its own labour, but other operations are performed by private cargo handling firms, on board vessels as well as on the quay and apron. The private operators are usually small firms.

Box 4.1

Public Private Partnership (PPP) in Ports

The role of the port authority is to provide and manage common facilities like the breakwater and entrance channel, utilities and road and rail access; and to plan and implement the expansion and development of the port. Most PPP models in the ports sector sit within a landlord port structure in which a public sector port authority (often autonomous) enters into PPP contracts for a series of individual terminals. The operators of the terminals are usually different, and the PPP model used may differ from one terminal to the next. The most common PPP models for individual business units are:

The management/investment model for existing public assets: The private operator manages publicly owned assets and makes additional investments in them, in exchange for being given the right to use them for a specified period of time. Ownership of the public assets remains with the public sector throughout this period; this type of PPP model is generally associated with the port privatisation programmes which have taken place since the late 1980s in southern Europe, South America, Africa and South Asia.

The development rights model for new private assets: Here the private investor buys the right to build new port assets and have exclusive use of them for a fixed period of time before transferring them over the public sector. This is a model which has been increasing in popularity in the ports sector as the stock of public assets suitable for private management has dwindled. However it raises the question of why private investors should have to give back their assets to the public sector, often free of charge, when a hotel complex built on the same waterfront site would be treated as freehold property.

The public-private joint venture model: In this, the public sector has an influential or controlling stake in the Special Project Vehicle (SPV) set up to hold either a management-investment contract or a development rights contract for new port facilities. These contracts otherwise operate broadly as described above, although the existence of a large public sector stake in the SPV has a significant effect on the detailed provisions of the contract. This type of PPP model has become the norm in China and Indonesia, but is rarely found elsewhere.

Management contracts: Where the private sector operates port facilities on behalf of the public sector with minimal investment of its own, are also now quite rare. This is partly because they generate small returns in relation to the inputs of relatively scare management time required. There is also a history of failure caused by conflicts over strategy, usually arising when private operators are not given the freedom they need to satisfy public sector objectives for the contract.

Short-term leases: Of public assets of up to 15 years, are more popular than management contracts because they give the operator greater commercial freedom.

Source: Farrell (2012).

While duplication of facilities is avoided, since investment in infrastructure and equipment is provided by the public sector, the fragmentation in responsibility for cargo handling can lead to conflict between small operators and between stevedoring companies and port administrators. Another weakness of the model is the risk of under-investment. Strong stevedoring companies are not developed as a local economic benefit.

LANDLORD PORT MODEL

The Port Authority maintains ownership of the port, while the infrastructure is leased to private operating companies. The Port Authority's responsibilities as landlord include economic exploitation, long-term development of the land and maintenance of basic port infrastructure such as access roads, berths and wharves. The private operating companies that lease from Port Authority provide and maintain their own superstructure and purchase and install their own equipment. Dock labour is also employed by the private firms.

The advantage: the same entity both executes operations and owns the cargo handling equipment; so the planning is likely to result in better outcomes and is more likely to respond effectively to changing market conditions. However, sometimes, there may be a duplication of marketing effort as both terminal operators and the Port Authority visit potential customers; so the model needs fine planning and coordination between stakeholders.

PRIVATE SERVICE PORT MODEL

Here, the public sector (the State) no longer has any interest in port activities. Port land is owned by the private sector. All regulatory functions and operational activities are performed by private companies. This is the model used in many ports in the UK.

A particular strength of the model is that port development and tariff policies tend to be market-oriented. On the other hand, it could result in monopolistic behaviour as well as a loss of public involvement in developing long-term economic policy and strategies.

Today, the landlord model is the mainstream port governance structure worldwide and becoming the dominant port model in larger and medium-sized ports. The landlord port is characterised by its mixed public-private orientation. Under this model, the publicly governed port authority acts as regulatory body and as landlord, while private companies carry out port operations (especially cargo-handling).

Though widely acknowledged, the landlord model is not fully implemented everywhere since it requires a level of institutional and managerial competence which is not always available in port organisations. Moreover, transition to the landlord model assumes a regulatory framework in place geared to encourage fair competition on a level playing field.

ECONOMIC REGULATORY FRAMEWORK

The shift in the role of the public sector from port services provider to a landlord calls for enhanced responsibilities as a regulator of activities that are now executed by the private sector.

Regulation in the port sector may entail controlling behaviour of port sector entities by rules or regulations or alternatively a rule or order issued by an executive authority, a regulatory agency or a Port Authority, having the force of law. Regulation may cover all activities of public or private behaviour—economic, social, environmental, safety and security—that may affect the development and management of ports and port terminals including their access roads, rail links, pipelines and waterways.

Economic regulation typically involves intervention in the functioning of markets in terms of setting and controlling tariffs, revenues and profits; controlling market entry or exit; and ensuring that fair and competitive practices are maintained within the sector. The overarching philosophy of regulation under the landlord model is that of competition regulation as opposed to tariff regulation.

PORT COMPETITION

There are three categories of port-related competition:

The regulator for port competition should preferably have the character of an arbitrator rather than a court of law, and be accepted by the port community as being independent. In case boundaries between port authorities and terminal operators are vague or nonexistent, for instance a regulator might be a solution for guaranteeing a level playing field for all operators

- **Inter-port competition** The scale of inter-port competition often depends on the size of the hinterland of the concerned ports. For example, Rotterdam competes with Antwerp, Hamburg and Bremen for cargoes destined for Central Europe. Trans-shipment container trade competition often concerns an entire region; for example, in South Asia, Colombo is competing with Singapore, Tanjung Pelepas, Dubai, Salalah, Aden, and possibly with Vallarpadam.
- **Intra-port competition** refers to a situation where two or more terminal operators within the same port area compete for the same type of cargoes. In general, intra-port competition is favoured by both government and port users, but is not always feasible. It depends on the volume of the cargo, which has to be sufficient to allow two or more operators to run profitable and effective businesses.
- **Intra-terminal competition** refers to two or more (stevedoring) companies competing within the same terminal. This situation is rare and usually only exists within small ports operating under the service port model with independent stevedores.

Establishing competition in the port sector requires four steps:

- Assessment of sector unbundling, especially in the case of a public service port. This relates to the financial and economic feasibility of creating more than one terminal handling the same commodity.
- Implementation of the new port management structure, if and when required.
- Conclusion of concession or lease agreements that include tariff regulation mechanisms, if required by the absence of intra-port competition.
- Introduction of regulatory oversight by the government (port competition act), but only with respect to those tariffs that relate to a monopolistic market situation.

When intra-port competition is deficient or absent, terminal operators, public or private, have an incentive to use their monopolistic market position to charge high tariffs particularly for captive cargoes

which may justify regulation. The need for such regulation may lead to the creation of an independent port competition regulator. This regulatory function is usually instituted by law.

The main objective of the regulator is to ensure fair competition among operators in the port; control monopolies including public ones and mergers; and prevent anti-competitive practices. Generally, a port sector regulator has powers to interfere in anticompetitive practices such as:

- Use of a dominant position to prevent or lessen competition
- Cross-subsidisation from monopoly services to contestable services, where it threatens fair competition
- Price fixing among competitors
- When a firm or a person providing port services pursues a course that of itself has or is intended to have the effect of restricting, distorting, or preventing competition
- Monopoly situations, which are most likely to occur in medium size or smaller ports. In many ports, only one container or oil terminal exists. Generally, when a monopoly or merger situation is not in conflict with the public interest, it may be permitted.

The regulator for port competition should preferably have the character of an arbitrator rather than a court of law, and be accepted by the port community as being independent. In case boundaries between port authorities and terminal operators are vague or nonexistent, for instance when a port authority not only runs its own container terminal but also owns shares in a competing facility, as is the case in Sri Lanka, a regulator might be a solution for guaranteeing a level playing field for all operators. The regulator and a possible national level competition regulator may have a concurrent role where cases may be referred equally to either of them based on who is most suited for a required intervention. The regulator, however, should not jeopardise the legal powers of port authorities to operate freely in the market or the ability of a terminal operator to negotiate tariffs with its clients.

In principle, tariff setting or other price controls should not be exercised under the landlord model but left to the market. Rather, economic regulation pertains to establishing conditions for fair competition on a level playing field. Only under serious market imperfections, as mentioned above, some pricing control may be indicated.

PORT REGULATORY POLICY

To help design an economic regulatory policy, reflecting the above principles of enhancing competition, the following guidelines have been suggested in the World Bank Port Reform Toolkit:

- Government should have a clear understanding of the competitive environment of the port sector
- A decision on economic regulation should be based on the risk of anti-competitive behaviour or on evidence that monopolistic behaviour is occurring and that other methods of intervention (for example, cease-and-desist orders, sanctions, or fines) are not feasible, adequate, or appropriate
- The regulator should clearly define what form of economic regulation (for example, rate of return or tariff setting) is to be applied and under what circumstances
- Responsibilities for regulation of port operations and competition should be formally separated and assigned to two different entities
- In the event that economic regulation is imposed, regulators will need to have a reasonable understanding of the cost structure of the operation; this means that regulators will need proprietary financial information and will have to weigh the trade-offs between the need for information and the burden of the reporting requirements on the operators
- When a determination is made that economic regulation is not necessary, but instead tariff monitoring or approval is warranted, then the regulator will need to clearly set out the tariff reporting requirements, the review process, and impose a time limit on itself as to when an approval decision is to be made
- The entire competition regulation policy should be conveyed to the port and shipping community, as should the disposition of antitrust cases and regulatory policy decisions
- Policy and case deliberations should include the opportunity for affected parties to present their views
- Any decisions made by the regulator should be enforceable with recourse for appeal

KEY REGULATORY AGENCIES

Under the Landlord Port Model, the following entities are active as regulators:

- The Ministry responsible for port affairs, with respect to drafting and implementation of transport and port laws, national and international conventions, regulations and decrees
- The public Port Authority issuing bye-laws inter alia with respect to safety of vessels in port or at anchor, reporting and communication with vessels, berthing, securing of vessels, shifting, control of dangerous goods in ports, delivery of sewerage, obnoxious and toxic wastes, specific use of terminal areas and other specific port-related issues. As part of its landlord function, a Port Authority concludes rent, lease and concession agreements with private operators and port users.

Table 4.5
Key Agencies in the US

KEY AGENCIES	ROLE
Department of Transportation (DoT)	■ To serve the US by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets vital national interests and enhances the quality of life of the American people, today and into the future Oversees federal highway, air, railroad, and maritime and other transportation administration functions
U.S. Maritime Administration	■ The Maritime Administration is the agency within the US Department of Transportation dealing with waterborne transportation. Its programmes promote the use of waterborne transportation and its seamless integration with other segments of the transportation system, and the viability of the US merchant marine

Source: Bossche (2012).

Table 4.6
Key Agencies in Canada

KEY AGENCIES	ROLE
Transport Canada	■ Transport Canada is responsible for transportation policies and programmes. It ensures that air, marine, road and rail transportation are safe, secure, efficient and environmentally responsible.
Infrastructure Canada	■ The main trading ports are Canada Port Authorities (CPAs) and these fall under federal jurisdiction. Under the Canada Marine Act (CMA), the federal government owns the port lands and infrastructure of six CPA ports in the province [British Columbia] but leaves administration to local authorities The CMA was introduced to allow ports to be more responsive to market opportunities. The Port Authorities provide port infrastructure (e.g., vessel berths) and lease terminal sites to private operators

Source: Bossche (2012).

Table 4.7
Key Agencies in the UK

KEY AGENCIES	ROLE
Department for Transport	■ The Department for Transport provides leadership across the transport sector to achieve its objectives, working with regional, local and private sector partners to deliver many of the services
Infrastructure Planning Commission (IPC)	■ The IPC is the independent body that decides applications for nationally significant infrastructure projects. These are the large projects that support the economy and vital public services, including railways, large wind farms, power stations, reservoirs, harbours, airports and sewage treatment works
Scottish Executive	■ The devolved government for Scotland is responsible for most of the issues of day-to-day concern to the people of Scotland, including health, education, justice, rural affairs, and transport
Welsh Assembly	■ Devolved Government for Wales
Northern Ireland Executive	■ Devolved Government for Northern Ireland

Source: Bossche (2012).

Apart from generally applicable legislation by any competent authority, specific port related regulation can also be exercised by a Competition Regulator giving regulations and specific orders to prevent anti-competitive behaviour in ports or abuse of dominant position by a Port Authority or private operators. Usually a Competition Regulator has the power to issue a tariff order. It might also deal with mergers of port service providers which endanger fair competition in ports. The Competition Regulator could be positioned at different levels: Sub-sector, e.g., Seaports; Sector, e.g., 'transport' or 'infrastructure'; Multi-sector, eg., National Competition Policy; and Maritime Authority, in the event that the Port Authorities are deemed to be too commercially oriented.

INTERNATIONAL EXAMPLES: PORT GOVERNANCE

US

In the US, the majority of ports are owned and managed by counties and municipalities and operate as landlord ports. The port operations are largely in the hands of private enterprise. Key agencies in the US and their role are provided in Table 4.5.

Table 4.8
Port Management Approaches in the EU

PORT MANAGEMENT APPROACHES IN EU				✓ Dominant model in a member state
MEMBER STATE	MEMBER STATE	GOVERNMENT DIRECT	PORT MANAGEMENT PUBLIC ENTITY	PRIVATE ENTITY
Belgium	Municipal/Regional		✓	
Cyprus	National		✓	
Denmark	Municipal/Regional	✓	✓	✓
Estonia	National		✓	
Finland	Municipal	✓	✓	✓
France	National/Regional	✓	✓	
Germany	Regional/Municipal	✓	✓	✓
Greece	National/Municipal		✓	
Ireland	National		✓	✓
Italy	National	✓	✓	
Latvia	National/Municipal		✓	
Lithuania	National		✓	
Malta	National		✓	
Netherlands	Municipal/Regional/ National		✓	✓
Poland	National/Municipal		✓	
Portugal	National		✓	
Slovenia	National		✓	
Spain	National/Regional		✓	
Sweden	Municipal	✓	✓	
UK	National /Municipal/ Regional	✓	✓	✓

Source: Bossche (2012).

CANADA

The main trading ports in Canada are Canada Port Authorities (CPAs) and these fall under federal jurisdiction. Under the Canada Marine Act (CMA), the federal government owns the port lands and infrastructure of six CPA ports in British Columbia, but leaves administration to local authorities. The CMA was introduced to allow ports to be more responsive to market opportunities. The Port Authorities provide port infrastructure and lease terminal sites to private operators. Table 4.6 lists the key agencies in Canada and their role.

UK

Most commercial ports' operations have been privatised. Fifteen of the 20 largest ports (by tonnage) in the UK are in private ownership, which accounts for two-thirds of the UK's port traffic. These private ports have no government investment; all their investment must be privately financed on a commercial basis. Many of the smaller ports are trust ports (independent statutory organisations but without shareholders), as well as a few larger ones such as the Port of London Authority. A few ports are also municipal ports belonging to local authorities. Key agencies in the UK and their role are provided in Table 4.7.

The governance model in the UK is however not representative of the European Union. Port management methods vary considerably from country to country. In some member states, ports are managed by private entities which own port land, or avail themselves of rights similar to those of an owner. Those ports are entirely private business. In other cases a large majority in continental Europe—ports are managed by public entities or undertakings.

Table 4.9
Key Agencies in Australia

KEY AGENCIES	ROLE
Department of Infrastructure, Transport, Regional Development	■ The Department of Infrastructure, Transport, Regional Development and Local Government is responsible for infrastructure planning and coordination; transport safety, including investigations; land transport; civil aviation and airports; transport security; delivery of regional and rural specific services; maritime transport including shipping; regional development; matters relating to local government; and major projects facilitation
National Transport Commission (NTC)	■ The role of the National Transport Commission is to work closely in partnership with peak industry bodies and government to develop more consistent, practical and effective land transport policies, laws and practices.
State Government Departments of Transport	■ Infrastructure Australia will develop a strategic blueprint for the nation's future infrastructure needs and—in partnership with the states, territories, local government and the private sector—facilitate its implementation. It will provide advice to Australian governments about infrastructure gaps and bottlenecks that hinder economic growth and prosperity. It will also identify investment priorities and policy and regulatory reforms that will be necessary to enable timely and coordinated delivery of national infrastructure investment.
Australian Transport Council (ATC)	■ The ATC was established in June 1993 to provide a forum for Commonwealth, State, Territory and New Zealand Ministers to consult and provide advice to governments on the co-ordination and integration of all surface transport and road policy issues at a national level
State Government Departments of Transport	■ Each State Department of Transport is responsible for road, rail and port policy in their respective states

Source: Bossche (2012).

Table 4.10
Evolution of Port Governance in China

PHASE	POLICY	KEY ELEMENTS OF POLICY
Phase I (1979-84)	■ Central control of port sector	■ Port ownership with Ministry of Communications; key functions included: – Control of planning and strategy – Management of operational activities – Definition of infrastructure priorities
Phase II (1984-2004)	■ Decentralised control of ports	■ Classification of 14 coastal cities as 'Open cities' ■ Regulations introduced by State council to promote economic cooperation and terminal interchange with foreign countries; and to speed up development of ports and terminals
Phase III (2004 onwards)	■ Further decentralisation and beginning of corporatisation	■ 'Port Law' introduced in 2003; seen as a signal of high importance attached to port industry by the state ■ Primary ownership with local authorities ■ Central government only plays an oversight role in strategic planning

Source: Bossche (2012).

Table 4.11
Key Agencies in Shanghai Port

KEY AGENCIES	ROLE
Shanghai Port Authority	■ In 2003 Shanghai's port oversight body underwent a restructure resulting in the Shanghai Port Administration Bureau, which took responsibility for port planning, administration and regulations, and the Shanghai International Port Group (SIPG). The latter was designated port manager and operator and also given responsibility for the operation and management of Yangshan's first five berths ■ Today administration of the Shanghai Port is the charge of the Shanghai Municipal Transport and Port Authority (the 'Shanghai Port Authority'), which has the authority to: – Implement guidelines and polices and enforce laws, rules and regulations – Formulate plans and strategies for the Shanghai harbour (including Yangshan) – Enforce trade regulations application to the Yangtze River (within the Shanghai municipality) – Supervise and manage environmental issues – Coordinate research and development – Supervise the quality and safety of construction projects – Vessel management – Tarification – Supervise and administer pilotage within the port – Conduct cooperation and technical exchanges between the Shanghai Port and other domestic and foreign ports – Administer technical and vocational training, including examinations and the issuance of certificates for workers engaging in port activities
Shanghai International Port Group (SIPG)	■ Established in 2003, the SIPG was wholly floated on the Shanghai Stock Exchange in 2006. Its major shareholders are the Shanghai Municipal Council (44 per cent), China Merchants International Terminals (Shanghai) Co. Ltd (26 per cent), and Shanghai Tongsheng Investment (Group) Corp (16 per cent). The Shanghai Municipal Council's major stake is consistent with the model of governance adopted throughout China since it began to corporatise and privatise ports from 2001.

Source: Bossche (2012).

Table 4.12
Key Agencies in Singapore Maritime

KEY AGENCIES	ROLE
Maritime and Port Authority of Singapore	The Maritime and Port Authority of Singapore (MPA) regulates and licenses port and marine services and facilities. It also manages vessel traffic in the Singapore port while ensuring safety and security. The port section contains information, guidelines and procedures on matters relating to the port and its operations. The shipping section covers information on how to register a ship under the Singapore flag as well as manning guidelines, procedures and requirements for owners and masters of Singapore-registered ships. MPA also posts circulars and notices to update the port and shipping community. Also important to the communities are information on port, shipping and other MPA tariffs. As an active member of the international maritime community, MPA posts updates on IMO matters.
PSA Singapore Terminals	The Port of Singapore Authority was formed on 1 April 1964 to take over the functions, assets and liabilities of the Singapore Harbour Board. On 25 August 1997, a parliamentary bill was passed to corporatise the Port of Singapore Authority, and PSA Corporation Ltd was created. PSA's staff are represented by the Singapore Port Workers, Union and the Port Officers' Union. Both unions enjoy a close relationship with PSA's management.
Singapore Maritime Academy (SMA)	As the country's main maritime training institution, SMA offers a full range of maritime diplomas and specialist diplomas, Certificate of Competency (CoC) courses as well as Standards of Training, Certification and Watchkeeping (STCW) courses.

Source: www.mpa.gov.sg; www.singaporepsa.com; www.sma.sp.edu.sg/ (all accessed 3 March 2014).

Table 4.8 shows government level and type of port management—direct government, public entity, private entity—in EU member states.

AUSTRALIA

Australia has three levels of government commonwealth, state and local. The commonwealth has key functions involving the ports, including security, environment and competition policy, and border control. It also finances and owns specific infrastructure assets including certain railways and roads. Port corporations are owned by state governments which also control adjacent land uses, with the exception of South Australia, which was privatised in 2001. Queensland is also currently processing the privatisation of the port of Brisbane. Australian ports are mainly landlords to terminal operators (stevedores) and are primarily only responsible for the management of port infrastructure such as dredged channels and berths. Terminal operating/stevedoring services are provided by a small number of specialist firms that own the container handling equipment but lease berth space from the relevant port authorities. Key agencies in Australia and their role are provided in Table 4.9.

CHINA

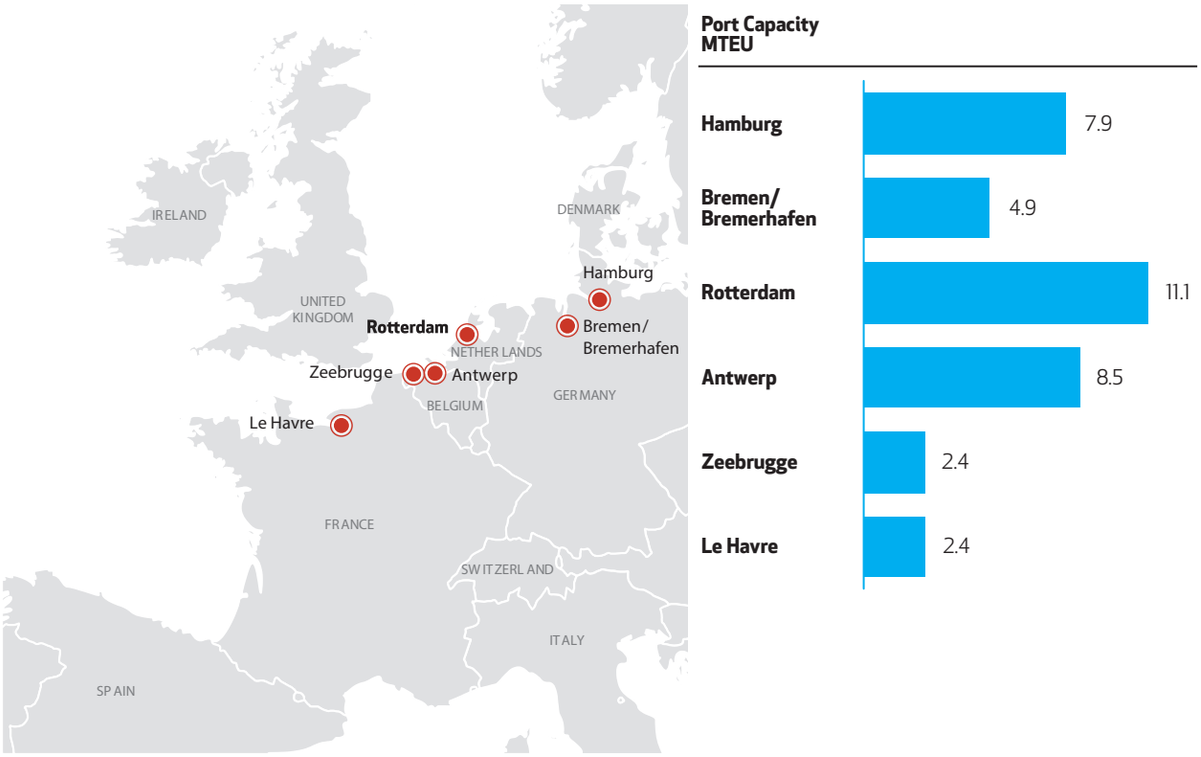
Ports in China generally feature open access, and are managed at the municipal level, with local governments taking a substantial interest in corporatised operations. Port governance in China has undergone significant change since 1979 across three phases of evolution, which are outlined in Table 4.10.

As an example, the key agencies for governance of Shanghai port and their roles are outlined in Table 4.11.

SINGAPORE

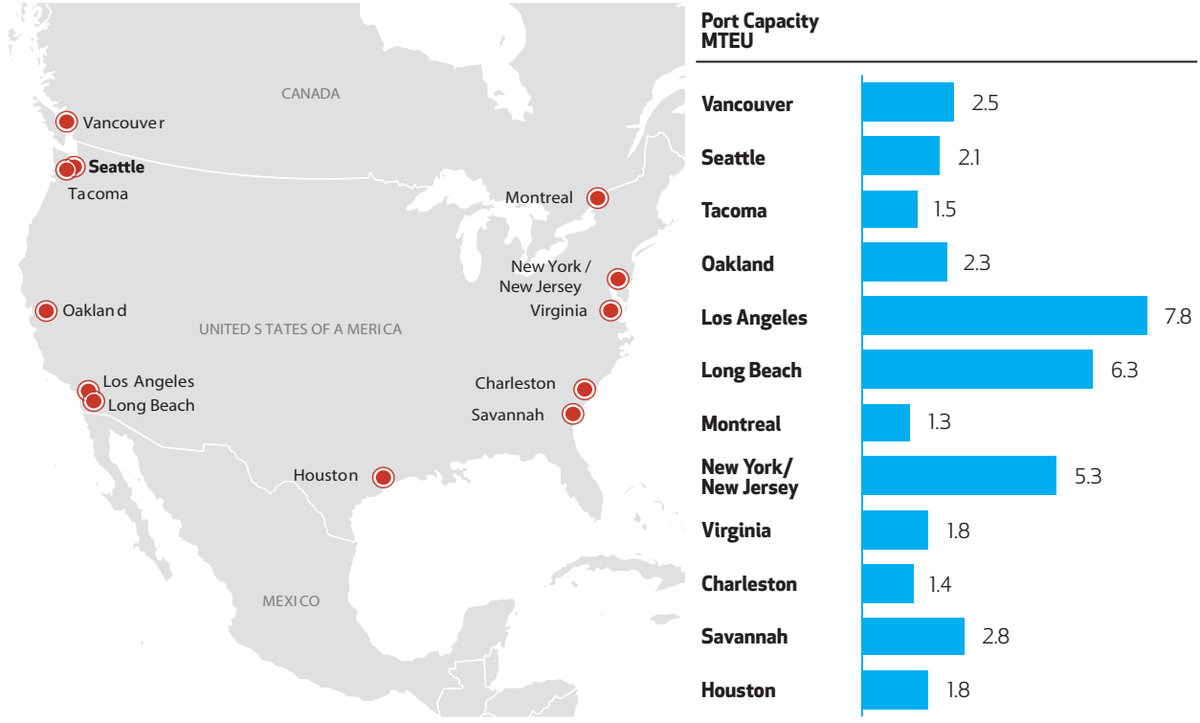
Up to 1996, Singapore was one of the few large public service ports in the world. It combined land ownership, regulatory functions and port operations as part of the Government of Singapore. In 1996, the government decided to change the management structure. First, it corporatised the terminal operations of the port under PSA Corporation, which is now one of the largest and most global container terminal operators in the world. Second, a new port authority was created as the MPA, Maritime and Port Authority of Singapore, which operates as landlord in the port, developing, promoting, regulating and securing safety. However, the full transitioning towards a landlord will be complete when the port authority divests its shares it has in PSA. As of now, the authority is not yet completely independent from operations. Key agencies in Singapore maritime are provided in Table 4.12.

Figure 4.33
Main Container Ports in Hamburg-Le Havre Range (NW-Europe)



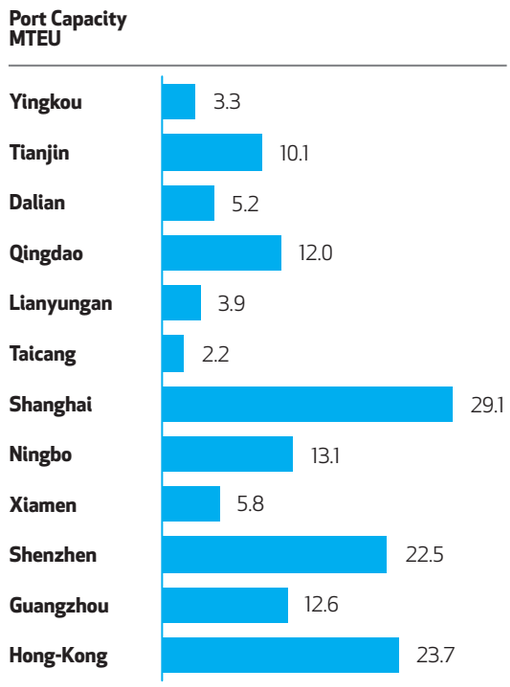
Source: Containerisation International, 2010.

Figure 4.34
Main Container Ports in US and Canada



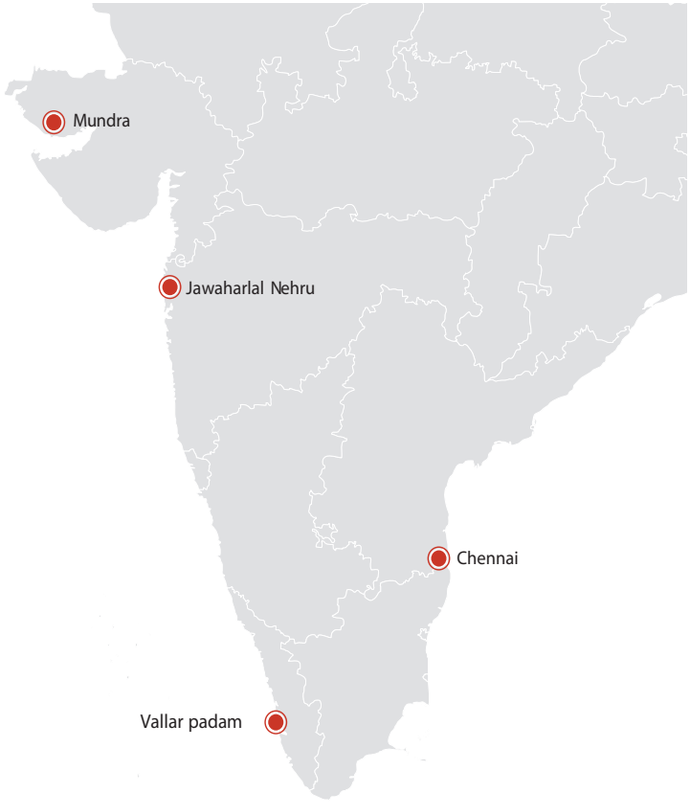
Source: Containerisation International, 2010.

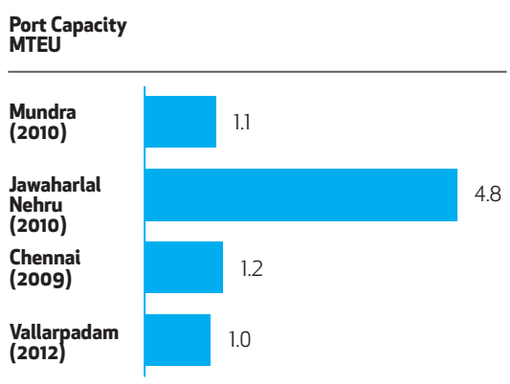
Figure 4.35
Main Container Ports in China



Source: Containerisation International, 2010.

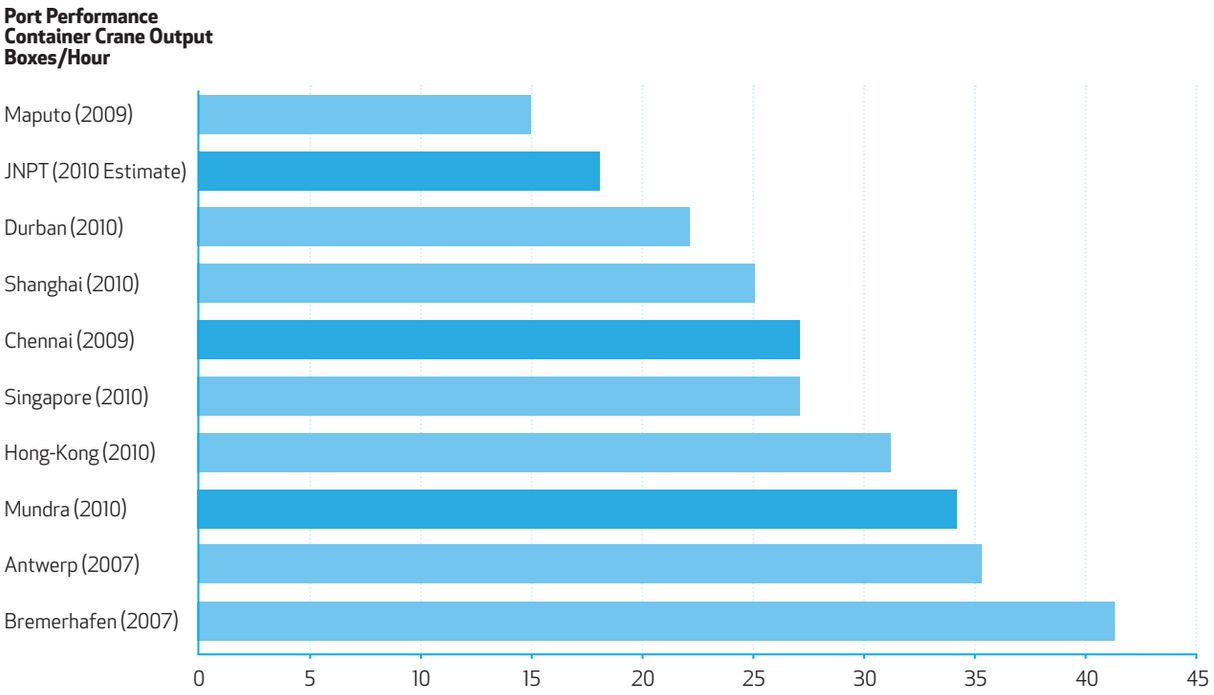
Figure 4.36
Main Container Ports in India





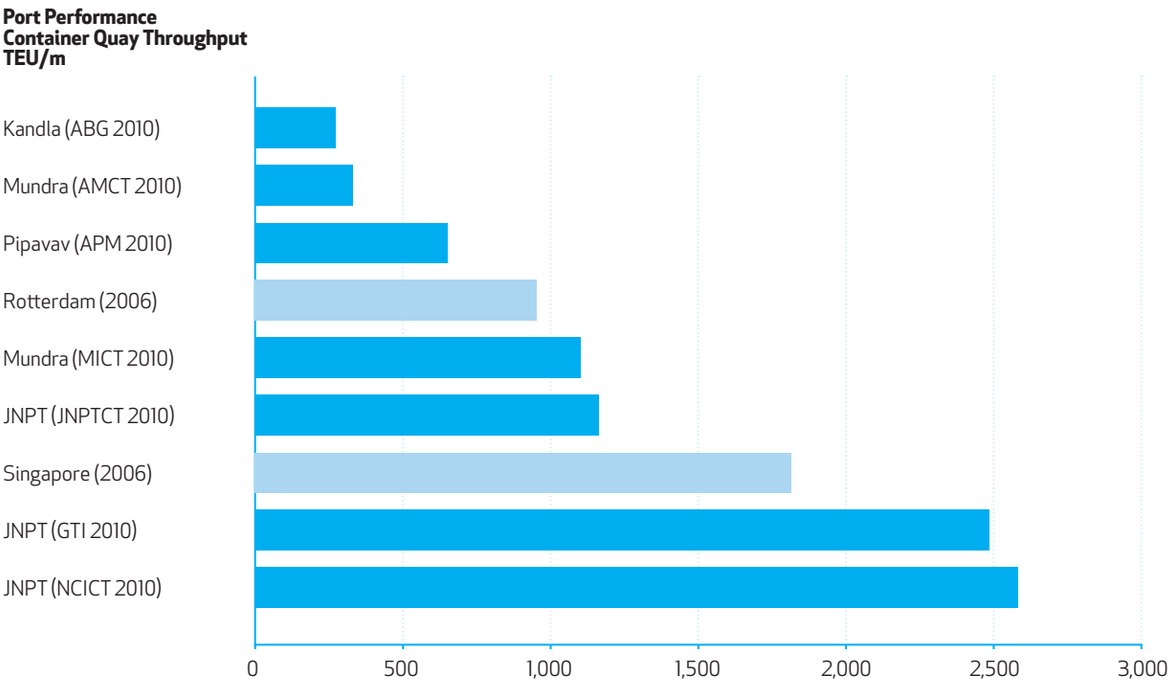
Source: Containerisation International, 2010.

Figure 4.37
Indian Container Ports in Comparison with Container Ports of Other Countries
[Container Crane Output]



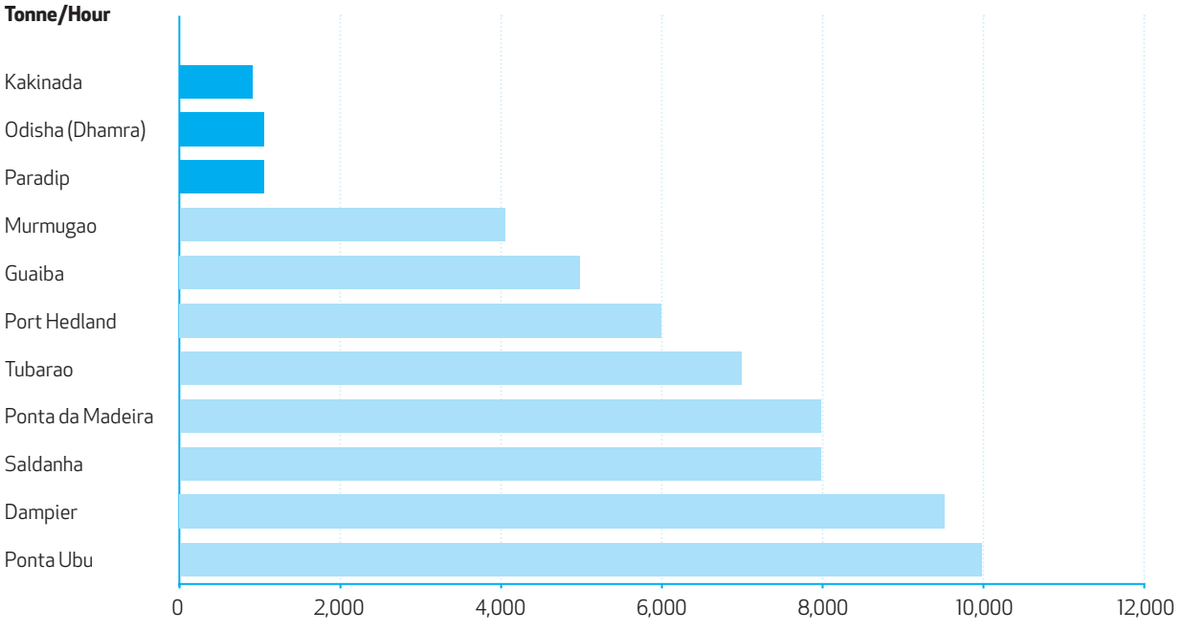
Source: Container productivity at New Zealand ports, Ministry of Transport, 2011.

Figure 4.38
Indian Container Ports in Comparison with Container Ports of Other Countries
[Container Quay Throughput]



Source: Indian ports: Port efficiency change in container handling terminals: a case of ports in JNPT-Mundra range of ports in India; Bhatt and Gaur (2010); Singapore and Rotterdam: Container port Markets in the Middle East and South Asia to 2020, Ocean Shipping Consultants Ltd, 2007, England.

Figure 4.39
Indian Ports in Comparison with Ports of Other Countries
[Iron Ore Export Terminals Loading Rates]



Source: Global iron ore load ports: information handbook; Wilhelmsen Ships Service (2008).

INTERNATIONAL EXAMPLES: PORT EFFICIENCY

CONTAINER PORT CAPACITY

Figures 4.33-4.36 show all container ports of 1 million TEU and over, in Northwest Europe, US/Canada, China and India, respectively (2010 figures).

India has only three such ports compared to six in Europe and 12 each in the US and China. Even if container volume in ports with less than 1 million TEU is considered, the picture does not change much. Clearly, container penetration in India is not very high. A lot of general cargo is still transported in loose form, which is less efficient than transport in containers.

However, this may change drastically in the coming years or decades. Continuous GDP growth will lead to more (containerised) imports; growth of industrial production will lead to more containerised exports. Moreover, as the Indian economy gets more interconnected with worldwide logistics chains, the container penetration will increase. These two factors combined are expected to result in enormous growth in Indian container volumes. This growth will have to be catered to by a large number of container ports and/or container terminals at existing ports. Careful and strategic selection and development of the best locations for this additional capacity is of utmost importance.

CONTAINER PORT PERFORMANCE

The best port performance will be achieved in a competitive environment for terminal operators. Monopolistic situations tend to result in lower scores on KPIs. And privately operated terminals generally perform better than publicly operated terminals.

Figures 4.37 and 4.38 provide a comparison of Indian container ports with others across the world, for two KPIs commonly used at container terminals: container crane output (boxes per hour), and container quay throughput (TEU per metre of quay per year). The figures show that there is quite some variation in the scores of Indian ports on these two KPIs, but that the same variation is found in ports throughout the world.

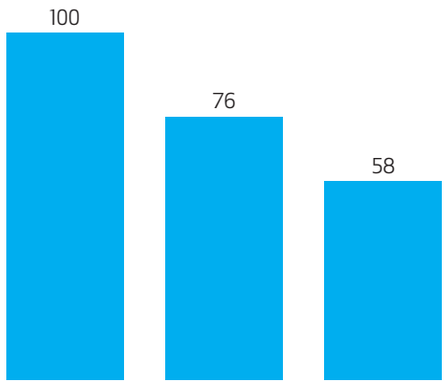
BULK PORT PERFORMANCE

Bulk ports can be compared using loading or unloading rates as a KPI. Figure 4.39 shows the loading rates of a selection of major iron ore export ports throughout the world. These are gross loading rates; net loading rates will be lower due to the time needed to berth and un-berth ships and to position loading equipment. It is clear that loading rates at Indian iron ore exporting ports are lower than those of similar ports worldwide.

It should be noted that the Indian ports generally service smaller ships than the other ports. The maximum draft at Paradip is 13 m, at Marmugao it is 13.7 m, and at Kakinada, 11 m. This means the maximum vessel size at the first three ports is Panamax (70,000 to 80,000 dwt dead weight tonnage, 12 m draft when

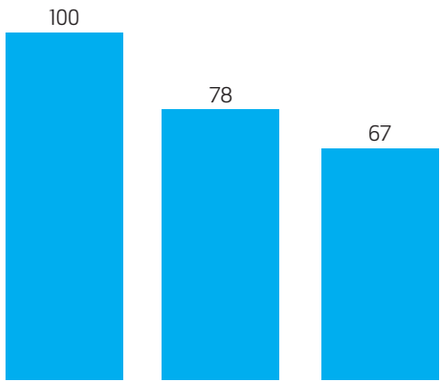
Figure 4.40
Comparison of Ship Sizes and Transport Costs
[Indexed]

Bulk Shipping



DWT	35,000	80,000	180,000
Draft (M)	10	12	18

Container Shipping



TEU	6,000	10,000	14,000
Draft (M)	10	12	18

Source: Bossche (2012).

fully loaded). In Kakinada, handy size bulkers are the largest size that can be fully loaded (about 35,000-45,000 dwt and 10 m draft). The other ports in the overview offer drafts of 19 to 25 m, enough to handle at least capesize bulkers (180,000 dwt, 18 m when fully loaded).

The question is whether the Indian ports do not handle larger vessels because the required draft is not available or because the markets they serve do not require larger vessels. For major bulk such as coal and iron ore, the rule of thumb is that the larger the bulk ship the better. Economies of scale can greatly reduce transport costs per tonne. Some Indian ports use barges to load larger vessels off-shore. From a logistics point of view however this is suboptimal, as it requires extra cargo handling from barge to ship.

SHIP SIZE ECONOMIES AND PORT DRAFTS

The size of vessels a port can service is determined by:

- Draft limitations in ports and their access channels. For bulk shipping, this means the ports at both ends of the journey; for container shipping, all ports along the route.
- Physical limitations elsewhere along major shipping routes, such as the Suez Canal (maximum draft 20 m), the Panama Canal (maximum draft 12 m, and for the new locks from 2014 onwards, 15.2 m), and to a lesser extent the Strait of Malacca (21 m).

The design vessel of a port the maximum ship size a port can take is always a trade-off between investment costs necessary to create sufficient draft and capacity in the port and the transport cost savings that can be realised by the employment of larger ships.

Figure 4.40 provides a comparison of ships sizes and the transport costs per unit for bulk and container shipping. It shows that:

For bulk shipping, the costs per tonne in a capesize are about 58 per cent of the costs per tonne in a handy size bulker. For instance, the cost of transporting a tonne of coal from Richards Bay, South Africa, to Vishakhapatnam with a cape size vessel is $10 per tonne less than that for a handy size bulker.

For containers, the costs per TEU on a 14,000 TEU ship (Maersk E-class) are 67 per cent of that on a 6,000 TEU ship. Meanwhile, Maersk has 18,000 TEU ships on order (Maersk triple E class), which the company claims will result in a 25 per cent cost saving per TEU compared to the 14,000 TEU E-class container vessels. And the hull design of the triple E-class is such that the maximum draft is 14.5 m, compared to 15.5 m for an E-class.

It should be noted that the drafts mentioned in the table are design drafts, based on the maximum weight that these vessels can carry. In practice, the draft is often lower as many containers are loaded with relatively light cargo, such as electronics or other consumer goods. It therefore is possible that 14,000 TEU vessels call at ports such as Antwerp or Hamburg, which both have a maximum allowed draft of 13 m. Often, these vessels call at Rotterdam (16.7 m

Figure 4.41
Comparison of Maximum Drafts at Indian Ports with Other Countries
[Metres]

		BULK SHIPPING	CONTAINER SHIPPING
EUROPE	Hamburg	13	13
	Rotterdam	23	17
	Antwerp	13	13
CHINA	Shanghai	12	15
	Tianjin	22	18
	Ningbo	21	21
	Qingdao	14	14
	Guangzhou	14	14
INDIA	Chennai	17	13
	JNPT	13	13
	Paradip	12	12
	Visakhapatnam	17	15

Source: Bossche (2012).

at container terminals) first in order to reduce their draft and then continue to ports that offer less draft.

Figure 4.41 compares drafts at various European, Chinese and Indian ports. Drafts at Indian ports generally match those at major European and Chinese ports, particularly for containers. In the bulk sector, European and Chinese ports generally offer more draft.

The drafts available at Indian ports are clearly inadequate to handle higher capacity ships such as the cape size for bulk transport and 14,000 TEU for containers that are increasingly being put to use worldwide. While deeper drafts may be desirable for most Indian ports in general, strategic investments in at least at few special ports will have to be made expeditiously.

INTERNATIONAL EXAMPLES: PORT CONNECTIVITY

The performance of a port is strongly related to its hinterland connections, whose capacity needs to match that of the port. Policy makers increasingly aim at developing transport corridors.

- Transport corridors connect various economic production and consumption centres
- They often cross national borders, which calls for efficient customs procedures that disturb logistic flows as little as possible
- Transport corridors often offer multimodal solutions, combining various transport modes into door-to-door logistics
- They require strategically placed inland terminals sometimes referred to as dry ports. If run in conjunction with maritime ports, these can take up the role of satellite ports, receiving cargo in large efficiently organised transport flows from the maritime port for further distribution in the hinterland.
- Ports are important nodes in transport corridors, where maritime transport connects with other transport modes

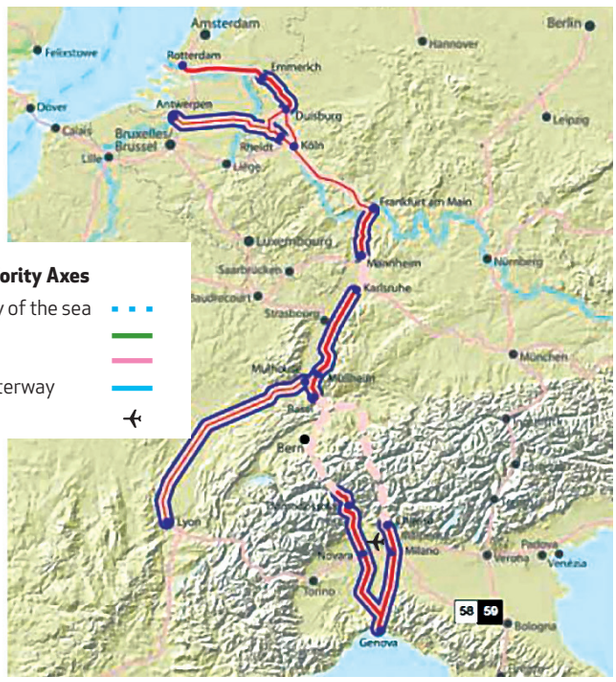
The European Union regards its ports as nodes in the Trans-European Network for Transport (TEN-T). Figure 4.42 shows the TEN-T Priority Axis 24, a corridor connecting the Italian port of Genoa and the French economic centre around the city of Lyon with the ports of Antwerp and Rotterdam. The river Rhine forms an important part of this corridor, connecting Rotterdam (and Antwerp) with major industrial and population centres in Germany (Rhine-Ruhr area and the region around Mainz and Mannheim) and Switzerland (Basel). Along the Rhine, major road and rail connections complete the corridor. The connections between Basel and Genoa, and Basel and Lyon consist of rail and road links.

The TEN-T priority axis concept is an umbrella for several projects along the corridor network, aimed at upgrading infrastructure. They include

Figure 4.42
TEN-T Priority Axis 24

Example: TEN-T Priority Axis 24 Railway Axis Lyon/Genoa-Basle-Duisburg-Rotterdam/Antwerp

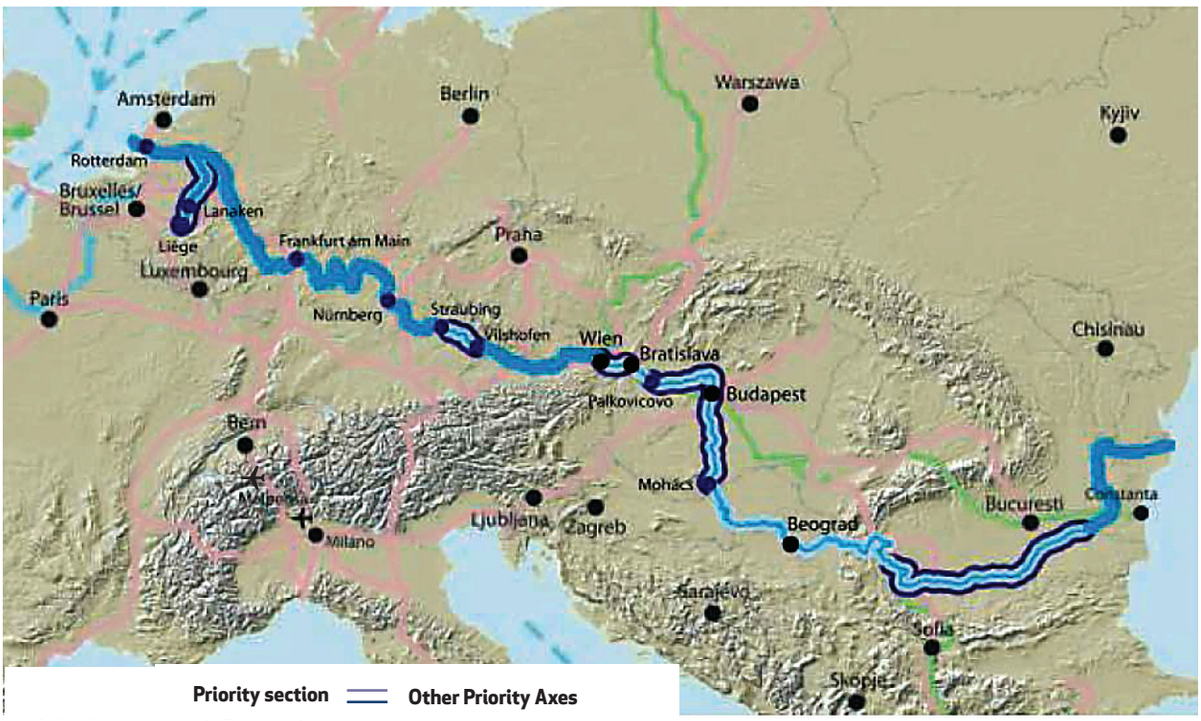
- Crossing national borders
- Connecting economic centres
- Multimodal solutions
- Not only infrastructures: also strategic dry ports
- Ports are part of corridors



Source: European Commission (2005).

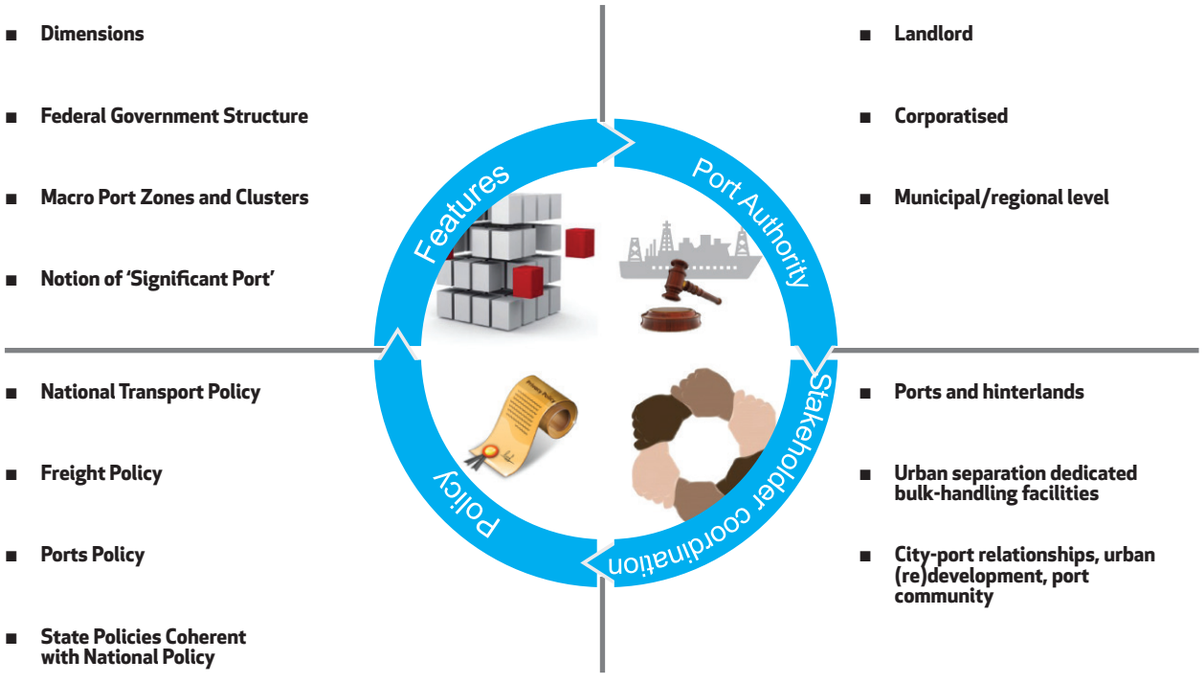
Figure 4.43
TEN-T Priority Axis 18

Example: TEN-T Priority Axis 18 Rhine/Meuse-Main-Danube Inland Waterway Axis



Source: European Commission (2005).

Figure 4.44
Key Characteristics of Australian Ports Policy and Managament



Source: Bossche (2012).

- Construction of dedicated rail freight connections from Rotterdam to the Betuwe rail network in Germany, and from Antwerp to the German Iron Rhine rail network
- Upgrading or expanding existing railway lines
- Upgrading rail systems, such as the introduction of European Rail Traffic Management Services (ERTMS) at rail sections along the corridor
- Creation of high speed passenger rail connections

Priority Axis 24 is aimed at creating efficient rail connections, as the inland waterways in the corridor are already well developed. But in Central and Eastern Europe, where the road network is partly underdeveloped, priority axes include motorway development. Figure 4.43 shows Priority Axis 18, aimed at developing an inland waterway connection between the North Sea and the Black Sea, along the rivers Rhine, Meuse, Main and Danube.

INTERNATIONAL EXAMPLES: DREDGING

Currently, most of the Major Ports in India have been financing capital and maintenance dredging from their own internal resources with the exception of Kolkata where maintenance dredging is financed through budgetary resources of the Centre.

Internationally, and specially in developed economies, port channels are used as a national asset and dredging projects are funded by local municipalities or the government, and not by the ports themselves.

One of the most comprehensive legislations on cost sharing in dredging is the US Water Resources Development Act, 1987, under which, the Federal Government meets 90 per cent of the dredging costs and 10 per cent is met by the local port authority for a depth upto 20 ft. For a depth up to 45 ft, about 75 per cent of the incremental maintenance dredging costs are met by the Federal Government and 25 per cent by the local port authority. For depth exceeding 45 ft, the incremental cost of dredging is to be borne by the Federal Government and the local port authority on a 50:50 basis. This implies that it is the responsibility of the Federal Government to provide some minimum level of navigational facilities in harbour projects.

The rejection of the concept of full cost recovery from direct users/beneficiaries seems to have been widely accepted by Canada, Japan and most West European countries. However, there is one important caveat. A study for the US Army Corps of Engineers on the economic benefits in terms of total industrial production from channel dredging and landfill development in the ports of Los Angeles and Long Beach found that the direct benefits were concentrated in

the immediate area of the port; the indirect revenues are distributed across the country.

LEARNING FROM GLOBAL BEST PRACTICES

A study of port governance structures and regulatory frameworks worldwide indicate that Landlord Port is the preferred port management model globally. Also, today's Port Authority is usually a corporatised entity with sufficient autonomy to pursue port regulations at the local/regional level. Port Authorities have been proven best placed to deal with traditional roles, landlord, regulator, operator, and enhanced functions, such as shaping supply chains, planning and financing of port development, port-related industrial development and urban (re)development.

It is also clear that a port policy needs to be embedded in a national integrated inter-modal transport policy, to be defined at the central government level. Countries differ substantially in port management policies, but one, Australia, is outstanding in this, and especially relevant to the Indian situation. Figure 4.44 provides a summary of the key characteristics.

SHIPPING

In several countries or regions, short sea shipping (SSS) is an important logistic solution for cargo flows. The EU for instance actively promotes SSS as an alternative to road transport in order to reduce road congestion and to reduce the environmental footprint of freight transport. Elsewhere in the world, similar policies can be found, such as in the US and Vietnam.

In the EU, about 30 per cent of all maritime shipping is SSS (978 million tonnes out of 3,333 million tonnes), defined as intra-EU and domestic shipping. In practice, the SSS share may be slightly higher, as some of the intercontinental shipping in the EU would also classify as short sea (short distance) shipping, particularly shipping services in the Mediterranean and the Black Sea, where short sea transport takes place between EU member states and neighbouring states.

The main bottlenecks to the use of SSS for cargo movements are:

- Lack of infrastructure specific short sea terminals
- Lack of service levels frequencies and intermodal connections
- Lack of logistics service providers offering a door-to-door service
- Traditional stance of cargo owners, who perceive it easier to arrange door-to-door road transport than an intermodal transport chain

SHORT SEA SHIPPING IN THE EU

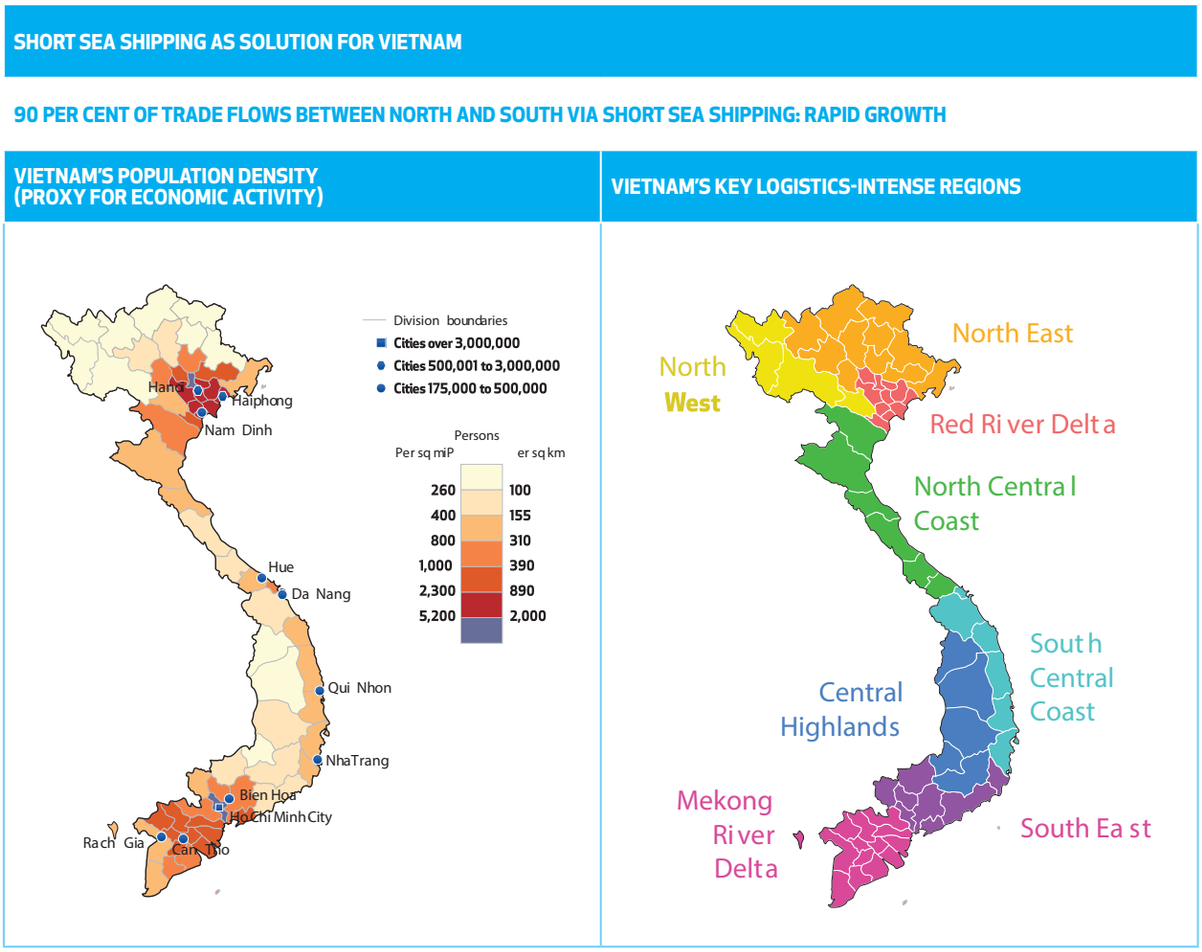
The EU has targeted these bottlenecks with a variety of policies and programmes. Short sea shipping is explicitly mentioned in the European White Papers on Transport, both in 2001 and 2011, as a means of reducing road congestion and reducing the environmental footprint of transport. The key developments in EU SSS have been:

Marco Polo: In its 2001 white paper, the EU launched the Marco Polo programme as a follow-up of the Pilot Action for Combined Transport programme. Though in principle aimed at promoting modal shift from road to other transport modalities, Marco Polo specifically made efforts to harness the advantages of short sea shipping. The programme financially supported new intermodal services, covering initial losses of services that were expected to be commercially viable in the long term. Marco Polo has, in some cases, been criticised for creating unfair competition and market distortions, as existing intermodal operators claimed they lost tonnage to Marco Polo-supported services. Following this, the criteria for support have been tightened to make sure intermodal services that received support indeed contributed to the objective of removing freight tonnage from the roads. In the 2011 white paper, Marco Polo is no longer mentioned.

Motorways of the Seas (MoS): The concept was introduced in the 2001 white paper. Whereas Marco Polo was aimed at intermodal in particular short sea services, MoS was aimed at the maritime infrastructure needed for the promotion of SSS as an alternative to freight transport on road motorways. The aim was to develop MoS as a real alternative to land transport, thus improving access to markets in Europe and relieving the overstretched European road system. MoS does not exclude rail and inland waterways, but it is primarily aimed at SSS. The EU defined MoS corridors and integrated these into the TEN-T network. Fifty-seven ports have been designated as TEN-T ports.

Short sea network: In the late 1990s, several EU countries established short sea promotion offices. These offices have the advantage of being much 'closer' to the market than the Brussels institutions of the EU, and thus better positioned to actively promote short sea shipping in these countries. Their tasks are to inform cargo owners and transport providers about the possibilities that SSS has to offer, to provide information on national and EU support programmes, to keep an updated inventory of intermodal services and to take away biases against SSS in the transport market. In 2000, the European Shortsea Network (ESN) was established

Figure 4.45
Coastal Shipping between North and South Vietnam



Source: Bossche (2012).

to provide coordination and support to the national organisations.

SHORT SEA SHIPPING IN VIETNAM

Due to its shape, a long and narrow country with a long coastline, Vietnam is very suitable for developing coastal shipping. Its main economic centres in the north (Red River Delta/Hanoi) and south (Mekong Delta/Ho Chi Minh City) are connected by a highway and a railway line, but these cannot cope with the increasing traffic. Freight transport via coastal shipping therefore experienced rapid growth; currently it accounts for over 90 per cent of all freight transport between the north and the south. Figure 4.45 provides an overview.

LEARNING FROM GLOBAL BEST PRACTICES

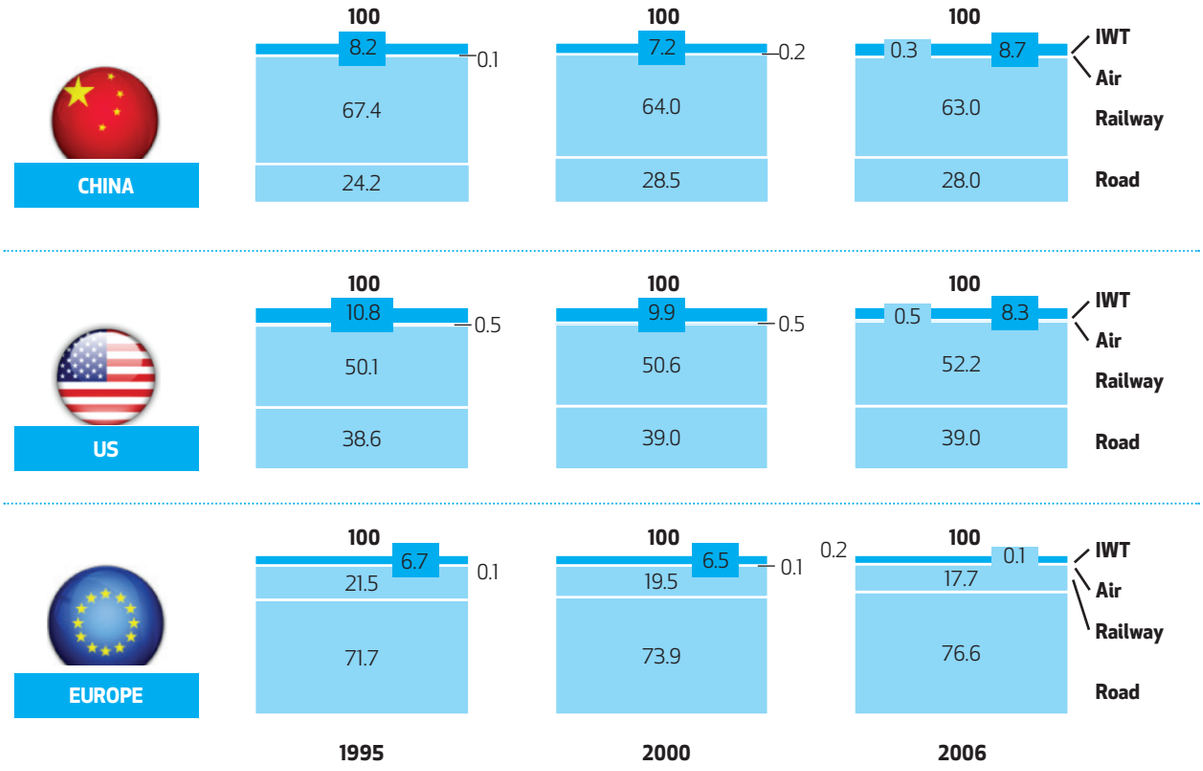
Domestic shipping has been regarded by most maritime countries big and small across the world as an effective tool to reduce increasing land congestion, particularly on roads. It is also five times as energy efficient as road transport.

Europe is regarded as a world model, for the way it long developed its short sea transport to its advantage, and today hauls as high as about 40 per cent of its domestic goods by way of its coastal seas. However, far more than just promoting domestic shipping itself, the reason that led to European success was the vision with which the short sea transport was made a part of an integrated transport network. Further, the continuous evolution of supportive policies and programmes such as the Marco Polo scheme and Motorways of the Seas have ensured that bottlenecks are addressed and provided the momentum to generate returns to scale.

The US, which currently undertakes limited coastal shipping, is also gearing up to expand short sea shipping in domestic waters to accommodate the anticipated increase in domestic freight movements, especially containerised goods. Coastal sea lanes are increasingly being referred to as Marine Highways.

Most maritime nations like US, China and Indonesia practise an absolute cabotage restricting movement

Figure 4.46
Modal Shares for Modes of Inland Transport in China, US and EU
[Per cent]



Source: Bossche (2012).

of coastal cargo only under their own flag vessels. Beijing has, effective January 2013, issued new regulations that further underscore the ban on foreign-flagged ships on Chinese waters. Such an approach, however, might be premature in the case of countries like India which have a long way to go before becoming self-reliant in supporting the needs of coastal sea transport. It may be worthwhile only after this is achieved to consider imposing absolute cabotage.

Landside congestion and infrastructure decay are both costly to fix, and coastal shipping is considered to provide a relatively inexpensive alternative. However, without it being suitably embedded in the overall transport plan that allows for efficient inter-modal access on both sides of the sea leg, any expectation for potential gains to the economy might be unfounded.

INLAND WATER TRANSPORT

In most countries where development of IWT has been given due importance, it has contributed significantly to the economy.

US

The US inland navigation system is nearly 12,000 miles of commercially navigable inland and coastal waterways. More than 630 MT cargo moves annually on the inland waterway system.

Inland navigation operates much like the highway system. Main stem waterways, the Mississippi, Ohio, Illinois, and Tennessee rivers and the Gulf Intra-coastal Waterway, are like interstate highways, and these routes carry most of the traffic. By building a series of barrages and navigation locks, these waterways have been developed with assured 9 depth all round the year, making inland navigation highly commercially viable. Smaller tributary waterways act as secondary roads or neighbourhood streets, allowing commerce on and off the main routes and providing access to communities not located on the main waterways. These tributary waterways carry less traffic than the main stem waterways, but, like neighbourhood streets, they play a vital role in linking communities to the system as a whole.

The trip on the tributaries is usually only a small part of the full journey between producer and consumer, but very important, as it connects origin and destination. They allow shippers and consumers on tributary waterways to take advantage of the huge economies of scale offered by large barge tows on the main stem, resulting in lower transportation costs. They also allow millions of tonnes of cargo to stay in barges until much closer to a final destination, rather than moving longer distances by highway or rail and adding to congestion.

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.

CHINA

China, with an inland waterway system of 119,000 km of navigable length, has the most developed IWT sector in the region. The majority of the country's total length of navigable waterways is located within the courses of the Yangtze, Pearl, Huaihe, Helongjiang rivers and the Grand Canal. The Yangtze, with its tributaries, alone has a navigable length of 58,000 km, of which 3,000 km is suitable for navigation by vessels of 1,000 dwt or more. There are about 2,000 inland ports, including 85 leading ports capable of accommodating vessels of up to 10,000 dwt. Seven of these ports each have an annual cargo throughput of at least 10 MT. The network has some 900 navigational structures such as ship-locks and ship-lifts. China is concentrating its IWT development thrust on five specific areas: the Yangtze, the Pearl, the Beijing-Hangzhou Grand Canal and the Yangtze and Pearl river deltas. Shanghai, the world's largest container port, is linked with the Yangtze, which moves 80 per cent of the country's IWT traffic, thus enhancing cargo evacuation capacity of the port.

The fleet of vessels plying the inland waterways now numbers 231,000 with a total deadweight tonnage of 20.67 million. The average vessel size is growing; it increased by 36 per cent between 1995 and 1999. In 2000, the cargo volume carried on the inland waterways of China reached 690 MMT and the total cargo task, measured in tonne-km, touched 155 billion, which is an average trip distance of 212 km.

Since 1990, the growth of container traffic has dominated overall traffic growth on the inland waterway system. The volume of containers carried to or from major river ports grew by 38.6 per cent per annum, from 100,000 TEU in 1990 to 1.88 million TEU in 1999.

THE NETHERLANDS

The Netherlands have a dense inland waterway network, due to the estuaries of the rivers Rhine/Wall, Meuse and Scheldt. The total length of the Dutch waterways amounts to 5,200 km.

The Dutch waterways provide seamless hinterland connectivity to the ports of Rotterdam and Amsterdam, not only for cargo destined for the Netherlands but also for countries like Germany, Belgium, France, Switzerland and Austria. The waterways account for about 40 per cent of international freight movements in the Netherlands and 20 per cent of domestic freight.

The waterways are an integration of canal and river networks with well-defined classification based on the barge configurations that can ply on a stretch. Intermodal terminals ensure last mile connectivity.

GERMANY

The German waterway system is 7,300 km long comprising of 2,540 km of free flowing rivers, 3,030 km of rivers with flood control, and 1,730 km of canals.

Since 1990, container traffic has dominated overall traffic growth on the inland waterway system. The volume of containers carried to or from major river ports grew by 38.6 per cent per annum, from 100,000 TEU in 1990 to 1.88 million TEU in 1999.

The waterways provide direct connectivity to two major sea ports of Hamburg the world's ninth largest container port and Bremen, and transport both domestic and exim cargo. They are largely being used for traffic like container, mineral oil and bulk cargo like ore and coal. The share of waterways with regard to the entire goods transport is 12 per cent, which is comparable to haulage of the German railway. Fifty-six of the 74 German metropolitan regions are directly connected to the waterway system. Most of the over 100 inland ports are developed on a trimodal logistic platform, so that cargo is directly connected with the waterways, the railway network and the most important trunk roads.

Duisport, located at the crossroads of European transportation routes and cargo flows, is one of the largest inland ports, delivering cargo up to Moscow. Waterways, railroad lines and highways turn over upwards of 100 MMT of cargo at Duisburg, while connecting it with other European countries and other continents. Approximately 20,000 ships and 16,000 trains move goods through the port; over 350 rail connections to 80 European destinations originate from the combined traffic hub. More than 300 globally active transport and logistics providers are active on site.

MODAL SHARES IN CHINA, EU AND US

The share of the IWT in 2006 is similar in China (8.7 per cent) and the US (8.3 per cent), but lower in the EU (5.6 per cent). However, the modal share of IWT has declined significantly in the US and the EU over the last 10 years. In China, the declined between 1995 and 2000, but has since rebounded by about a fifth. Figure 4.46 gives the data.

It is important to note that while the percentage figures are small compared to the dominant modes, these are significant numbers both in absolute terms and in comparison to share of IWT in other countries, including India.

It is also important not to confuse mode share across large regions with market share. IWT can only 'share' or compete for markets in any particular transport corridor where it actually exists. In all three regions,

most transport corridors do not offer a realistic IWT option. Market shares in IWT corridors in all three regions are therefore much higher than regional averages. For example, though the overall mode share of IWT in the EU is quite low, in the Netherlands, which has many excellent waterway routes, IWT carries more tonne-km than any other mode.

LEARNING FROM GLOBAL BEST PRACTICES

An analysis of IWT development indicates three important lessons for India.

INTEGRATION WITH OTHER TRANSPORT MODES

World over, bimodal and tri-modal inland terminals have become an intrinsic part of the transport system. Most gateway ports are linked with all the three modes of transportation—road, rail and IWT—that provide alternatives for both inbound and outbound cargo. This in turn provides smooth evacuation from the gateway port that in turn reduces the chance of congestion within the port and enhances productivity.

PUBLIC INVESTMENT IN IWT

Waterways in the EU and USA have reached the state of mature asset with massive public investment over a century. The Chinese IWT infrastructure is also a state contribution. At this belated stage of IWT development in India, there needs to be a push from the State for funding of infrastructure, though other models like PPP and viability gap funding could be considered in cases which are commercially viable.

An efficiently run IWT system has clear environmental and social benefits over other modes of freight transport. It helps minimise loss of agricultural land, reduce congestion on roads and road accident costs, and of course, can contribute significantly to shrinking the carbon footprint. These are powerful reasons to try and enhance the role and scale of IWT within national transport strategies. They also provide a stronger case for state funding of IWT infrastructure projects.

STANDARDISATION OF WATERWAYS

Complete standardisation of waterway exists in the EU, US and China to ensure depth and width, which in turn enables fixation of barge specification and configuration.

RECOMMENDATIONS

PORTS

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

Exports and imports for India, bulk of which takes place through the seaports, have demonstrated unprecedented growth during the last decade. While exports grew at a CAGR of about 21 per cent, imports witnessed a 25 per cent growth. The pace of trade growth is likely to continue in the coming years. Thus, from a long-term transport policy perspective, 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.

Current investment trends may lead to significant waste and inefficiencies in the building of transport links that connect with the burgeoning Non-Major Ports. While physical infrastructure grew rather arbitrarily, there has also been little progress towards the generally accepted and successful Landlord Model of port governance.

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 landlord model of port governance. The ports in India, essentially the Major Ports, widely follow a hybrid format of the long obsolete service port model and the preferred landlord model. This has resulted in a conflict of interest between the port trusts and the private sector, with the former acting both as port regulators and providers of commercial services in many instances.

INVESTMENT IN KEY MEGA PORTS

A key government priority should be to invest in four to six Mega Ports over the next 20 years, with two to three on each coast. These Mega Ports can be established either by transforming some of the exist-

An expert group should be set up to undertake detailed studies to identify potential location and modalities for creation of Mega Ports, preferably two to three on each coast. The expert group shall have to take due cognizance of developing and planning high-density freight corridors, as they analyse potential locations for such Mega Ports.

ing Major (or Non-Major) ports into Mega Ports, by combining some major and minor ports, or by setting up totally new Mega Ports. As opposed to other large economies, each of which have a few Mega Ports (such as Shanghai, Shenzhen in China; Los Angeles, New York in US; Hamburg, Bremen in Germany and so on), India has none.

Planning for Mega Ports would involve identifying the port locations, projecting the cargo requirements for 2030, identifying the capacities and investment required to handle larger ships, container traffic and varieties of cargo, planning and designing the ports and the inland connectivity. As ports are nodes in the overall logistics chain, adequate hinterland connectivity through multiple transport modes assumes great significance. Typically, provision of sufficient rail/road connectivity is primarily a result of concerted public investment. But since public investment is limited, it may not be possible to provide superior multi-modal hinterland connectivity to all ports. For maximum impact of the investment, it is logical to identify ports with large proportion of country's capacity as Mega Ports that can then be connected with a multi-modal transport system. An effective implementation of such a decision would invariably call for close coordination with the maritime states. This strategy should also take note of the transport requirements of key commodities such as coal, petroleum and iron ore.

There are several critical benefits of developing Mega Ports:

Economies of scale: Average costs of handling are reduced when more volumes are put through a port. First of all, larger (Mega) ports facilitate larger vessels to call due to higher drafts, which create cost advantages on the seaside of the supply chain. Second, 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 transhipment 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 transhipment cargo is handled twice on the seaside—incoming and outgoing—and therefore also paid for twice.

Mega Ports and smaller ports can act very well together. Especially in the container segment, when a hub-and-spoke system serves India and coastal shipping is stimulated, the hub ports capture all major global maritime flows and feed the smaller ports with their specific markets behind them. Thus, both types of ports operate optimally within their own boundaries and opportunities.

DECISION CRITERIA FOR MEGA PORTS

Mega Ports are proposed with a view to provide strategic direction to otherwise piecemeal investments so as to result in ports with superior infrastructure, more specifically in terms of capital intensive multi-modal hinterland connectivity and deeper drafts, among others. The decision to channel greater investments, therefore, should be based on scrupulous identification of potential port locations. A port needs to be identified as a possible future Mega Port

when certain conditions are met in a port and its environment.

EXPERT GROUP

An expert group should be expeditiously set up, to undertake detailed studies to identify potential location and modalities for creation of Mega Ports, preferably two to three on each coast. The expert group shall have to take due cognizance of developing and planned high-density freight corridors, as they analyse potential locations for such Mega Ports, so that there is planned and efficient integration of these ports with the transport corridors. If Mega Ports are to be commissioned, decisions to do so must be taken 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 transhipment port. For instance, Rotterdam functions both as gateway and as transhipment port.

Hinterland connections: In case of a gateway port, the hinterland connections should facilitate distribution of high volumes handled in the port into the specific hinterland. There should be enough potential to develop these connections into safe, efficient and high-capacity corridors. The presence of rail, road and possibly inland waterway operators and infrastructure, as well as distribution centres and inland terminals are required.

Feeder connections: If a Major Port tends to develop as a transhipment 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.

A crucial reason for having a Mega Port on the east coast is to tap the immense potential that ASEAN has to offer. While ASEAN is becoming one of the most important regions of the world, the trade relationship between ASEAN and India is still limited. The major obstacle cited is the high cost of moving goods across the borders, reflecting insufficient infrastructure for physical connectivity.

POTENTIAL LOCATIONS FOR THE PROPOSED MEGAPORTS

The studies will help establish potential locations for Mega Ports based on a more detailed technical analysis. However, a limited commercial analysis undertaken by the Committee (see chapter on Transport of Energy Commodities) does indicate a few potential locations, with Gujarat as the prime area, based on expected highest port traffic from POL and coal over the next two decades. A port on the southern end of the Maharashtra coast that could also be used to serve Goa and Karnataka. Odisha, Andhra Pradesh and Tamil Nadu are potential candidate states for Mega Ports on the east coast.

A crucial reason for having a Mega Port on the east coast is to tap the immense potential that ASEAN has to offer. While ASEAN is becoming one of the most important regions of the world, the trade relationship between ASEAN and India is still limited. The major obstacle cited is the high cost of moving goods across the borders, reflecting insufficient infrastructure for physical connectivity. Greater connectivity will help both sides achieve rebalancing strategies and provide more opportunities for less developed areas such as Northeast India. ASEAN-India trade was historically carried out through maritime routes while land transport connected major urban centres. In the modern world, an integrated transport system at the regional level is essential and the Comprehensive Asia Development Plan (CADP) recommends a strategy based on a multi-modal, multi-functional and multi-tier approach to enhance ASEAN-India connectivity (See chapter on International Connectivity). The two principal proposed routes to enhance ASEAN-India connectivity are:

- Sea route along the Mekong-India Economic Corridor (MIEC), the most important part of which is the development of Dawei port, Myanmar
- Land routes, with various options, along the Trilateral Highway (TH)/Asian Highway (AH)-1 connecting Thailand, Myanmar and India.

A strategic Mega Port on the Indian east coast along the MIEC needs specific consideration to benefit from the emerging world's largest free trade areas.

The existence of two fundamentally different systems for governance of Major and Non-Major Ports creates hurdles to achieving balanced growth. The necessary integration between these two systems cannot be done without the cooperation of maritime states.

Some of the existing ports that have deeper drafts, an important feature that makes them suitable candidate for development as Mega Ports are Mundra (Gujarat), Gangavaram (Andhra), Dhamra (Odisha), and Ennore (Tamil Nadu).

However, selection of sites for locating Mega Ports will require extensive modelling and analysis. First, all types of port traffic including containers and other commodities needs to be included in the analysis. Second, detailed data are required on the cost of development of candidate ports, and then detailed modelling is required to examine the costs and benefits of various alternative selections from a short list of potential sites.

IMPROVING HINTERLAND CONNECTIVITY

Identification of ports as Mega Ports and planning for capacity expansion is only the first step towards a well-developed port system. Concerted efforts need to be made to ensure adequate, preferably multimodal, hinterland connectivity for these Mega Ports.

Roads: The committee endorses the recommendations made by the Committee of Secretaries (CoS) set up under the chairmanship of Member Secretary, Planning Commission, on the minimum levels of surface transport infrastructure that needs to be provided to and from the Major Ports. The CoS had recommended that each Major Port should preferably have minimum four-lane road and double-line rail connectivity and this should be established within a fixed timeframe. This should be taken up for speedy implementation. At the same time, the location of the proposed Mega Ports should be harmonised with NHDP plans.

Dedicated Freight Corridors (DFC): The Ministry of Railways has undertaken the construction of a dedicated DFC between Delhi and Mumbai. It will be a high-speed rail corridor with multiple linkages with feeder lines. It stretches over 1,483 km in length, covering six states. The DFC will help alleviate congestion on the Delhi-Mumbai corridor considerably. It is critical to the hinterland connectivity of the Mumbai and Gujarat port clusters that handle a large share of India's port traffic. The focus is also to ensure high-impact development within 150 km on either side of the of DFC. The first DFC should be completed at the earliest, preferably by the end of 12th Plan and should extend up to JNPT. The second DFC, between Ludhiana and Dankuni, is expected to provide connectivity mainly for the traffic stream of coal to power houses, although later on, connectivity to Kolkata port is also a possibility. There are four more DFCs planned: Kolkata-Mumbai, Chennai-Kolkata, Delhi-Chennai and Goa-Chennai. The need to integrate the development of the proposed Mega Ports with the planned DFCs and possible new freight corridors that come along in due course cannot be overemphasised.

Inland waterways: The connectivity for select ports Ganga-Bhagirathi-Hooghly river system (NW-1) and the Brahmaputra (NW-2) are linked by the Indo-Bangladesh protocol route via Sunderbans and Meghna (total 2,258 km) and provide hinterland connectivity to the Major Ports of Kolkata and Haldia. Similarly, the East Coast Canal and Hijili Tidal Canal, along with the Brahmani river (NH-5) provides 588 km hinterland connectivity to the ports of Kakinada, Krishnapatnam and Ennore. The 205-km West Coast Canal System (NW-3) connects the Major Port of Kochi and also Neendakara, Kayamkulam and Munambam. The Mandovi and Zuari rivers, along with the Cumberjua canal (122 km) are connected with the Major Port of Mormugao and the port of Panjim. The backwater system of Mumbai-Thane-Ulhas waterway (142 km) provides hinterland connectivity to Mumbai and JNPT. Thus, a vast network of waterways has the potential to provide viable IWT connectivity at many ports.

Given the near saturation of rail/road connectivity to Major Ports in particular, it is imperative to explore and augment connectivity through inland water mode wherever feasible. IWAI is setting up intermodal terminals at major cargo centres on all national waterways. Terminals have been built at Patna and Pandu, and similar terminals are planned or under construction at Kolkata, Varanasi, Allahabad on NW-1, Dhubri and Jogighkopa on NW-2, eight terminals on NW-3, 16 on NW-4 and seven on NW-5. Likewise, terminals are being set up on Goa and Mumbai waterways by the respective state governments. All IWT terminals need to be linked with the nearest NH by road, for which appropriate junctions with NWs are to be provided by NHAI. Further, permission for use of service roads as link loads, or use of NH land for construction of link roads needs to be granted for proper linkages with NHs.

STRATEGIC INSTITUTIONAL SHIFT: LANDLORD PORT MODEL

The current governance structure of Major Ports the public service port model lacks potential to attract private capital and therefore competitiveness. While it was appropriate for a period when centralised economic planning was the norm, the need today is to move towards a landlord model.

The existence of two fundamentally different systems for governance of Major and Non-Major Ports creates hurdles to achieving balanced growth while rendering it difficult to draw on the experiences of either of the two for any meaningful comparison.

The necessary integration between these two systems cannot be done without the cooperation of maritime states. Moreover, given that Non-Major Ports under the management of maritime states have enjoyed more success as compared to Major Ports, any progressive regulatory shift should attempt to bring in the cooperation and participation of maritime states.

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.

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.

At the same time, it is important to ensure that the corporatised port authority is professionally run, insulated as much as possible from government intervention. The Board of Directors should largely comprise professionals with sufficient expertise in technical, finance, strategy, marketing and other relevant disciplines. Depending on equity contribution, a few seats could be fixed for the central and state government.

The Committee is not recommending complete privatisation of port authorities. Under the landlord model, ownership of port land is not transferred to a private party, even temporarily, such as under the BOOT system.

There is pressing need to expedite the adoption and implementation of the landlord port model for Major Ports. On the other hand, given the relative success of Non-Major Ports, it is recommended that their governance structure should be retained and the management of these ports should continue to be performed by the maritime states.

UNBUNDLING

Currently, a majority of the Major Port trusts in India carry out terminal operations as well. Unbundling of the terminal operations of the port trusts and corporatising them as public sector corporations

Table 4.13
Functions of Port Authority

PUBLIC FUNCTIONS	COMMERCIAL FUNCTIONS
■ Planning and administration of port land and waters ■ Issuance of public licenses ■ Regulation of port and terminal activities by issuing bye-laws within the framework of applicable law ■ Construction and maintenance of basic port infrastructure and common areas ■ Ensuring public order and safety in port area ■ Protection of the port environment ■ Representing the entire port community	■ Establishment of contractual (concession, lease) and other conditions (Public license) for private operator to provide marine or terminal services; application of transparent and open public tender procedures with clear and objective selection criteria ■ Construction and maintenance of terminal infrastructure, across roads/rail and port basins ■ Re-development of existing port areas that have lost their port function, in conjunction with local and regional authorities

Source: NTDPC (2012b).

Table 4.14
Functions of Ministry in Charge of the Port Sector

PLANNING	LEGISLATIVE FUNCTIONS
■ Planning and development of a basic maritime and port infrastructure comprising coastline defenses (shore protection), port entrances, lighthouses and aids to navigation, navigable sea routes and canals ■ Planning and regulating port development (location, function, type of management) ■ Planning and development of port hinterland connections (roads, railways, IWT, pipelines)	■ Drafting and implementation of transport and port laws, national regulations and decrees ■ Inclusion of international conventions (SOLAS, MARPOL, etc.) into the national legislation
INTERNATIONAL RELATIONS	**FINANCIAL AND ECONOMIC AFFAIRS**
■ Developing and executing national policies for furthering international transport capability of the country	■ Planning, financing and budget preparation of national plans and projects ■ Evaluating socio-economic/financial feasibility of projects in relation to national policies in various sectors

Source: NTDPC (2012b).

shall accordingly be the next logical step under the landlord port model. Involvement of the port authority in terminal operations leads to a conflict of interest and works against objectivity. The neutrality of the landlord port authority is a basic requirement for fair competition between port service providers, specifically the port terminal operators.

Even if some indirect involvement is required in the form of strategic investments by a port authority for overall development of the port area, it should be limited. The port terminals including infrastructure should be leased out to private terminal operators who will:

- Provide and maintain their own superstructure, including buildings offices, warehouses, container freight stations, workshops and often also terminal infrastructure such as quay walls
- Install their own equipment in the terminal such as quay cranes, transtainers, conveyor belts
- Employ stevedores port and dock labour with the exception of some ports where labour is provided through a pool system

Eventually, both private and corporatised public sector terminal operators would compete under the aegis of the landlord port authority. The landlord port authority would carry out all public sector services and operations such as administration of port land and waters, development of common infrastructure, dredging, award of bids for containers and other terminals. The main objective of unbundling is to eliminate direct control of the government or port authority over the terminal operator and make it more responsive to market forces. It must also be ensured that the board and management of the corporatised entity should be free of political and bureaucratic interference. This can only be the first step towards full privatisation and should be treated as that. At the end of a reasonable period, the corporatised public sector terminal operators could potentially be disinvested, listed and possibly privatised.

Unbundling could be a complicated task for older ports, and the transition process needs to be customised for each Major Port. During the changeover phase when terminal services such as stevedoring activities are still being provided by the port trusts,

there needs to be a clear demarcation between each of the terminal service activities and other activities. This, in turn, requires that the internal accounts for each of the activities are kept separate, and all costs and revenues are correctly allocated on the basis of consistent and justifiable accounting principles, which need to be clearly identified and stated.

SEPARATION OF RESPONSIBILITIES

There should be clear separation of responsibilities between the Ministry of Shipping and the port authorities. The Ministry should avoid micro-management of day-to-day operations of the port. It should rather play an enabler role. Tables 4.59 and 4.60 provide the functional areas of the port authorities and the Ministry respectively.

There should be clear separation of responsibilities between the Ministry of Shipping and the Port Authorities. The Ministry should avoid micro-management of day-to-day operations of the port. It should rather play an enabler role.

ROLE OF REGULATORY AUTHORITY

As observed already, given the relative success of Non-Major Ports, their governance structure should be retained and the management of these ports should continue to be performed by the maritime states. The existing regulatory mechanism for the Major Ports, on the other hand, will have to be suitably revamped to make it more responsive to the needs of capacity augmentation and market demand.

The three-pronged approach to reform tariff regulation (short, medium and long-term) suggested by the B. K. Chaturvedi Committee has already been discussed. The report recommends moving away from tariff regulation, leaving its determination to market forces as competition sets in. As mentioned before, the Australian landlord port model is certainly one that India could adopt.

Drawing on the above and keeping in mind the key priority of Indian ports sector to add capacity quickly through private participation, the role of regulatory body is recommended to undergo an enabling structural change:

- In principle, tariff setting or other price controls should not be exercised under the landlord model but left to the market. Rather, economic regulation pertains to establishing conditions for fair competition on a level playing field.

- To this end, TAMP should soon start delegating tariff determination and setting to corporatised terminal operators, where efficient price discovery should be market-driven rather than being regulated. All terminals and cargo handling facilities at ports should be encouraged to operate at higher levels of efficiency using the best available technologies. This can only be achieved through competition and not through a tariff setting process.

- Only in cases of inadequate competition between terminals in a port or among ports, or serious market imperfections, may some pricing control be required. Accordingly, TAMP, set up under the Major Ports Trust Act, should be restructured under a new Major Ports Authority Act (needed to transform port trusts into port authorities) and allowed to regulate tariff setting on a normative basis till such time that it is found essential or in specific cases where competition is inadequate. TAMP could also act as the Appellate Tribunal for all tariff-related matters where tariff is determined by service providers.

- A new regulatory authority, Maritime Authority for Ports (MAP), should be constituted under a modernised Indian Ports Act 1908, suitably empowered to regulate competition and port conservancy across all ports in the country. The proposed MAP should essentially have two main functional divisions:

  Conservancy division: This should set standards for conservancy, safety and environment as a unified code applicable to all ports, and carry out periodic audits to see if the required functions are satisfactorily carried out and to decide on the qualification of the conservator.

  Port conservancy management has been relatively less discussed in India. At the same time, all the conservancy powers in ports and all other regulatory functions are vested in the port trusts. Conservancy needs to be regarded as a national issue and any form of regulation should facilitate establishing a common conservancy code for Indian ports. This can perhaps be better monitored and enforced by the proposed Maritime Authority for Ports (MAP). For this, India needs to draw on experiences of certain international port regulating bodies that have created substantive frameworks to address port conservation. One such successful model is that of the Maritime and Port Authority (MPA) of Singapore which is responsible for ensuring port safety and conservancy in addition to promoting, regulating and

licensing of port and marine services and facilities.

Competition Division: The proposed MAP should be parallely vested with powers pertaining to competition regulation on the lines of other sectoral regulators such as the Central Electricity Regulatory Commission (CERC). This might create overlapping jurisdiction between MAP and CCI. This is not unusual and exists in all infrastructure and utility sectors that have a specific regulator. Since the sector regulator is likely to better deal with specific regulatory and competition issues that call for sector/domain expertise, it is best to empower the proposed regulatory authority to address complaints concerning alleged anti-competitive practices or abuse of a dominant position. In addition, it should also be charged with merger approvals and review of draft concession agreements to advise the port authority on whether any provisions may be incompatible with the promotion of competition. The sector regulator is likely to have the best information about the sector to monitor it. For example, competition issues arising from imperfect price and non-price conditions of access to unbundled elements in landlord ports, or cross-subsidy problems would be best understood and addressed by sector regulator. In essence, the sector regulator and CCI can have a concurrent role with matters being referred or interventions made depending on who is best equipped to deal with a particular issue. This would clearly call for establishing a mechanism for close coordination and consultation between the sector regulator and the CCI.

It may not be possible to shift from the current state tariff regulation to the proposed one competition regulation immediately. The 2013 draft guidelines for tariff setting in Major Ports proposed by the Ministry that allow market-driven tariff can be considered a step forward in support of the recommended shift to tariff deregulation under a landlord model of port governance. However, going forward, these guidelines will have to be reviewed, given that they still retain the concept of tariff regulation.

Under tariff regulation, the final issue to be dealt with pertains to vessel-related activities. Currently, the tariff setting is done on a cost plus basis which does not incentivise efficiency. However, the shift to a normative approach is a complex task because of the lack of standardisation across different situations. An expert panel should be set up to recommend a normative approach for tariff setting in vessel-related services.

In addition, regulatory approvals need to be granted in a time-bound manner and towards this end, the regulatory process should be streamlined including adequately strengthening administrative and statutory aspects of regulatory organisations.

PORT LEGISLATION

It is recommended that the two Acts governing the Indian ports—the Indian Ports Act, 1908, and the Major Port Trusts Act, 1963—be kept separate but modernised. A review of port legislation should be undertaken to have one unified law relating to conservancy and competition and a new law to transform the port trusts to landlord port authorities with functional and financial autonomy. The following approach to reform of port regulation is recommended:

- The Major Port Trusts Act (MPTA) should be replaced by a new Major Port Authority Act (MPAA) that allows port trusts to become landlord port authorities and enable them to function on the basis of commercial principles, subject to the rigour and discipline of financial and capital markets.
- The Indian Ports Act, 1908 that already deals with the safety of ports (both major and non-major) can be modernised to introduce setting up of a new Maritime Authority of Ports vested with power to regulate intra-port and inter-port competition as well as port conservancy across all the ports in India.
- TAMP should ideally cease to exist with time as port operations become competitive and tariff regulation is no more required.

STRENGTHENING PROJECT IMPLEMENTATION

The route to the much-needed capacity addition to India's ports is through effective implementation of PPP projects. Three initiatives have been identified to facilitate this.

HIGH-POWER GROUP FOR PORT PROJECTS

Such a group can add transparency and force decisions to strengthen weak project implementation and enable progress. Its scope should cover a small number of larger projects. The group can be headed by a minister or a secretary and carry out functions on the lines of the Cabinet Committee on Investment. It can bring in other ministries as necessary. The group should

- Identify key projects that need to be implemented on a time-bound basis, involving investments above Rs 5 billion and upto Rs 10 billion, or any other project identified as critical by the Committee
- Prescribe time limits for issue of requisite approvals and clearances by the ministries/

Figure 4.47

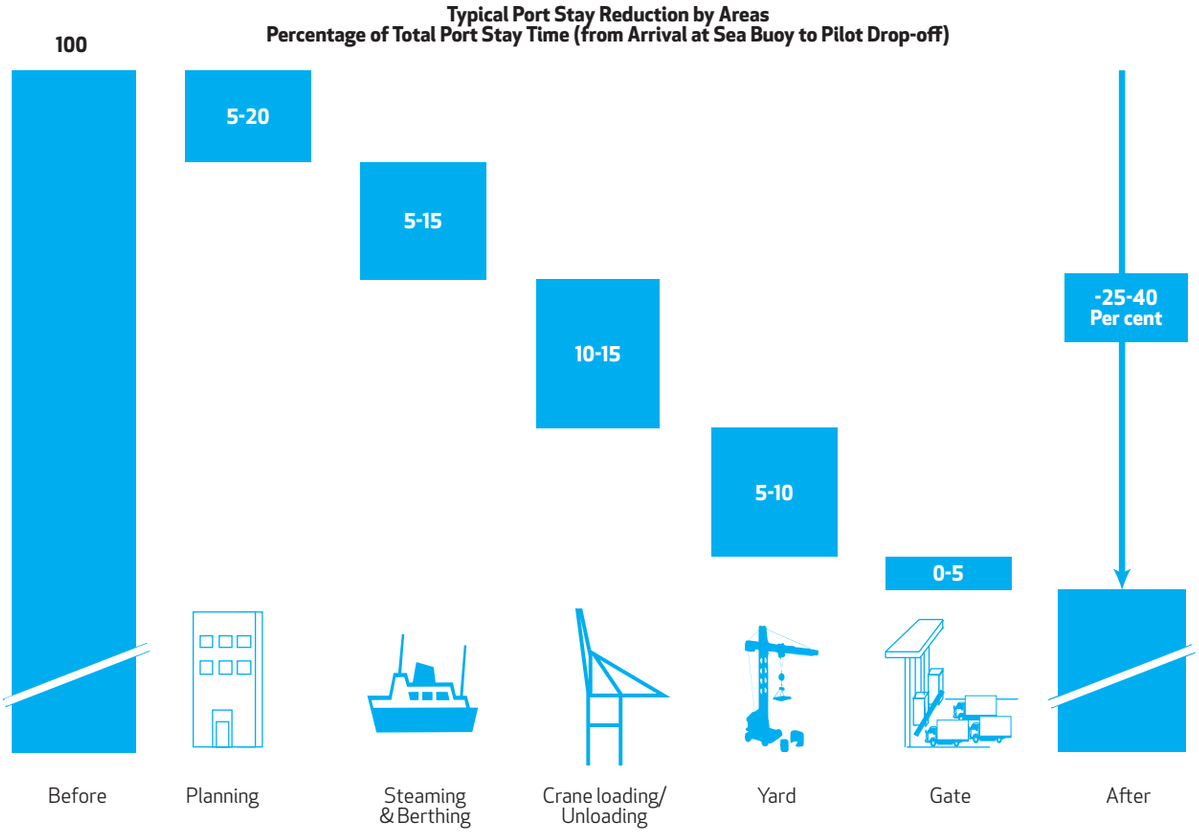
In Line with Global Norms, QCBA Approach should be used to Select Consultants

CRITERIA FOR QUALITY ASSESSMENT		COST OVER-RUNS [PER CENT]
■ Technical rating (80 per cent weightage) includes – Performance rating (50 per cent weightage), based on appraisals over the last 3 years – Health rating (30 per cent weightage), based on cash position; project portfoli. ■ Bid price (20 per cent weightage)	Canada (Ontario Ministry of Transportation)	5
■ Technical rating includes – Performance on previous projects – Health rating, based on sector experience of the firm; quality of staff; education and experience of personnel ■ Ratio of technical score-to-price quote is used to determine the winner	US (FHWA, State DOTs)	9
■ Technical rating includes – Quality of bidder's technical suggestions on the project (value engineering) – Health rating	China (Highways agency)	12
■ Technical rating includes – Experience of similar work – Suggested approach and methodology – Staffing, resume of key personnel	India	22
■ Technical rating, wherever used at final tendering stage, delivers better results ■ Factoring the consultant's past performance in his technical rating makes the pre-qualification very robust		

Source: NTDPC (2012b).

Figure 4.48

Total Port Stay can be Cut by 25-40 Per Cent across 5 Main Levers



Source: NTDPC (2012b).
Note: From typical very large vessel's port stay of 12-24 hours to 10-15 hours with move count over around 1,500 containers.

A Port Community System (PCS), a single technology based platform which brings together all stakeholders and shares information is essential. An 'e-custom' solution could also be developed later. While implementation of PCS has been already initiated, its rollout has not been very successful.

departments concerned in respect of identified projects
- Monitor project portfolio and port performance on at least three key metrics: on-time award; actual construction progress against planned milestones; and within-budget completion, including time taken to obtain approvals
- Involve providers of identified projects to understand bottlenecks and collaborate on solutions for delays and over-runs
- Remove inter-ministerial bottlenecks that are impeding important projects pre- or post-tendering to relevant authorities, and push for decisions. For instance, the group can selectively convene ministers and bureaucrats from concerned areas, creating an empowered group to expedite the resolution of bottlenecks
- Take decisions regarding grant/refusal of approval or clearance of specific projects that have been unduly delayed, if deemed necessary

CAPACITY BUILDING

The skill set of public sector port managers in structuring PPP projects is limited. This affects timely implementation of projects due to frequent delays in the pre-tendering phase itself. There is a strong need to build capacity of port officials to structure and manage private investments, as well as officials in the ports/shipping ministries and departments at the Centre and in the maritime states.

CONSULTANT SELECTION ON QUALITY-CUM-COST BASIS

Paid consultants help to prepare most DPRs and can impact the time and cost of project execution. It is important to select technical consultants using a quality-cum-cost-based assessment (QCBA), instead of the traditional L1—lowest cost—approach. Figure 4.47 lists some of the criteria used for quality assessment in Canada, the US and China along with the consequent impact on cost overruns. The quality score should count for 50 to 80 per cent of overall assessment as in Canada and the US. Evaluators can rate the consultant through feedback from the respective port trusts about his or her performance on previous and ongoing projects. The port trusts in turn can assess performance in a standard manner across projects using a set of standard guidelines with objective scoring parameters. For instance, evaluators can look at the magnitude of design changes during project execution and the reasons for the same.

OPERATIONAL PERFORMANCE OF PORTS

Optimising the vessel handling process end-to-end can reduce the port stay time of a vessel by up to 40 per cent (Figure 4.48). In this context, five typical stages of a vessel's port stay need close attention.

Planning: Better planning, coordination and communication ahead of the vessel's arrival in a port can help save 5 to 20 per cent on total port stay time

Steaming: Optimising berthing and steaming process for container ships can save 5 to 15 per cent of total port stay time

Handling: Efficient crane loading and unloading can cut port stay times by 10 to 15 per cent

Yard operations: Better yard layout and production process storage and retrieval of boxes can save 5 to 10 per cent on existing timelines

Gate operations: This might not result in direct savings for shipping lines or terminal operators, but it reduces the dwell time of the cargo for the shipper and limits the duration for which shippers need to hire the truck driver. There can be a maximum of 5 per cent savings if the port focuses on avoiding non-value-added activities at the gate, and arranging better arrival/departure pattern of incoming and outgoing trucks and containers to smooth peak loads.

Prudent use of information and communication technologies (ICT) can substantially help to address the operational constraints with Ports in India. While a discussion on ICT intervention for the Ports sector is undertaken in greater detail in Chapter 9, a broad introduction on the proposed framework for ICT in ports is placed hereunder:

FRAMEWORK FOR IMPLEMENTATION OF ICTS IN PORTS

Most significantly, all major ports would need an extensive IT infrastructure to manage their day to day operations. To create an interconnected network of ports and ensure consistency in ICT policies, it is required that the Ministry of Shipping lay down the ICT policy and roadmap for the Indian maritime sector. An important requirement will be of interoperability between IT systems owned by various entities and provision for Electronic Data Interchange (EDI). It will help them share latest information, analyse data, monitor progress and support quick decision making.

All of this should facilitate movement to a Single Window system. This would involve looking at various processes and documentation requirements from a trader's point of view and weeding out redundancies, improve transparency and reduce process

lead times, thereby improving India's competitiveness in trade.

Smart cargo is the next step in automation of maritime operations. Recent developments in Radio Frequency Identification (RFID) and Global Positioning Systems (GPS) seek to make the cargo intelligent. It will help reduce handling time, and eliminate risks associated with container security and missing consignments.

ICT TECHNOLOGIES FOR PORTS

There is no clear view of yard storage space to plan movement of cargo which leads to sub optimal utilisation of a port's storage and loss of revenue. **Geographic Information System (GIS)** solutions could be used to get a real time view of the storage area. It can lead to better yard operations thereby increasing yard throughput and enhance customer satisfaction.

Another application is **Radio Frequency Identification (RFID)** technology for monitoring container movement in yards. It can be used for container identification, information related to cargo origin-destination, and can also help check cases of seal tampering.

Traffic congestion at port gates is another critical problem with currently little or no automation. The entry and exit of vehicles and drivers through the gates of container terminal can be automated. The **Optical Character Recognition (OCR)** system can be installed at the terminal gates and driver's **biometric identity** and his authentication documents could be stored in a **smart card** which he can flash at the counter to gain entry.

It would also be useful to implement **Enterprise Resource Planning (ERP)** solutions which are driven by an integrated suite of software that supports the basic internal business process of any organisation. Importantly, a **Port Community System (PCS)**, a single technology based platform which brings together all stakeholders and shares information is essential. An 'e-custom' solution could also be developed later. While implementation of PCS has been already initiated, its rollout has not been very successful. Thus, before embarking on such plans, focus should be on building the foundation and developing stakeholder capabilities.

INSTITUTION AND CAPACITY BUILDING

A well-coordinated and integrated approach will require a strong institutional framework. In that context, the Committee recommends the establishment of an organisation, the Indian Institute of Maritime Research & Planning (IIMRP). Its functions can include supporting government in policy formulation, planning, carrying out high-end research, improving operational efficiency and developing standards and protocol for ICT solutions etc. It should be controlled by an advisory board and should have participation by both government and private sector.

ICT IMPLEMENTATION ROADMAP

For effective implementation of ICT applications, considerable groundwork is required. The first phase, Foundation Building, should focus on developing the ecosystem, capacity building and creating necessary institutions. The next phase should be capacity building, focusing on setting up ICT systems at port and provide assistance with technology implementation to various stakeholders. In the third phase, Integrated Traffic management system, focus should be on integrating business processes and IT systems of various stakeholders. Some of the initiatives could be Single Window concept, RFID tagging, etc.

A review of various ports in India suggests that a 'one size fits all' strategy cannot be adopted. Separate studies need to be undertaken to assess IT maturity of individual ports and identify specific action items for each of them in line with the overall ICT enablement roadmap.

INVOLVING ALL STAKEHOLDERS

The four main stakeholders in the port productivity improvement process are the government either directly or through the port authority; the shipping lines; the terminal operators; and the cargo owners or shippers. Each stakeholder has a specific and critical role in accelerating performance.

A review of various ports in India suggests that a 'one size fits all' strategy cannot be adopted. Separate studies need to be undertaken to assess IT maturity of individual ports and identify specific action items for each of them in line with the overall ICT enablement roadmap.

- Government and/or port authorities have to make sufficient pilots/tugs available to bring vessels to their berths with minimal delay. They must also ensure clearance of cargo in the ports to limit the dwell time of these goods inside the port.
- Shipping lines need to clearly align and communicate with terminal operators around their port arrival planning and preferred handling process. This enables terminal operators to turn their vessels around in the fastest possible time.
- Terminal operators need to ensure transparent communications, apply leaner operations in berthing, loading/unloading and yard operations processes, and facilitate faster exit/entry at the terminal gate.

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.

- Shippers need to limit the dwell time of the cargo inside the port.

A programme that brings in the right organisational structure, clear processes, required skills and appropriate tools is critical to improve operational performance of Indian ports. Such a programme usually consists of four steps; determine the base line; do a diagnostic on improvement potential; generate ideas; and implement. The process might take months to complete, and its success requires a strong focus on the following key factors:

- Commitment from management: target setting and responsibility
- Clear transformation plan driven by the programme management office
- Incentives and disincentives based on performance

A sustained focus on all three key performance indicators can drive high operational efficiency at ports. All four major stakeholders must collaborate to ensure optimum utilisation of existing capacity. This can help our ports effectively manage ever-increasing freight traffic.

SHIPPING

Indian tonnage must be increased and made more competitive. Most importantly, multiple policy changes are necessary to ensure that coastal shipping becomes a critical part of our overall logistics infrastructure.

INCREASING NATIONAL TONNAGE

Increasing Indian tonnage will help spawn associated shore-based services, such as stevedoring, ship repairs, logistics, manning and cargo movement. It will provide higher employment opportunities for Indian seafarers: India has about 30,000 officers and 230,000 ratings. Having more ships under the Indian flag will also provide bigger opportunities for training of Indian seafarers. Higher tonnage will help alleviate national security concerns: national tonnage maintains the supply line for essential cargoes in emergency situations. For example, 100 per cent of the total crude imports from the Middle East during the Iraq war came on Indian ships.

Apart from direct acquisition of new tonnage with emphasis on adequate tonnage towards fulfilling energy security needs over a medium term, domestic tonnage can be augmented in the interim and short run through a combination of policies.

CARGO ASSURANCE THROUGH LONG-TERM CHARTERS

Need for long-term charters by public sector enterprises for critical energy cargoes of crude oil, petroleum products and gas could be explored exclusively with Indian ship owners for Indian flag vessels, which will ensure a dedicated fleet of vessels at competitive rates on a long-term basis and will ultimately result in a win-win situation for charterers, ship owners and the economy at large, providing stability in freight costs and lowering input costs. For instance, Japan and Korea have developed strong LNG fleets on the basis of long-term contracts.

MANAGERIAL AND ADMINISTRATIVE CAPACITY

While technical personnel like marine engineers and master mariners are formally trained for their job; administrative personnel are brought in to the Directorate for three to five years from other services. The sector loses their valuable experience and expertise when they are repatriated. It may be useful to identify ways to build and retain expertise within the system, such as building a subordinate cadre. At the same time, in order to build internal administrative capacity, introduction of an Indian Maritime Services (IMS) merits consideration.

NEED FOR A LEVEL PLAYING FIELD

It is important that the Indian shipping industry be provided a level playing field for it to grow and compete globally with vessels under other flags. This will require rationalisation of restrictive policies, particularly related to imposition of a variety of direct/indirect taxes.

INCENTIVES FOR COASTAL SHIPPING

The following steps merit consideration:

- According priority to coastal ships by setting up coastal terminals at the Major Ports and identifying and developing five or six Non-Major Ports on the east and west coasts as designated coastal ports.
- Providing adequate road and rail connectivity to these coastal terminals and designated Non-Major coastal ports.
- Ensure that certain minimum service levels are provided for the coastal fleet in new container terminals as part of the concession agreement to get parity treatment with international vessels. This will help avoid long waiting times for coastal vessels due to preference given by terminals for international cargo given that they pay 30-40 per cent more on a per container basis.

- Allow coastal ships to import bunker fuel as well as spare parts with the same concessions availed of by ocean going vessels. The diesel subsidy available to land transport—road and rail—should be completely phased out to even out the current price distortion and provide a level playing field across transport modes.
- Providing fiscal incentives to consignors who shift cargo from road and rail to coastal shipping on the lines of the incentives provided by the EU under the Marco Polo scheme.
- Develop separate wings in development financial institutions to fund coastal shipping.
- Suitably amend the Merchant Shipping Act or enact separate legislation for coastal shipping to provide different specifications and lower manning scales.
- Have absolute cabotage for import and export of crude, critical energy cargoes and defence equipment/parts. Relax cabotage to allow foreign vessels to carry bulk/general cargo and transhipped exim containers, including empty containers on Indian waters. This would help meet the principal objective of enhancing domestic mobility for Indian cargo while also contributing to reduce the strangulating stress on road transport.

A few countries practice an absolute cabotage law while others practice a tailored one. China introduced absolute cabotage beginning January 2013. While it may be desirable to exercise absolute cabotage, given the current inadequacy of the Indian coastal fleet and the need to introduce competition and growth in containerisation, a certain degree of cautious relaxation in cabotage policy might be needed for next couple of years till coastal shipping grows sufficiently. Absolute cabotage might be imposed beyond a certain growth in national tonnage and achievement of desired outcomes.

Reforming the coastal shipping sector will enable India to leverage its coastal lines for logistics three to four times more, reduce dependence on imported fuel by 5-10 per cent, apart from reducing overall cost of cargo movement by over 25 per cent and carbon emissions by more than 50 per cent.

INLAND WATER TRANSPORT

The key issues to be addressed in the IWT sector have already been outlined. However, it must be noted that IWT sector is unique in the sense that water is largely a state subject, though inter-state rivers could be brought under the control of the Union, as are the National Waterways. Success can only be achieved if multiple stakeholders come together and work towards a common objective.

Each river basin should be developed with total integration of multiple uses like irrigation, flood control, navigation, hydro-power, industrial/ domestic water use, fishing, tourism, and ecology, instead of viewing the river use independently from each user point of view by different agencies.

NAVIGATIONAL INFRASTRUCTURE

Development of adequate depth (LAD) Efforts should be made to develop deeper stretches of the rivers (at least 2.5 m, preferably 3 m LAD round the year). Several rivers in India meander, which results in increase in distance to be travelled on waterways as compared to road or rail. Technical feasibility of reducing the IWT route length by straightening the waterway, wherever feasible, to avoid bends, should be studied. While the problem of siltation would be overcome to some extent by adequate LAD, the longer term measure is river basin development.

Each river basin should be developed with total integration of multiple uses like irrigation, flood control, navigation, hydro-power, industrial/domestic water use, fishing, tourism, and ecology, instead of viewing the river use independently from each user point of view by different agencies

Central legislation of River Basin Authorities under the control of the Ministry of Water Resources will help total development of river basins instead of isolated interest shown by each organisation and each state government. This system is in line with that followed in several developed countries. Navigation authorities (IWAI and state IWT departments) should be well represented in this forum.

Such River Basin Authorities can plan storage of flood waters in the upper catchment area and release it during the lean season while generating hydro-power. This will control floods during the monsoon and save vast areas of land from erosion and prevent siltation at the downstream end of the river. The augmented lean season flow will help irrigation, navigation, industrial/domestic use, fishing, tourism and ecology.

Finally, it will lead to integration of river basins with one another and a total network of rivers and waterways, resulting in water balance in the entire region.

Adequate air draft: Funding may be made available through specific budget provisioning for raising the bridges to at least 5 m above high flood level (HFL) to make these canal systems navigable for commercial cargo carriers.

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.

Augmentation of cargo terminals and IWT vessels: There is a case for provision of support at concessional terms for setting up cargo handling facilities and for the acquisition of vessels. Formation of a Special Purpose Vehicle—Inland Vessel Leasing Company—may be looked into, that can procure and lease out the IWT vessel based on market demand to lower entry barriers to IWT operators.

Focus on North-East: Given that the available draft in the waterways is low, the appropriate strategy would be to focus on the waterways in the North East. Terminals and cargo handling facilities should be set up at strategic locations and adequate connectivity to road and rail provided.

Development of night navigation: Infrastructure IWAI should develop this in all National Waterways with a clear plan and timelines. IWAI also needs to provide differential global positioning systems (DGPS), light buoys, river information services (RIS) and other advanced technology for night navigation on some stretches of waterways and subsequently to be extended to cover all NWs.

Development of MRO facilities: Private sector participation needs to be explored for development of MRO facilities in North Eastern states and other National Waterway corridors. In Goa, there is already interest from the private sector to develop repair yards, if the state government provides land. Finally, vessel repair facility could be considered for infrastructure status.

POLICY PARITY

Inland vessels could also be considered for inclusion in the tonnage tax regime. Fiscal incentives could be provided to consignors using inland water transport.

MODAL INTEGRATION

IWT terminals need to have sufficient connectivity with road and preferably with rail for last mile connectivity.

Identification of potential multimodal corridors: This requires detailed mapping of waterways and industrial clusters and analysis of origin and destination cargo. Existing NWs need to be extended to their tributaries to connect important cargo hubs to enable connectivity at optimum cost.

Develop IWT feeder routes: There is a need to create feeder routes under the jurisdiction of states to NWs so that the entire channel can be developed on the 'fish bone structure'. This would involve development of feeder routes in the North East such as Subansiri, Dhansiri and Dibang, as well as major tributaries of Ganga such as Yamuna, Gandak, Kosi and Ghagra. Successful operations of these feeders will pave the way for development of barrages/weirs with navigational locks to ensure round-the-year operations.

In many stretches, IWT and coastal shipping operations could be integrated to accommodate hinterland, coastal and international traffic. Both modes are by nature inter-modal. At many places, these two modes provide seamless connectivity to the hinterland, for example, the region adjoining Kolkata and Paradip port; the Goa region, the Cochin port-West Coast Canal region, the proposed NW-4 and NW-5 linking East Coast Canal and Eluru, By combining inland terminals with an automated Roll on-Roll off (Ro-Ro) system, the cost of transhipment can be minimised to a great extent since ro-ro vessels offer an excellent alternative to road haulage on certain corridors/stretches. Also, such vessels will be able to reach certain inland locations via inland waterways; this could take some of the traffic load off the road network and bring about a better balance among various modes.

PUBLIC INVESTMENT

A choice was posed earlier about the relative priority of IWT against other transport modes, given the limited public investment available for the transport sector. That is the foremost question that needs to be answered before any avenues for development of IWT can be considered.

In case IWT is considered a priority, there ought to be a quantum jump in funding in the 12th Plan and beyond. In addition, the possibility of private sector participation in the development, maintenance and regulation of some stretches of rivers may be also looked into. Following pre-conditions need to be in place to encourage private participation:

- There is long-term cargo commitment from the user on both ways. In the initial years, when business volumes are lower, policy intervention is required to mitigate demand uncertainty. Such an intervention in identified routes may be similar to awarding concession for seaport/airport
- Freight through IWT is sufficient so that the private operator is able to recover his investment
- Freight subsidy is given on par with road and rail

WATER TRANSPORT STATISTICS

Improving quality of water transport statistics to monitor trends and performance of the sector key to enabling the development of the sector.

These statistics include data about ports, shipping, ship building and ship repair, and inland water transport. Transport Research Wing (TRW), Ministry of Road Transport and Highways is the nodal agency for collection, compilation, dissemination and analysis of water transport statistics.

The following data gaps exist in port statistics in India:

- Data on country-wise break-up of origin and destination of cargo is frequently asked for by researchers. Shipping lines/companies generally provide information on the port of country from where the cargo is loaded or where the cargo is to be discharged, and not the actual country from where the cargo originated or is destined to.
- Container cargo is the fastest growing form of traffic at Major Ports. However, the commodity-wise data handled in containers is not being maintained.

Data on the shipping sector, disseminated through two annual publications—Indian Shipping Statistics and Statistics of India's Ship-Building & Ship Repairing Industry, was found to have the following gaps by the National Statistical Commission:

- Financial performance indicators of private shipping companies.
- Operational indicators voyages, cargo, capacity or space utilisation
- Freight rates for selected Indian import and export commodities for all shipping companies
- Safety statistics
- Environment pollution caused by shipping industry

Apart from the non-availability of timely data on inland water statistics, particularly from states, there are significant data gaps on IWT. IWAI provides cargo statistics for vessels which are registered and availing IWAI facilities on NWs. But numerous unregistered vessels/boats carry cargo and do not avail IWAI infrastructure facilities. This traffic is not being captured at all. Periodic surveys need to be carried out—perhaps once in five years—to assess the cargo carried by such vessels on NWs. Many state governments are unable to maintain the data/information on IWT due to lack of scheduled/systematic records on freight/passenger operations. Consequently, the data on IWT at the all-India level lacks full coverage.

IMPROVING QUALITY OF STATISTICS

- Periodic review of water transport statistics is required to assess the system and identity the possible changes required for meeting user needs. Such reviews should be undertaken once every five years.
- At present, no system for training and sharing of experiences on water transport statistics exists. Training programmes/workshops for officials/staff involved in compiling statistics, particularly port statistics may be organised. The workshops should cover statistical concepts, definitions and issues of compilation, processing and Total Quality Management.
- The annual publication should be out in the year following end of the calendar/financial year, and the bi-annual publication within the three months, i.e., in June for the period ending March and December for the period ending September
- TRW may provide the metadata for water transport statistics in the form of a manual on the Ministry of Shipping website
- All regular publications of TRW on ports, shipping and IWT should be available online
- Concurrent audit of statistical activities is necessary for early detection of errors and mistakes during the progress of work, and their rectification in time is essentially an internal activity of the primary data compiling agency. It is suggested that assessment of quality of the data produced by the primary source agencies may be carried out through statistical audit by officers authorised by the Ministry of Shipping.

THE ROAD AHEAD

The section below summarises the traffic projections and related investments in infrastructure for the ports and shipping sector for around next 20 years. Given the unusually long term assessment of the traffic and associated investments, it is only reasonable to suggest that these projections be reviewed and rationalised at specific intervals to factor in the socio-economic changes as they emerge overtime. The section concludes with a summary of key recommendations for the sector discussed in detail earlier. An indicative time plan, bucketed into short-term, medium-term and long-term targets, has been drawn at the end to guide decisions through the next 20 years.

TRAFFIC PROJECTIONS

PORTS

The cargo traffic at ports is expected to grow at a CAGR of more than 6 per cent to reach **3,068 MT** by

the end of the 15th Plan (2031-32) from the current levels of 914 MT. Higher annual growth rates of around 7-8 per cent are expected to be seen in case of coal, containers and general cargo. To meet this growth in cargo traffic, a capacity requirement of about **4,000 MT** including the major and non-major ports, is projected by 2031-32.

SHIPPING

The growth in Indian shipping has been projected in terms of the desirable growth of Indian tonnage as percentage of the world tonnage, by end of the 12th Plan. This growth has been looked at from a business-as-usual perspective, i.e., if the Indian tonnage remains the same percentage of global tonnage. In addition, two rather aggressive growth scenarios, one with Indian tonnage reaching 2.5 per cent and other at 5 per cent of the world tonnage by 2016-17, have also been assumed. The tonnage projections are:

GROWTH SCENARIOS	TONNAGE (GT) - PROJECTED (BY END OF 12TH 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

Source: 12the Five Year Plan.

INLAND WATER TRANSPORT (IWT)

Provided that the IWT infrastructure develops sufficiently, the cargo potential on the existing five national waterways is projected to increase to about 47 MMT by 2019-20 and to 92 MMT by 2031-32. The composition of projected cargo is expected to be similar to the current structure comprising of coal, agriculture & forest products and others with coal forming the bulk of the volume.

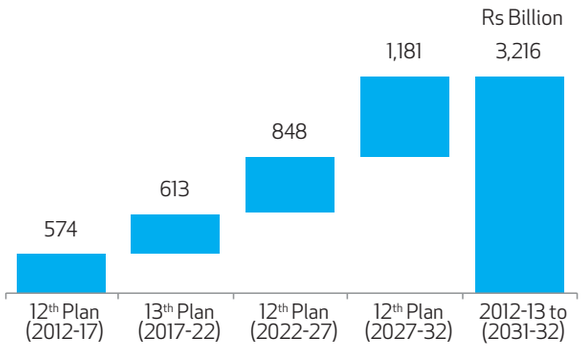
INVESTMENTS

PORTS

An estimated cumulative investment of over Rs 3 trillion shall have to be made to create the projected port capacities of about 4,000 MT by 2031-32. The Plan-wise break-up of projected investments (in Rs billion) in building port capacities including that for dredging, is shown in the figure below.

SHIPPING

The projected investment towards Indian tonnage growth, basis the three scenarios considered, are placed hereunder. Even for a business as usual case, India will have to make an investment to the tune of Rs 25 billion during the 12th Plan on creating Indian tonnage which is consistent with its present share in the world tonnage.



Source: NTDPC (2012b).

GROWTH SCENARIOS	TONNAGE (GT) - PROJECTED (BY END OF 12TH PLAN)	ESTIMATED EXPENDITURE (RS BILLION)
Business as usual (same percentage of world tonnage)	12.4M	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: 12th Five Year Plan.

INLAND WATER TRANSPORT (IWT)

The volume of cargo moved through inland water transport remains very low, confined largely to the movement of iron ore in Goa and fertiliser raw material in the West Coast region. Development of inland water transport with adequate intermodal connectivity can help to reduce the congestion on roads and rail and reduce CO_2 emissions. In order to support the cargo growth expected by the end of the 15th Plan, an investment of about Rs 640 billion is projected for development of IWT, with about Rs 300 billion contributed by the government and the rest by the private sector.

A total investment of about Rs 4,000 billion[8] is projected for desired development of the ports and shipping sector till the end of the 15th Plan.

KEY RECOMMENDATIONS

The Indian ports and shipping sector suffers from poor incentives, lack of clarity in the regulatory structure coupled with overlapping jurisdiction of institutions charged with sector oversight and a debilitating prevalence of ad hoc and piecemeal decision making. Neither the regulatory structure nor capacity has kept pace with the enormous growth in traffic witnessed in the last decade due to India's increased integration with the global economy. Coastal shipping as well as Inland water transport has grown far less optimally than what

8. Of the total sectoral investment projected, shipping investments have been projected only upto the end of the 12th plan (i.e., 2016-17).

would have been ideally desirable, given the low unit transportation cost and environmental impact.

The Committee is making the recommendations with the intent to provide a long term direction to the future development and governance of Indian ports while aiming to incentivise and integrate water based transport for it to play an increasing role in the national transport network. Needless to say, most of these recommendations shall bear fruit when their implementation results from well co-ordinated and planned integration between agencies at various levels so that the maritime capacities created complement one another in an integrated national network. Following is a summary of recommendations made, which are then followed by an indicative time plan mapped against the key recommendations.

PORTS

There is a strong need to put in place an overarching long-term theme for national port development that prioritises and guides investments while also paving way for regulatory reforms and suitable governance structure.

STRATEGIC VIEW ON PORT INVESTMENT

Indian ports will have to be adequately invested, efficient and cost effective to be globally competitive, particularly in terms of superior multi-modal hinterland connectivity and higher drafts of at least 17 metres at the major ports. One of the key government priorities should be to invest in four to six Mega ports over the next 20 years, with two to three on each coast to substantially cater to our foreign trade and the estimated requirement of raw material imports and exports by 2030.

These mega ports can be established either by transforming some of the existing major (or non-major) ports into mega ports, if feasible, by combining some major and minor ports, or by setting up totally new mega ports. This would call for close coordination with the maritime states. Contingent on such a decision, the location of these ports should be harmonised with plans for the NHDP and the upcoming dedicated freight corridors as well as those that are planned in future, so that there is efficient multi-modal connectivity.

An expert group needs to be expeditiously set up to study and identify potential locations for development of these mega ports while giving special consideration to the immense trade potential with the east.

a) Strategic Institutional shift: Landlord Model of Port Governance

The ports in India, essentially the major-ports, widely follow a hybrid format of the long obsolete service port model and the preferred landlord model. The hybrid approach has resulted in a conflict of interest between the port trusts and the private sector, with the former acting both as port regulators and providers of commercial services in many instances.

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.

Whereas there has been consensus within the various echelons of the Government for moving to landlord model of port governance and corporatisation of major port trusts, there has been little progress towards its implementation. There is immediate need to make appropriate legislative and policy changes to expedite the move to the landlord model and to transform the port trusts to statutory landlord port authorities through specific legislation. All the terminal operations of port trusts would need to be corporatised as public sector corporations. Then, both private- and corporatised public-sector terminal operators would compete under the aegis of the landlord port authority. The corporatised public sector terminal operators could potentially be disinvested, listed, and possibly privatised at a later stage. The landlord port authority would carry out all public sector services and operations such as the award of bids for containers and other terminals, dredging etc.

Moreover, given that non-major ports under the management of maritime states have enjoyed more success as compared to major ports, any progressive regulatory shift should attempt to bring in the cooperation and participation of maritime states.

• Role of TAMP

Based on the assessed levels of competition between ports and between similar cargo handling terminals in a region, tariff determination should be left to market forces. Only in cases of inadequate competition, or serious market imperfections, may some pricing control be required. Accordingly, TAMP should be restructured under a new Major Ports Authority Act and allowed to regulate tariff setting on a normative basis till such time that it is found essential for lack of competition. TAMP could also act as the Appellate Tribunal for all tariff-related matters where tariff is determined by service providers. TAMP should naturally cease to exist with time as port operations become competitive and tariff regulation is no more required.

A new regulatory authority, Maritime Authority for Ports (MAP), should be constituted under a modernised Indian Ports Act, suitably empowered to

regulate competition and port conservancy across all the major and non-major ports in the country.

The combination of strategic decisions on investment in Mega Ports and movement to a landlord port system would do much to accelerate the investment in and modernisation of Indian ports.

b) Strengthening Project Implementation

The route to much-needed capacity addition to India's ports is through effective implementation of PPP port projects. Three initiatives have been identified for the government, regulators and nodal agencies to facilitate the implementation of PPP port projects in India.

• High-power group for port projects
Such a group can add transparency and force decisions to strengthen weak project implementation and enable progress. Its scope should cover a small number of larger projects. The group would essentially identify key projects required to be implemented on a time-bound basis, involving investments above Rs 5 billion and upto Rs 10 billion, or any other project identified to be critical by the Committee. It would escalate inter-ministerial bottlenecks that are impeding important projects (pre- or post-tendering) to relevant authorities, and push for decisions.

• Capacity Building
The capacity of port managers as well as officials at the ministry should be developed in structuring of PPP projects and managing private investments. This would help address delays in pre-tendering phase that ultimately affects project implementation schedule.

• Consultant selection on quality-cum-cost basis
Paid consultants help to prepare most DPRs and can impact the time and cost of project execution. It is important to select technical consultants using a quality-cum-cost based assessment (QCBA) instead of the traditional L1 based (lowest cost) approach. While QCBA is being increasingly adopted in India, the quality is typically ensured through quantum of past experience and not necessarily by the quality of that experience. For instance, evaluators can look at the magnitude of design changes during project execution in the past and the reasons for the same.

SHIPPING

a) Increasing national tonnage

• Cargo assurance through long term charters
Need for long term charters by PSUs for critical energy cargoes of crude oil, petroleum products and gas could be explored exclusively with Indian shipowners for Indian flag vessels, which will ensure a dedicated fleet of vessels at competitive rates on a long term basis.

• A level playing field
It is important that the Indian shipping industry be provided a level playing field for it to grow and compete globally with vessels under other flags. This shall require rationalisation of restrictive policies, particularly related to imposition of variety of direct/indirect taxes.

b) Managerial and Administrative Capacity

While technical personnel like marine engineers, master mariners, etc., are formally trained for their job; administrative personnel are brought in to the Directorate for three to five years from other services. The sector loses their valuable experience and expertise as they are repatriated. In this context, it may be useful to identify ways to build and retain expertise within the system, such as building a subordinate cadre. At the same time, in order to build internal administrative capacity, introduction of Indian Maritime Services (IMS) merits consideration.

c) Incentives for Coastal Shipping

Multiple policy changes can help increase penetration of coastal shipping leading to a cleaner, cost effective and sustainable alternative to rail and road. The following steps merit consideration:

- According priority to coastal ships by setting up coastal terminals at the major ports and identifying and developing five or six non-major ports on the east and west coasts as designated coastal ports.
- Providing adequate road and rail connectivity to these coastal terminals and designated non-major coastal ports.
- Allowing coastal ships to import bunker fuel as well as spare parts with the same concessions availed of by ocean-going vessels.
- Providing fiscal incentives to consignors who shift cargo from road and rail to coastal shipping on the lines of the incentives provided by the EU under the Marco Polo scheme.
- Develop separate wings in development financial institutions to fund coastal shipping.
- Manning scales and vehicle specifications for coastal ships should conform to near ocean-going vessels, which are currently related to ocean going vessels.
- Cabotage—While it may be desirable to exercise absolute cabotage in India, given the current inadequacy of Indian coastal fleet and the need to introduce competition and growth in containerisation, certain degree of cautious relaxation in Cabotage policy might be needed for next couple of years till coastal shipping grows sufficiently. To clarify, the more desirable absolute cabotage might be imposed beyond a certain growth in national tonnage and achievement of desired outcomes.

Accordingly, the following is suggested:

- Absolute cabotage for import and export of crude, critical energy cargoes and defence equipment/parts
- Relax cabotage to allow foreign vessels to carry bulk/general cargo and trans-shipped EXIM containers, including empty containers on Indian waters. This would help meet the principal objective of enhancing domestic mobility for Indian cargo while also inducing competition led efficiency and reduced load on road transport.

INLAND WATER TRANSPORT

- **Development of adequate depth (LAD):** Efforts should be made to develop deeper stretches of the rivers for IWT/navigational purposes (at least 2.5 m, preferably 3.0 m LAD for round the year navigation).
- **Focus North-East:** Given that the available draft in the waterways is low, the appropriate strategy would be to focus on the waterways in the North East Region (NER). Set up terminals and cargo handling facilities at strategic locations in the north-east and provide adequate connectivity to road and rail.
- Provide support at concessional terms for setting up cargo handling facilities and for the acquisition of vessels
- Provide fiscal incentives to consignors using inland water transport
- **Modal integration:** IWT terminals need to have sufficient connectivity with road and preferably with rail for last mile connectivity, on lines of bi-modal and tri-modal concept of developed waterways of other countries. Following are proposed:
  - Identification of potential multimodal corridors: This requires detailed mapping of waterways and industrial clusters and analysis of origin and destination cargo to undertake development of suitable waterways as well as multimodal transport hubs in IWT Corridors.
  - **Develop IWT feeder routes:** There is need to develop the feeder routes on the water under jurisdiction of State, to National waterways so that the entire channel can be developed on the 'fish bone structure'.
  - In many stretches, IWT and coastal shipping operations could be integrated to accommodate hinterland, coastal and international traffic.

THE ROUTE

RECOMMENDATION	OBJECTIVE	SHORT-TERM	MEDIUM-TERM	LONG-TERM	EXPECTED GAINS
		1-5 YEARS	5-10 YEARS	10-20 YEARS	
PORTS					
Drafts at Major Ports	Accommodating larger mother vessels	Draft at major ports needs to be increased **to at least 17 metres,** by the first half of 13th Plan			Economies of scale - Increased cost competitiveness
Develop 4-6 Mega-ports	Strategic and efficient Investments for superior multi-modal hinterland connectivity, substantial improvement in available drafts and port capacity	Initiate technical studies			- Economies of Scale - Economies of Scope - Growth in Containerisation - Growth in Coastal Shipping - Strategic gateway to the emerging East
		Identify potential locations			
		Harmonise with planned and future Highways/Rail Freight Corridors	Harmonise with planned and future Highways / Rail Freight Corridors	Harmonise with planned and future Highways / Rail Freight Corridors	
			Develop 2-3 Mega Ports		
			(Consider Port for connectivity to ASEAN)	**Develop 2-3 Mega Ports**	
Shift to Landlord Model of Port Governance for Major Ports	Adoption of suitable port governance model that encourages private investments and efficiency through competition	Corporatise Landlord Port Authorities			- Private Investments - Competition - Operational Efficiency - Government disengagement from operations
		Unbundle Terminal Operations and Corporatise			
		Induce Competition			
		With competition, deregulate tariff and restructure TAMP			
			Competition Regulation		
SHIPPING					
Cargo Assurance	Increasing National Tonnage	Possibility of long term charter contracts with PSUs for critical energy cargoes could be explored			- National Fleet - Alleviate National Security concerns - Create jobs - Stable freight cost
Coastal Terminals and dedicated Ports	Promote Coastal Shipping	Set-up Coastal terminals at Major ports			- Reduced congestion on roads and railways - Reduced CO_2 emissions
		Identifying 5-6 Non-Major ports on east and west coasts as designated coastal ports			
		Develop 2-3 of such ports	Develop 2-3 of such ports		
		Provide Rail / Road Connectivity to Terminals and ports			
Cabotage	Improve mobility while protecting coastal shipping	Absolute cabotage for EXIM crude, critical energy cargo and defence related			- Competition led efficiency - Reduced cost
		Relax cabotage for Bulk/General cargo and trans-shipped EXIM containers (including empty containers)			
				Absolute Cabotage	

RECOMMENDATION	OBJECTIVE	SHORT-TERM	MEDIUM-TERM	LONG-TERM	EXPECTED GAINS
Inland Water Transport		**1-5 YEARS**	**5-10 YEARS**	**10-20 YEARS**	
Develop Adequate Depth	Improve Navigational Infrastructure	Initiate technical studies for optimal route length			- Improved carrying capacity - Reduced land congestions
		Develop deeper stretches of the rivers (at least 2.5 m, preferably 3.0 m LAD)			
Focus on North East	Address low draft available in the waterways	Set up terminals and cargo handling facilities at strategic locations in the North-East			- Exploit the natural draft at NER - Strengthen opportunities for Strategic linkages for the region
Incentivise Vessel Acquisition and Cargo Handling Facilities	Encourage investments in IWT infrastructure	Consider Inland vessels in the Tonnage tax regime			- Increase private participation - Improved infrastructure
		Provide concessions for setting up cargo handling facilities			
Multi-modal Integration	Provide last mile connectivity	Initiate studies for mapping of waterways and industrial clusters	Develop suitable waterways and multi-modal transport hubs in IWT Corridors		- Efficient inland movement of cargo - Economies of scale - Integration with coastal operations
			Develop IWT Feeder routes (Fish-bone structure)		
OTHERS					
Improve water Statistics	Address current gaps in data	Periodic review of Water Transport statistics (once every 5 yrs)			Improved monitoring of trends and performance of the water transport sector for effective decision making
		Training of officials			
		Concurrent audit of statistical activities			

Annex 4.1

Draft Available at Major Ports

PORT	LENGTH OF ENTRANCE CHANNEL (KM)	DRAFT (METRES)	DRAFT AVAILABLE AT BERTHS (METRES)	
			MIN.	MAX.
Kolkata	232	7.2	7.2	13.7
Haldia	115	7.2	Subject to tidal variations	
		13		
Paradip	500	(17 m by June, 2012)	11.0	21.0 (SPM)
Visakhapatnam	IH-2.0 OH-3.1	IH-11.0 OH-20.0	8.0	17.0
Ennore	3.775	16.0	15.0	15.0
Chennai	6.7	IH-18.6 OH-19.2	8.5	17.4
V.O. Chidambaranar	4.0	12.8	5.85	12.8
Cochin	10.5	14.5	9.14	22.5(SPM)
New Mangalore	14.0	14.0	7.0	12.5
Mormugao	4.6	14.4	12.0	14.1
Mumbai	9.6	10.7	7.0	12.0
JNPT	10.0	11.0	5.0	13.5
Kandla	25.0 OOT-8.0	11.6 OOT-23.5	9.1	30 (SBM)

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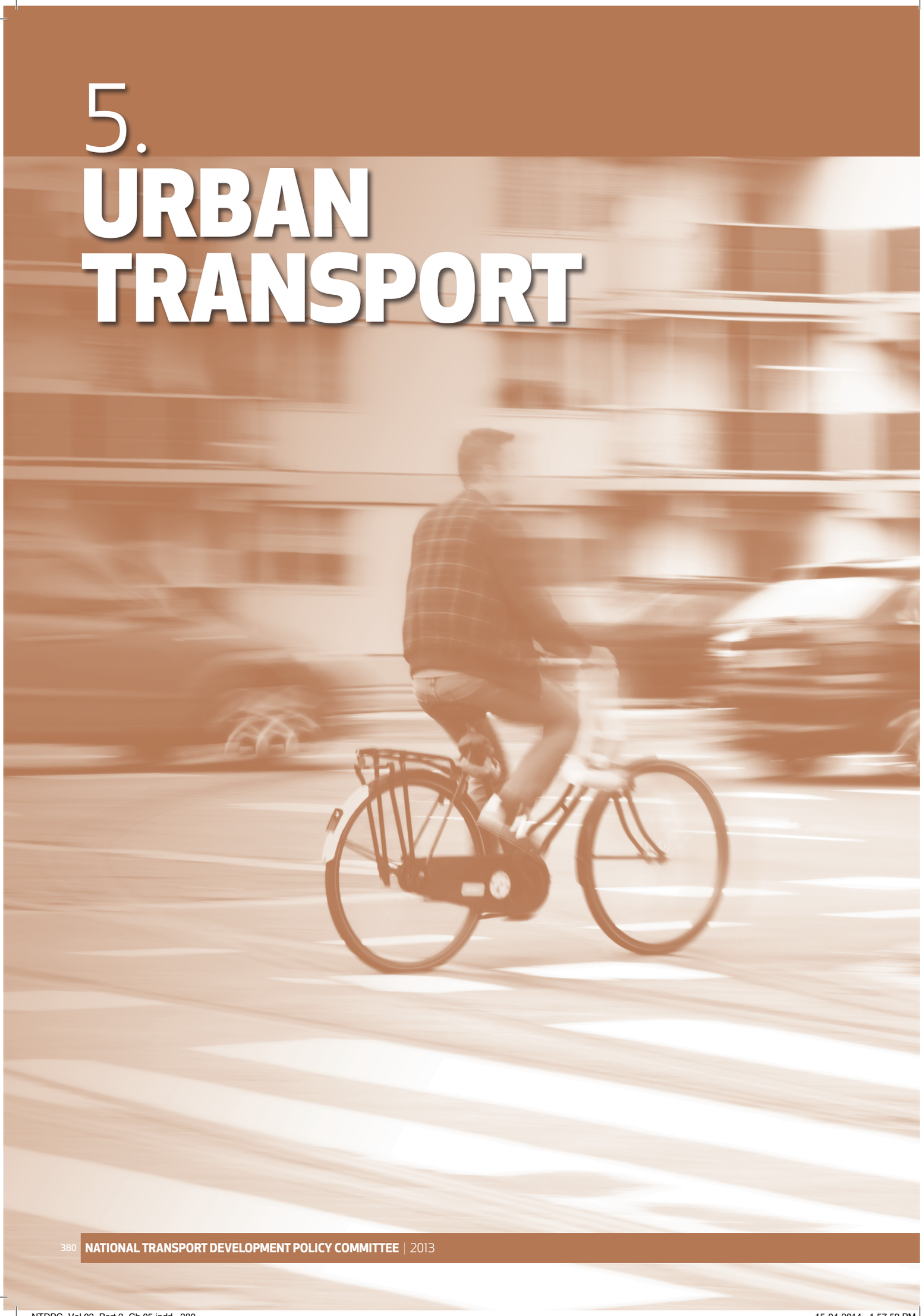
5. URBAN TRANSPORT



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5. URBAN TRANSPORT

India's cities have expanded rapidly over the last few decades and are likely to grow faster in the future. Urban India is expected to contribute 70 per cent of India's GDP by 2030[1].

INTRODUCTION

These are centres of wealth—the per capita income in the largest cities is much higher than the average per capita income of the country as a whole and, in some cases more than double the national average–but they are also intertwined with the national and rural economy through consumption patterns, remittances, and other links.

URBANISATION AND FUTURE URBANISATION PROJECTIONS

According to Census 2001, 27.8 per cent of Indians, i.e., 286 million people or 55 million households lived in urban areas. The provisional data from Census 2011, showed that urban population had gone up to 377 million, which represents 31.2 percent of the population of India. Estimates of urban population growth in India range from 550 to nearly 600 million people by 2030[2].

'Urban India' will be varied. The total urban population living in cities and towns in any particular class has increased consistently due to the stable and balanced pattern of urbanisation throughout the last century. This balanced urban growth pattern has led to increasingly larger proportions of population living in Class I towns. As seen from Table 5.1, over two-thirds of the total urban population now lives in cities that have populations over 100,000 (Class I towns). The continuing increase in the number of large cities, million-plus cities, half-million-plus cities, and 100,000-plus cities does have implications for strategies for urban transport management.

In 2001, there were 5,161 towns in India which increased to 7,935 towns by 2011 (Table 5.2). The total number of Urban Agglomerations, which constitutes the urban frame, is 6166 in the country. Nearly 50 per cent of the urban population lives in small cities (<0.5 million), whereas 15 per cent lives in mega cities.

The fastest growth in the last decade has been of cities with population between 100,000 and 1 million, e.g., Surat, Nashik and Faridabad. Mumbai, Delhi, Kolkata, Chennai, Hyderabad and Bengaluru have grown at a slower rate than the others during the past three decades. The faster growing big metros like Hyderabad and Bangalore have experienced peripheral expansion with smaller municipalities and large villages surrounding the core city becoming part of the larger metropolitan area. This trend is also beginning to emerge in smaller metros like Pune, Indore and Surat.

Although the share of population in cities with more than a million population is high, more than 60 per cent of the urban population is still living in cities of smaller size (Table 5.3). As will be brought out in the following sections, these cities have not received any support on urban transport either from their respective states or the national government. There is a huge responsibility of addressing urban transport needs responsibly in these towns and cities too.

Even by 2031, about 30-40 per cent of the urban population will be living in small and medium towns. This will be a significant population for which mobility services need to be thought through. The demand for urban transport in newly-growing areas and now-smaller cities also will need significant attention so that urban transport in these locations don't reach crisis proportions before they are addressed. The approach to small and medium towns and large rural

1. McKinsey (2010).
2. UN Population division; the High Powered Expert Committee for Estimating the Investment Requirements for Urban Infrastructure Services set up by the Ministry of Urban Development, Government of India which submitted its final report entitled 'Report on Indian Urban Infrastructure and Services' (HPEC 2011) in March 2011 and the McKinsey Global Institute's Report entitled 'India's Urban Awakening : Building Inclusive Cities, Sustaining Economic Growth', April 2010.

Table 5.1
Composition of Class 1 Cities as per Population Size (Census 2011)

CITIES AS PER POPULATION	NO. OF CITIES
More than 10 million	3
5 - 10 million	5
2 - 5 million	10
1 - 2 million	35
Total Million Plus Cities	**53**
0.5 million to 1 million	43
100,000 to 500,000	372
Total Class - I Cities	**468**

Source: Ministry of Home Affairs (2011).

Table 5.2
Category of Urban Agglomerations as per Census 2001 and 2011

CATEGORY	NUMBER OF UAs AS PER CENSUS	
	2001	2011
Class I (more than 100,000)	441	468
Class II (50,000 to 100,000)	496	
Class III (20,000 to 50,000)	1,388	
Class IV (10,000 to 20,000)	**1,563**	
Class V (5,000 to 10,000)	1,041	
Class VI (below 5,000)	232	
	5,161	**7,935**

Source: Ministry of Home Affairs (2011).

areas cannot be the same as for metropolitan cities and while their demands and problems are also significant urban planners should not look at them with the peculiar lens out of their understanding of mega cities alone.

URBAN TRANSPORT IS UNLIKE OTHER TRANSPORT SECTORS

'Urban transport' (UT) is a broad name for a sector that covers a variety of modes of intra-city transport for people and goods, including walking, bicycling, non-motorised transport such as rickshaws etc, private personal transport, i.e., cars and motorbikes; public transport which could be rail- or bus-based; private-public transport such as taxis and para-transit modes among others.

NTDPC's scope has been spread across a range of issues related to development of comprehensive and sustainable policy for meeting the transport requirements of the country through various modes of transport. While looking at the changing nature of demand for transport and the particularities of each mode of transport, UT cannot be neglected since more often than not, it accounts for the last mile in any other inter-city transport trip. In fact it is, cumulatively, a significant percentage of the overall transportation trips in the country. It is often productive, but also contributes significantly to congestion,

Table 5.3
Distribution of Urban Population, 2001 and 2011

CITY SIZE	POPULATION RANGE	NUMBER OF TOWNS		POPULATION IN TOWNS (IN MILLION)		PERCENTAGE OF URBAN POPULATION	
		2001	2011	2001	2011	2001	2011
Class I	> 100,000	441	468	178	265	62.3	70.2
Class II	50,000 -100,000	496		344		12.0	
Class III	20,000 -50,000	1,388		421		14.7	
Class IV	10,000 -20,000	1,563	**7,467**	23	**112**	7.9	**29.8**
Class V	5,000 -10,000	1,041		8		2.8	
Class VI	< 5,000	232		0.8		0.3	
ALL	Total	5,161	7,935	286	377	100	100

Source: Ministry of Home Affairs (2001, 2011).

environmental pollution, energy dependence and other social concerns.

One of the key differentiating factors between UT and other transport sectors like, railways, roads and inland water ways is the complexity of the system given the variety of modes prevalent here. UT solutions not only have to look at the efficiency in terms of time and cost and convenience of each mode but also the inter dependency of one mode on the other. As an example, a highly efficient mass transit system could be made ineffective if links to other parts of transit systems are weak and inefficient.

Unlike other transportation sectors, UT is primarily guided by the nature and future nature of urbanisation. UT system choice decisions are rarely taken on the basis of technology or system performance alone; they also incorporate economic geography, industrial development, distributional, environmental and other goals. Wider urban social, economic and governance issues such as the crime and safety, public sector regulation and management capacity, also play a strong role in determining the mode of transport adopted by a city.

UT could be a facilitator or could pose a burden on the urban contribution to city productivity and the national economy. The defining trait of urban transportation is the ability to support higher densities in urban areas and efficiently, affordably move people and goods through and in the city. Agglomeration economies rely on provision of basic urban infrastructure services in general and UT infrastructure in particular. UT helps connect people and residential areas to education and employment locations, expanding opportunities and choices for people to access alternate education and employment. The efficiency and effectiveness of the UT system also has an important impact on the health and safety of the commuters in specific and urban residents in general. Safety from traffic-related accidents as well as safety from crime, is also related to the way the city and the transport system is planned and managed. In terms of the health-related impacts of transport in urban areas, vehicular pollution has emerged

In the absence of adequate provision of UT infrastructure, including public transport, congestion diseconomies can outweigh the benefits of agglomeration. Well-planned and implemented UT can augment the agglomeration advantages of cities and minimise their congestion diseconomies.

as the top contributor to air pollution. These issues are discussed more at length in other chapters of this report.

In the absence of appropriate infrastructure, diseconomies could set in from traffic congestion, environmental degradation, deterioration in civic services, fatalities and injuries due to road traffic crashes, and air and water pollution. In order for cities to perform their role as engines of economic growth and innovation, while providing an improved quality of life to its residents it is very important to integrate the competing demands of transport, housing, and commercial real estate in their development. In the absence of adequate provision of UT infrastructure including public transport, congestion diseconomies can outweigh the benefits of agglomeration. Well-planned and implemented UT can augment the agglomeration advantages of cities and minimise their congestion diseconomies.

URBAN TRANSPORT IN INDIA TODAY

URBAN TRANSPORT MODAL SHARE ACROSS INDIAN CITIES

Urban transportation enables movement of goods and people from one location to another within an urban area. UT modes related to the transportation of goods in Indian cities commonly include a variety of modes including non-motorised modes such as manual push carts and bicycle carts, and motorised modes such as small and large trucks, pick up vans etc. UT modes related to the transportation of people, for work, education, social activities and shopping include walking, non-motorised transport–bicycling, cycle rickshaws, etc.; alternative mode of flexible passenger transportation commonly termed para-transit modes–such as minibuses and share taxis, that do not follow fixed routes or schedules; public transport such as on-call taxis, chartered taxis and buses; organised bus systems; bus rapid transit systems; trams and electric buses; underground and over-ground rail based mass transit systems; and private motorised modes such as cars and two wheelers. The distribution of travel among these modes varies significantly across cities. At present, there is inadequate understanding of, and inconclusive data on, the modal share distribution between these various transport modes, across city types and sizes in India. The variations in reported modal share from a few studies are reflected in Table 5.4. It is clear that there is no consensus among transport planners about the true modal split of trips in any city. Particularly lacking is information and data on urban freight movement, which is commonly believed to be up to 15 per cent of the traffic.

The different results are due to a range of factors that include, differences in types and the methodologies of the surveys. Most transport studies, have been conducted by consultants who have designed their methodologies and surveys to measure viability of specific projects such as a new road or flyovers or even integrated public transport systems. Project based methodologies are now also used in wider surveys including a study conducted for Ministry of Urban Development (MoUD) in 2008 leading to the report titled 'Study on Traffic and Transportation Policies and strategies in Urban Areas in India'[3]. These kinds of traffic surveys, however, give an incomplete and often biased picture of modal share as they are most often conducted on points/places on roads (such as at petrol pumps, traffic junctions or midway on roads, etc.) that are unrepresentative of broader traffic patterns. Surveys based on household interviews can also miss many trips taken by those not present when the interview was taken, or those not considered as 'trips' by the respondent.

Comprehensive traffic diary surveys are a superior instrument for policy level discussion and decision making, but are not available in India. Accurate comprehensive traffic diary surveys should be undertaken at the start of each Comprehensive Mobility Plan (CMP) revision process. As discussed in Chapter 5, Volume II on Institutions for Transport System Governance, there also is a strong requirement for developing an institutionalised system that would be responsible for conducting its own national travel and urban transportation surveys on a periodic basis and maintain data banks for data generated by other organisations associated with transportation too.

PUBLIC TRANSPORT MODES ACROSS CITIES

Internationally and historically the choice of the mode of public transport has closely followed the developments in transportation technology as well as the city form and the needs of the city's economy. Many large European and many large American cities that have extensive rail-based public transport, were constructed during the 1850–1920s, the period before the diesel engine, good pneumatic tyres (essential for large buses) and availability of mass-produced road vehicles took hold. These cities have important large Central Business Districts (CBD) which were fed by rail/metro systems. Cities like

3. Asian Institute of Development (2011).

Table 5.4
Mode Share in Various Indian Cities

CONSOLIDATED FIGURES FROM VARIOUS REPORTS ON MODAL SPLIT IN INDIAN CITIES										
CITY SIZE CATEGORY (MILLION POPULATION)	CITY NAME	POPULATION IN THE CITY (MILLION)	WALK	NON-MOTORISED TRANSPORT		INTERMEDIATE PUBLIC TRANSPORT		PUBLIC TRANSPORT	MOTORISED PERSONAL TRANSPORT	
				CYCLE	RICKSHAW	AUTO RICKSHAW	OTHERS		CARS	TWO WHEELERS
>8.0****	–	-	22	8		7		44	10	9
>5.0*	-	-	29	8	1	1		47	4	10
	Mumbai**	-	12	10		-		60	18	
	Mumbai***	16.40	28	5		9		44	9	5
	Mumbai****	17.70	27	6		7		45	8	7
	Kolkata**	-	12	4		-		77	5	
	Kolkata***	13.20	18	12		3		57	7	3
	Kolkata****	14.70	19	11		4		54	8	4
	Delhi **	-	35	5		-		40	20	
	Delhi ***	12.90	20	12		6		43	14	5
	Delhi ****	13.80	21	12		6		43	14	5
	Chennai**	-	32	16		-		42	10	
	Chennai***	6.56	22	6		9		32	9	22
	Chennai ****	7.00	22	8		8		31	10	20
	Bengaluru**	-	46	10	-	-		36	8	
	Bengaluru***	5.70	28	5	18	18		26	16	7
	Bengaluru****	8.60	26	7	7	7		35	8	17
	Hyderabad**	-	21	28	-	-		35	16	
	Hyderabad***	6.34	22	6	7	7		49	8	8
	Hyderabad ****	6.30	22	9	7	7		35	9	9
	Ahmedabad**		48	14	-	-		28	10	
	Ahmedabad***	5.41	22	14	5	5		15	20	24
	Ahmedabad ****	5.90	22	14	6	6		16	17	25
'4-8****	-	-	25	11	7	7		21	10	26
'2-5*	-	-	29	13	2	7		33	1	21
	Pune**	-	28	10	-	2		38	24	
	Pune***	3.78	24	8	8	-		12	10	38

CONSOLIDATED FIGURES FROM VARIOUS REPORTS ON MODAL SPLIT IN INDIAN CITIES										
CITY SIZE CATEGORY (MILLION POPULATION)	CITY NAME	POPULATION IN THE CITY (MILLION)	WALK	NON-MOTORISED TRANSPORT		INTERMEDIATE PUBLIC TRANSPORT		PUBLIC TRANSPORT	MOTORISED PERSONAL TRANSPORT	
				CYCLE	RICKSHAW	AUTO RICKSHAW	OTHERS		CARS	TWO WHEELERS
	Pune ****	4.20	22	11		7		12	12	35
	Kanpur **	-	72	21		-		5	2	
	Kanpur ***	2.72	30	18		7		6	7	32
	Kanpur ****	-	29	19		7		9	16	21
	Lucknow**	-	36	36		-		0	28	
	Lucknow***	2.24	38	26		8		0	4	24
'2-4 ****	-	-	25	18		6		10	12	29
'1-2 *	-	-	30	8	5	2		24	1	30
'1-2 ****	-	-	24	19		8		13	1	24
'0.5 -1 *	-	-	32	10	9	3		21	2	23
'0.5 -1 ****	-	-	32	20		3		9	12	24
< 0.5 (category 1a) ****	-	-	34	3		5		5	27	26
< 0.5 (category 1b for hilly towns) ****	-	-	57	1		0		8	28	6
'0.1-0.5 *	-	-	38	15	12	3		13	1	18
'.05-0.1 *	-	-	38	17	13	4		11	1	16

Source: * Tiwari (2011); ** Pendakur 2002 and World Bank 2002; *** Data from various City Development Plans available at http://www.jnnurm.nic.in/ (accessed on 20 January 2014); **** WSA, GoI (2008).
Note: Figures in per cent except where mentioned otherwise.

Tokyo, New York, Paris and London provided exceedingly large CBDs with large number of jobs each[4]. In today's developing world, there are very few cities that have such large CBDs with such high employment densities. India's cities often have several concentrated business districts corresponding to city centres in particular eras.

Very few Indian cities currently, have organised, registered and regulated public transport systems. The coverage of local commuter rail services are available only in the seven metropolitan cities in India Mumbai, Delhi, Chennai, Kolkata, Bengaluru, Hyderabad and Pune. Organised city bus services operate now in about 65 cities, an increase from only 20 cities in 2006. Intermediate public transport modes like three-wheeled auto rickshaws, tempos and cycle rickshaws also provide public transport services. Today, while the share of city buses is very small compared to para-transit modes (registered transport and personalised motorised vehicles (two-wheelers and cars), it must be kept in mind that in most cities, a large number of contract buses also ply especially catering to trip demands for work and for children to go to school. City-wise vehicle registration data when compared to the fleet strength of the formal public transport agency reveal interesting insights on how important other vehicles, contract buses and para transit vehicles must be in those cities for urban transport (Table 5.5).

A general decline in public transport trips is noticeable in cities of all sizes when a RITES study of 1994 is compared to the WSA, Study on Traffic and Transportation Policies and Strategies in Urban Areas in India (Table 5.6). Another analysis of data on vehicles registered in India, presented in Table 5.7, reveals that the share of buses has declined to 1.1 per cent of all registered vehicle in India from 11.1 per cent in 1951, indicating that while cars and two wheelers have seen rapid growth, governments have not invested significantly to increase the quality and availability of public transport, especially through buses, over the decades. However, the rapid growth in personal two-wheelers specifically, and in cars to some extent, is still much less than comparative economies globally as discussed in a later section.

4. Mohan (2008).

Table 5.5
Pattern of Public Transport in Selected Indian Cities
(All figures in numbers)

CITY	MUMBAI	DELHI	CHENNAI	BANGALORE	KOLKATA	PUNE
Public Transport Buses operated by State Road Transport Undertaking (SRTU)	BEST	DTC	MTC	BMTC	CALCUTTA STC	PUNE MPML
	4,652	5,771	3,414	6,111	956	1,549
Other Buses (Registered buses excluding SRTU buses)	8,189	39,986	33,791	22,150	3,293	13,459
Paratransit-registered commercial transport vehicles including taxis and three to six seater passenger vehicles	159,629	253,532	174,314	162,431	49,648	78,778

Source: Adapted from Ministry of Road Transport and Highways (2011, 2012).

Table 5.6
Composition of India's Vehicle Population

YEAR END (MARCH)	TWO WHEELERS	CARS, JEEPS AND TAXIS, ETC.	BUSES	GOODS VEHICLES	OTHERS VEHICLES	TOTAL
	(as percentage of total vehicle population)					(Million)
1951	8.8	52.0	11.1	26.8	1.3	0.3
1961	13.2	46.6	8.6	25.3	6.3	0.6
1971	30.9	36.6	5.0	18.4	9.1	1.8
1981	48.6	21.5	3.0	10.3	16.6	5.4
1991	66.4	13.8	1.5	6.3	11.9	21.4
2001	70.1	12.8	1.2	5.4	10.5	55.0
2011	71.8	13.6	1.1	5.0	8.5	141.8

Source: Ministry of Road Transport and Highways (2012).

While these figures do provide a macro picture of the rapid increase in registration of personal modes of transport, especially two wheelers, a significant caveat is that public transport vehicle numbers are likely to be more accurate than those of personal vehicles. This is due to annual or bi-annual verification of public transport vehicles in all states. The number for personal vehicles registered is likely to be much higher than those being used and those on the road due to the fact that very few of them are de-registered. They pay a one-time road tax at the time of registration and annual monitoring of the registration is not in place. Therefore the number of personal vehicles registered presented in the table reflects a cumulative number of all vehicles registered over many decades. The personal vehicles on the road are only a small percentage of these. A survey conducted in Delhi to support the Auto Policy, demonstrated that only around 60-70 per cent of the personal registered vehicles were in use[5].

5. Expert Committee on Auto Fuel Policy (2002).

Table 5.7
Public Transport Share Comparison, 1994 and 2007

CITY CATEGORY	CITY POPULATION (RANGE IN MILLIONS)	WSA, 2007 (PER CENT)	RITES, 1994 (PER CENT)
1	< 0.5	0–15.6	–22.7
2	0.5-1	0–22.5	22.7–29.1
3	1.09–2	–50.8	28.1–5.6
4	2–4	–22.2	35.6–45.8
5	4–8	32.1	45.8–59.7
6	Above 8	35.2–54.0	59.7–78.7

Source: Urban Transport Working Group, 2012

URBAN TRANSPORT TRIPS AND TRIP LENGTHS

It is generally believed that the demand for transport increases with increasing incomes. The point to be noted however is that work and education trips, which are essential in nature, remain constant even with increasing incomes. All the other trip types (such as shopping, social, personal business, etc.) are flexible and are smaller in number than work trips.

As described in Box 5.1, the total number of trips does not increase dramatically with rising incomes or increasing population, but the number of motorised trips can and the motorised essentially replace walk or non motorised trips. Also as a city grows motorised trips per corridor may increase.

Indian cities have traditionally been developed on mixed land use models that allow neighbourhoods to provide for residences, workplaces, shopping, social and educational facilities. This has resulted in minimising of trip lengths irrespective of city size as the mixed land use prevalent in the cities due to either planned or unplanned market interventions ensure that living and work spaces are as close to each other as possible and the dependence on motorised urban transport is minimised separately by all households. Figure 5.1 shows that 80 per cent of the trips are less than 10 km in length and 70 per cent of the trips are less than 5 km even in big cities like Mumbai and Hyderabad. In cities like Pune 97 per cent of the trips are less than 10 km and 80 per cent are shorter than 5 km. The average trip length in medium and small size cities is less than 5 km, which makes non motorised transport an attractive option for commuting.

Another associated phenomenon is that in large cities such as in Mumbai, Delhi, Hyderabad and Pune, as documented in the Census of 2011, about 41.3 per cent, 16.2 per cent, 32.9 per cent and 20.7 per cent of the urban households, respectively, live in slums. The residents of slums are essentially from lower income groups. They typically find it difficult to afford either motorised private or motorised public transport and hence are primarily dependent on Non Motorised Transport (NMT) even for long distance trips. As documented by Tiwari[6], only a small percentage of people living in slums use public transport for commuting. Development projects or housing projects for the poor displace communities from slums closer to the city to far off locations. This displacement of poor people from areas close to their work, while raising each poor families own transport costs, also pose significant challenges to their mobility, thereby increasing their economic vulnerability.

Whereas in most cities of the world, the majority of trip distances are less than 10 km, in India, they are still less than 5 km as in Mumbai[7].Other cities most likely have shorter average trip lengths. These characteristics of Indian cities are a huge positive, i.e., smaller trip lengths and travel time, for providing sustainable and affordable travel options in the future too. New city development strategies and plans including UT plans need to recognise and strengthen these characteristics to ensure modern, efficient, sustainable UT service provision.

RESIDENTIAL DENSITY AND MIXED LAND USE OF INDIAN CITIES

Population density is a key determinant of the spatial spread of a city and therefore the intensity of travel demand. At the city-wide 'net density'[8] level Bangalore has a density of 5,889 persons/sq. km, Hyderabad has 6,265 persons/sq. km and Ahmedabad has 15,574 persons/sq. km[9].

As presented in the Urban Transport Working Group report[10] and other literature, Indian cities are often described to have low densities that need to be made more dense. This may be misleading. 'Residential urban density' measures how many people live in

6. Tiwari (2011).
7. Baker et al. (2005).
8. Total population of the city divided by the total area of the city.
9. Urban Transport Working Group Report, NTDPC, 2011.
10. Urban Transport Working Group Report, NTDPC, 2012.

Box 5.1

The Limit to Mobility Needs: Each Trip Has a Purpose

'With increasing motorisation mobility increases. The number of trips a person makes a day increases with number of cars per inhabitants. More cars mean more mobility'. This has been the conventional wisdom propagated through the 20th century and has been the traditional definition of mobility. As explained by H. Knoflacher each trip is related to a purpose. This purpose is to compensate the existence of local deficits (i.e., non-availability of services and goods) of the origin at the destination.

In low-density cities like Houston and Melbourne, which are car-dominated and have abundant road space, car owners travel long distances relatively fast, but still have high travel times. It is difficult to establish efficient public transport systems in such low-density cities. In such cities, those who do not have cars, cannot get to work easily and can be excluded from economic activities. On the other hand, cities that have a dense settlement pattern, such as Hong Kong, Singapore and Tokyo, tend to be more public transport friendly and more citizens use non-motorised forms of transport. These world-wide experiences tell us that access needs despite varied mobility patterns, remain similar across cities of different sizes, populations and contexts.

Mobility can therefore only improve if local deficits, such as facilities available in the vicinity/neighbourhood are expanded which are often lacking due to poor urban planning, poor logistics, poor management. Deficits have to be compensated by physical mobility. But the number of purposes for accessing which mobility is needed in society have not changed during increased motorisation . Mobility therefore has nothing to do with car ownership since it is purpose-related. Each trip with the car replaces a trip of another mode.

Increasing car mobility means decreasing mobility for pedestrians, cyclists or public transport. There is no or marginal growth of mobility in the transport system as a whole, when the population is constant. The number of trips remains constant. Knoflacher shows from an example from an Austrian city, that the trend of increasing motorisation was broken by changing the physical structures and land uses around 1990. Since then car traffic has declined; pedestrian, cycling and public transport has increased. These changes did not result in trip numbers changing.

Source : Adapted from Knoflacher (2007); Mohan (2006).

relative proximity in cities, expressed as the number of people living in each square kilometre of a 100 x 100 kilometres urban region[11].A mapping of 'residential urban density, as in Figure 5.2, shows how Hong Kong, Mumbai, Istanbul and Shanghai have more effective 'residential urban density' than New York, Mexico City, Sao Paulo, Johannesburg and London. Residential density is largely driven by topographical constraints, the location of public transport and other infrastructure, but also by each city's inherited traditions of urban culture and development.

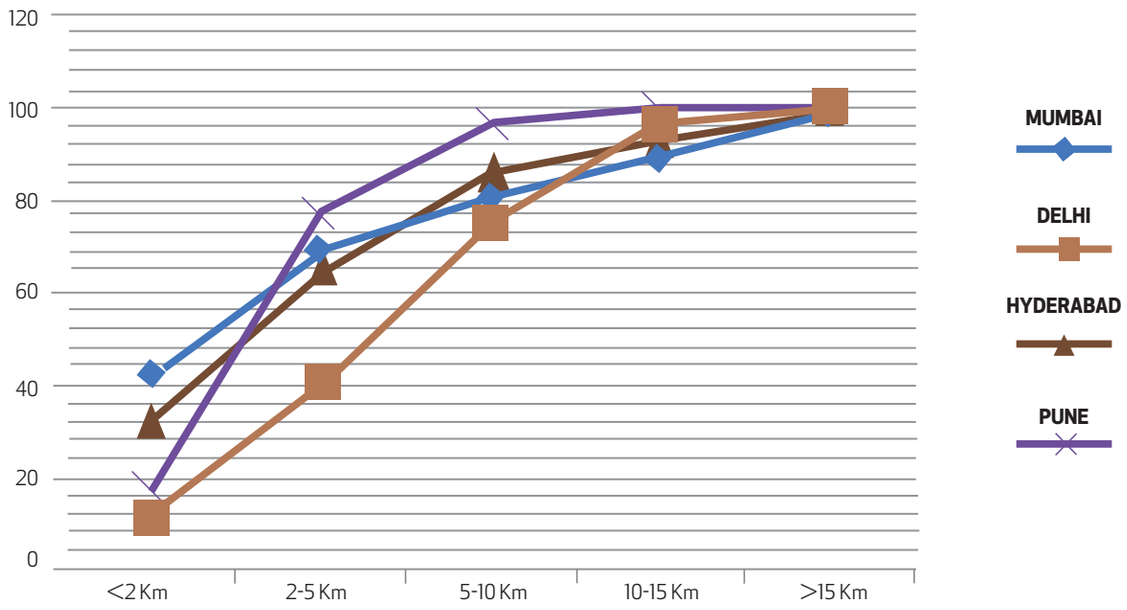
Globally, residential density differs widely. Figure 5.2 shows how topographical constraints drive densities that rise to 'spikes' in Manhattan and parts of the Bronx, Brooklyn and Queens in New York, and in Hong Kong Island and Kowloon in Hong Kong, and Mumbai. São Paulo is multi-centred and similar in its overall density pattern to Mexico City, yet São Paulo's skyline is dominated by high-rise apartment blocks, while Mexico City's is consistently low-rise, demonstrating that high-density can be achieved with different types of built form.

Indian cities, in most instances, have high proportions of mixed land use, which result in high residential densities and ensure smaller trip lengths and maximise non-motorised transport modes for commuting. London and Paris also demonstrate that even with lower density cities can have very good and effective public transport systems. Over the next 20 years, while per capita income in India will increase significantly, it will still be low, and so most areas in most cities will have significantly high densities, other than a few pockets for some very high-income citizens.

The need for effective UT increases with density. With respect to public transport in urban areas it should be noted that cities such as London, Paris,

11. LSE Cities (2011).

Figure 5.1
Trip Lengths in Selected Indian Cities



Source : Tiwari (2011).

Zurich, etc. have much lower built up densities than most Indian cities (Table 5.8) yet have very good public transport systems. Angel et al also conclude that 'average densities in developing-country cities are high enough….to sustain public transport'. Several studies compiled by Holtzclaw[12], for example, suggest that average densities of 30 persons per hectare can sustain local bus service and densities of 50 persons per hectare can sustain high-frequency bus service. Many planners recently have been calling for cities, especially developing country cities, to be made denser, for better benefits from energy savings and the reduced levels of greenhouse gases associated with public transport, but this strategy is not without costs.

RAPID GROWTH OF PERSONAL TRANSPORT AND ITS IMPACT

According to the Motor Transport Statistics[13], the annual rate of growth of motor vehicles in India over the last decade was very high close to 9.9 percent. In 1981 there were only 5.4 million vehicles registered in the country. The figure was 21.4 million in 1991, 54.9 million in 2001 and 141 million in 2011 (Table 5.6 earlier).

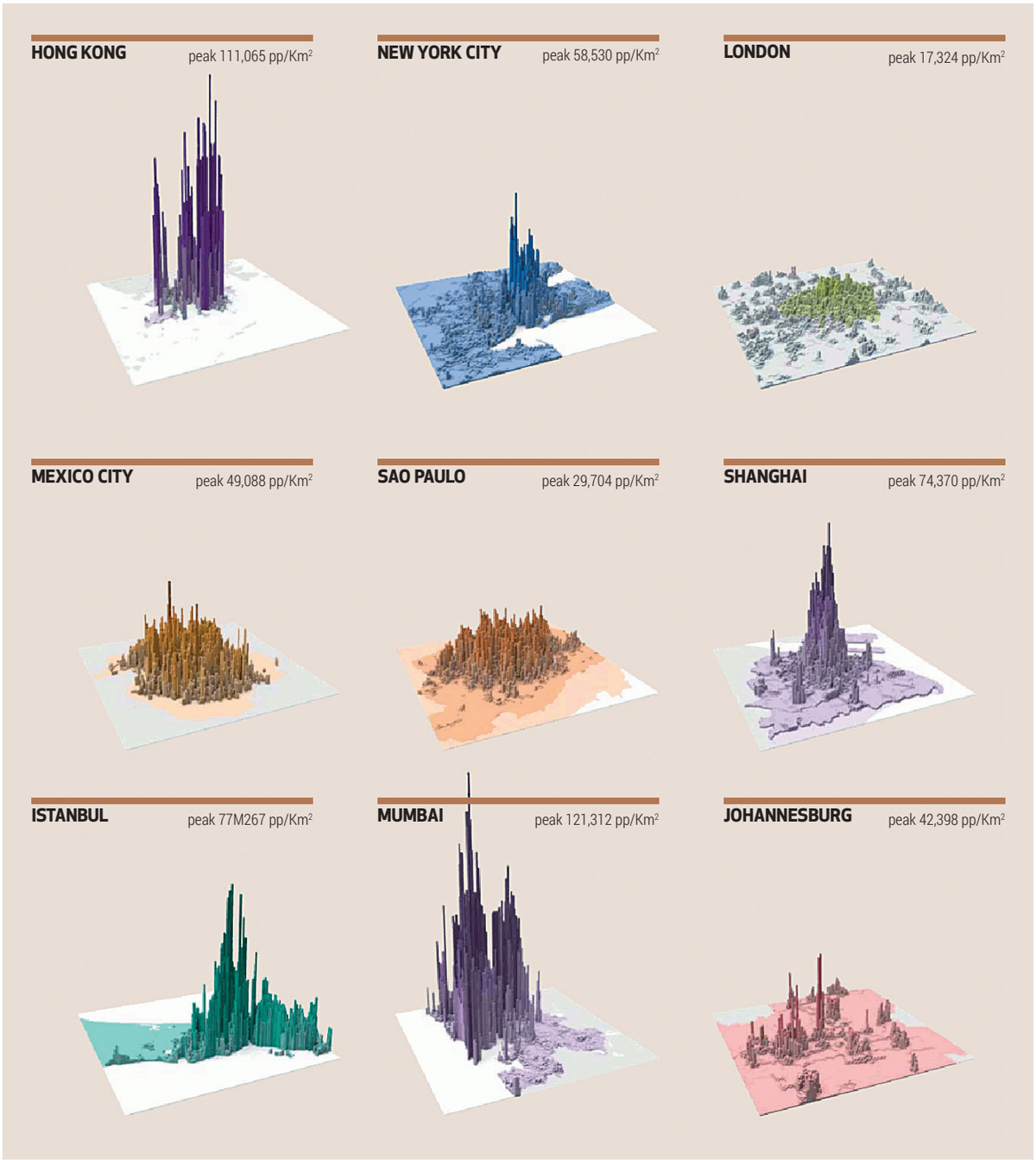
Notwithstanding this rapid growth of motor vehicles in the last three decades, international comparison of vehicle per 1000 population rates across countries, shows that India has low penetration (Table 5.9), but which is consistent with its level of per capita income. The figure is likely to be even lower since registered but unused vehicles figure in the data. International comparison in Figure 5.3 shows the trends in car ownership in countries with per capita incomes less than $40,000 and with increasing car ownership trends. While it shows that increasing trends in car ownership can be witnessed as a phenomenon even in countries with much higher per capita incomes, it also reveals how countries with similar per capita incomes have different car ownership ratios, establishing that while a rapid increase in motorised vehicles can be expected in India, policy can affect car ownership to some extent and car usage to a large extent.

India's most acute UT problems are not because of the number of vehicles but the high concentration of private vehicles in a few selected cities. About 32 per cent of motor vehicles are in metropolitan cities alone, which constitute just around 11 per cent of the total population[14].

Delhi, with around 1.4 per cent of the Indian population, accounts for more than 7 per cent of all motor vehicles in the country. As of 31 March 2011, there were more than 7.23 million registered motor vehicles in Delhi compared to a population of 16.7 million residents and about 600 additional vehicles are being registered every day, even though there has been a downward trend in this over the last couple of years. However, a recent report suggests that the actual number of vehicles in Delhi may be about half this number[15]. This therefore indicates that the issues

12. Holtzclaw (1994).
13 Motor Transport Statistics of India, Various Issues, Transport Research Wing, Ministry of Surface Transport, Government of India, New Delhi.
14. Ministry of Road Transport and Highways (2012).
15 Mohan (2013).

Figure 5.2
Residential Density of International Cities



Source: LSE Cities (2011).

related to cars and private transport need special focus in our metropolitan cities.

The huge increase in the population of two wheelers in India is a unique. From being 8.8 per cent of registered vehicles in 1951, it has crossed the 70 per cent mark. India now has the second highest concentration of two wheelers in the world only after Malaysia and ahead of China.

Personal vehicle demand is going up in an environment where there is the absence of adequate and efficient public transport systems. At the same time rising incomes makes cars and motorcycle ownership increasingly affordable. Cars are available from Rs 150,000 to Rs 300,000 upwards and motorcycles requiring an outlay of around Rs 50,000-60,000 plus are the two major choices for private vehicle ownership and serve two different sections of the market. Level of service (comfort) and travel time are the principal priorities for those in the high income population group, while initial capital investment and operating costs are the major deciding factors for those in the middle-income class. Thus,

Table 5.8

Built Up Area, Urbanised Area and City Footprint Densities in Selected Cities

CITY	COUNTRY	BUILT-UP AREA DENSITY (HECTARES)*		URBANISED AREA DENSITY (HECTARES)**		CITY FOOTPRINT DENSITY (HECTARES)***	
		1990	2000	1990	2000	1990	2000
Beijing	China	164.7	162.7	144.9	138.4	84.1	71.4
Shanghai	China	162.9	125.2	141.4	102.9	78.3	59.5
Hong Kong	China	629.5	543.0	532.7	462.9	399.7	346.8
Bandung	Indonesia	278.3	241.8	219.1	188.9	134.7	127.0
Kuala Lumpur	Malaysia	76.4	68.0	60.2	52.7	40.4	37.6
Manila	Philippines	347.6	284.1	264.4	230.9	154.9	146.4
Singapore	Singapore	170.9	174.8	128.6	130.3	78.7	87.3
Bangkok	Thailand	139.4	100.3	107.5	77.1	47.9	44.4
Hyderabad	India	276.4	189.6	228.7	155.8	128.5	95.0
Jaipur	India	347.9	200.4	282.8	158.6	179.5	127.2
Kanpur	India	159.2	151.7	132.5	128.5	78.4	73.7
Kolkata	India	386.9	276.7	321.4	226.4	172.6	110.4
Mumbai	India	474.5	440.3	407.3	384.5	310.7	286.3
Pune	India	466.9	201.6	362.9	158.1	181.0	124.3
Vijayawada	India	246.9	181.5	199.7	157.2	133.3	98.3
Istanbul	Turkey	190.7	165.9	144.6	129.5	107.1	94.0
Cairo	Egypt	259.7	231.1	221.3	198.2	167.7	143.1
Addis ababa	Ethiopia	204.6	211.3	157.7	164.5	110.8	111.8
Sao Paulo	Brazil	101.7	99.6	87.9	88.1	72.1	71.5
Moscow	Russia	139.1	95.5	109.4	76.9	62.3	47.4
Philadelphia	United States	35.0	34.3	28.3	28.4	24.0	24.5
Chicago	United States	24.7	20.4	19.0	16.4	12.0	10.4
Paris	France	70.2	64.4	55.7	53.1	40.8	39.5
Tokyo	Japan	117.6	115.7	91.5	93.0	80.1	81.7
Madrid	Spain	147.1	124.5	119.7	98.9	74.4	63.7
London	United Kingdom	62.2	54.1	48.6	43.6	35.5	30.8

Source : Shlomo et al. (2010).
Note: * is the ratio of the total population in the smallest administrative districts containing the city and the total area of the built up pixels within these districts.
** is the ratio of the total population to the total urbanised area.
*** is the ratio of the total population and the total city footprint area (sum of the urban and suburban built up areas).

Table 5.9
Vehicular Penetration in Select Developed and Developing Countries

COUNTRY	GROSS NATIONAL INCOME PER CAPITA 2009 (US $)	PER 1,000 PERSON		
DEVELOPED		PASSENGER CARS	TOTAL VEHICLES**	TWO WHEELERS
US	46,360	439	828	26
UK	41,370	460	544	21
Japan	38,080	617	617	28
Germany	42,620	510	610	46
Australia	40,240	550	717	28
France	42,620	496	654	56
DEVELOPING				
Mexico	8,960	191	288	11
Malaysia	7,350	313	675	325
South Africa	5,760	110	170	7
Brazil (*)	8,070	165	275	68
China	3,650	34	119	72
Korea, Rep	19,830	267	393	37
India (##)	1,220	13	117	76

Source: Calculated on the basis of data received from offices of State Transport Commissioners/UT Admns; International Road Federation (2011); Ministry of Road Transport and Highways (2012).
Note: **: India Vehicle include passenger cars, buses + coaches, vans + lorries and Two wheelers
(*): Data relates to 2008, ##: Data relates to 2011

cars and two wheelers address different markets and, in general, they are not competitors. Recent industry trends also indicate that a significant segment of the market is moving out of the small entry-level car segment and is buying larger cars. This could have increased negative impact on city mobility indicators.

One of the most direct impacts of increase in personal motorised transport has been on parking requirements. As most residential or work facilities were not developed with such high private transport ownership in mind personal motorised transport parking often overflows and occupies public land such as road carriageways, footpaths or parks etc. posing other problems of mobility. Simultaneously parking space for public transport and non-motorised transport is not given any priority. It is now well recognised that parking demand is insatiable, in an environment of rapid increase in private vehicles in larger cities. Conventional policies encourage more parking supply.

However it must be noted that despite the high and increasing percentage of cars and two wheeler ownership in relationship to over all vehicles these personalised vehicles still constitute a small portion of overall passenger trips in each city. As in the case of Delhi[16] (Figure 5.5), and in various city-level comprehensive mobility plans in cities where the penetration of personal motorised transport is high, car ownership still constitutes at the most, less than 25 per cent. Personal motorised transport use has had severe negative impacts and the pace of increase of personalised motor vehicles has emerged as the key urban transport and mobility challenge for the country.

EXTERNALITIES, ENERGY ISSUES, ENVIRONMENTAL IMPACT AND SAFETY PERFORMANCE

ENERGY ISSUES

Energy efficiency of UT is important for two reasons. First, energy costs form a significant proportion of transport costs for all modes in urban India,

16. As per RITES (2010) for Delhi, the business as usual scenario will have cars based trips increasing from 19.3 percent to 23.4 percent by 2021 and two wheeler trips from 21.7 to 21.9 percentage of trips by then.

Table 5.10
Registered Motor Vehicles per 1,000 Population in Million-Plus Indian Cities

CITY	MVS/'000 POPULATION
Agra	366
Bangalore	434
Bhopal	401
Chennai	388
Coimbatore	577
Delhi	332
Greater Mumbai	90
Gwalior	408
Hyderabad	391
Indore	560
Jaipur	551
Jodhpur	559
Kanpur	343
Kochi	193
Kolkata**	30
Lucknow	417
Madurai	412
Pune	415
Visakhapatnam	356
Average of 35 Million + cities	293

Source: Ministry of Road Transport and Highways (2012).

so that efficiency in energy use is a central issue in sector efficiency. Second, consumption of energy, particularly that of hydrocarbons, is a critical factor in determining the impact of the UT sector on both the local and the global environment. Figure 5.6 shows the estimated fuel consumption in 23 largest cities which is close to 8-10 per cent of the petroleum used in the country.

Another TERI study[17], indicates that

- There will be an 18 per cent reduction in motor fuel demand, if buses meet 70 per cent of the total passenger travel demand in 2030.
- If fuel efficiency of vehicles can be improved by 5 per cent and 20 per cent in 2015 and 2030, respectively, for the vehicles registered after 2010, a reduction of about 17 per cent is achievable in motor fuel consumption by 2030 as against the BAU scenario.
- Integrated land-use and transport planning can also reduce transport energy demand by 20 per cent by 2030.

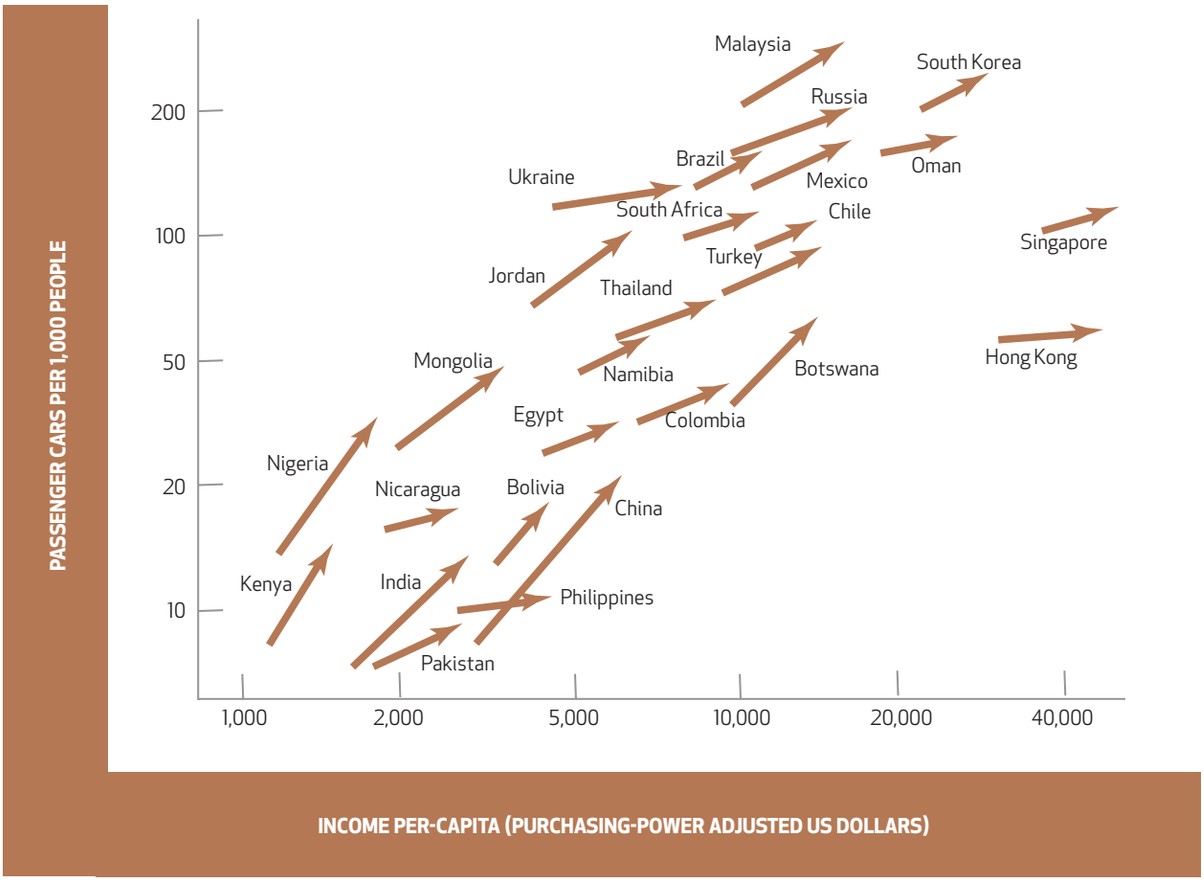
These numbers indicate the impact of different interventions. If these interventions are taken together, the reduction in energy use and CO_2 emissions could be very significant.

The National Mission on Sustainable Habitat of the National Action Plan on Climate Change (NAPCC) also focuses on reducing energy use in UT by emphasising the strengthening of public transport systems through various promotional, regulatory and fiscal measures. The key actions proposed, related to UT are:

- Promoting modal shift towards public transport and better urban planning for reducing the need to travel and to shorten travel distances
- Introducing appropriate transport pricing measures to influence purchase and use of

17. TERI (2007).

Figure 5.3
Projected Growth in Passenger Cars Per 1,000 People, Various Countries



Source: Kutzbach (2010).

vehicles with higher fuel efficiency and alternate fuels

- Tightening regulatory standards such as enforcing fuel economy standards for automobile manufacturers
- Establishing mechanisms to promote investments in development of high capacity public transport systems
- Abandoning of old vehicles to be made illegal and responsibility for handing over the end-of-life vehicle to collection centres fixed on the last owner of the vehicle
- Setting up of a demonstration unit to take up recycling of vehicles, especially two wheelers, which require new techniques
- Setting up a Combustion Research Institute to facilitate R&D in advanced engine design
- Providing tax benefits and investment support for recovery of materials from scrap vehicles.

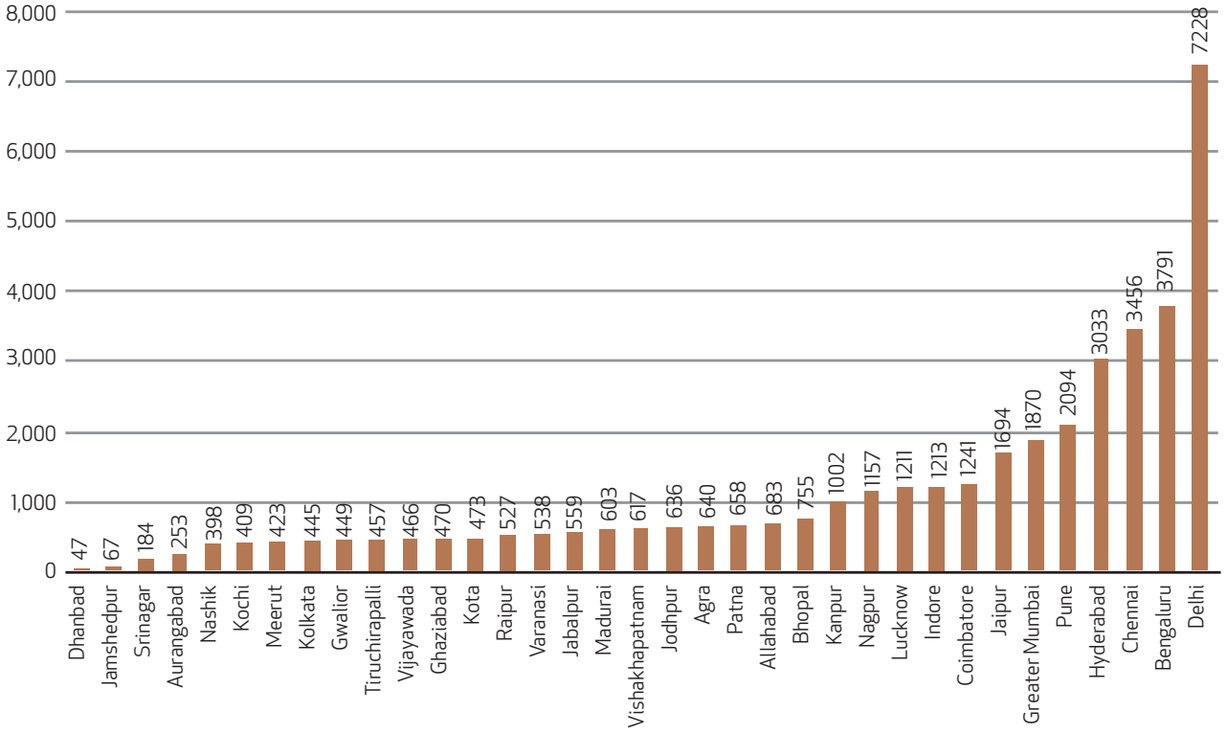
ENVIRONMENT EXTERNALITIES AND PUBLIC HEALTH

On one side, urban transportation activities support increasing mobility demands for passengers and freight, and on the other side, they have resulted in growing levels of motorisation and congestion. This results in the UT sector becoming an increasingly significant contributor to environmental problems. In urban areas the key manifestation has been air pollution and its health effects, which have been discussed in detail in the Chapter 7, Volume II on Energy and Environment. Some anecdotal data which outlines the externalities and environmental impacts of the urban transport sector in India are discussed below to stress the urgent requirement to focus on the need to focus on measure to control the same.

UT externalities are closely linked to environmental pollution and public health outcomes. In India it is clearly evident that increasing vehicular emissions leading to poor air quality are having significant negative impacts on public health. Traffic-related air pollution, especially PM and NO_x, has been shown to lead to premature morbidity and mortality. The World Health Organisation (WHO) estimates that over 700,000 people die each year in South Asia as a result of ambient particulate matter pollution[18]. In 2008, the CPCB identified around 70 cities, representing over 80 per cent of the cities that were being mon-

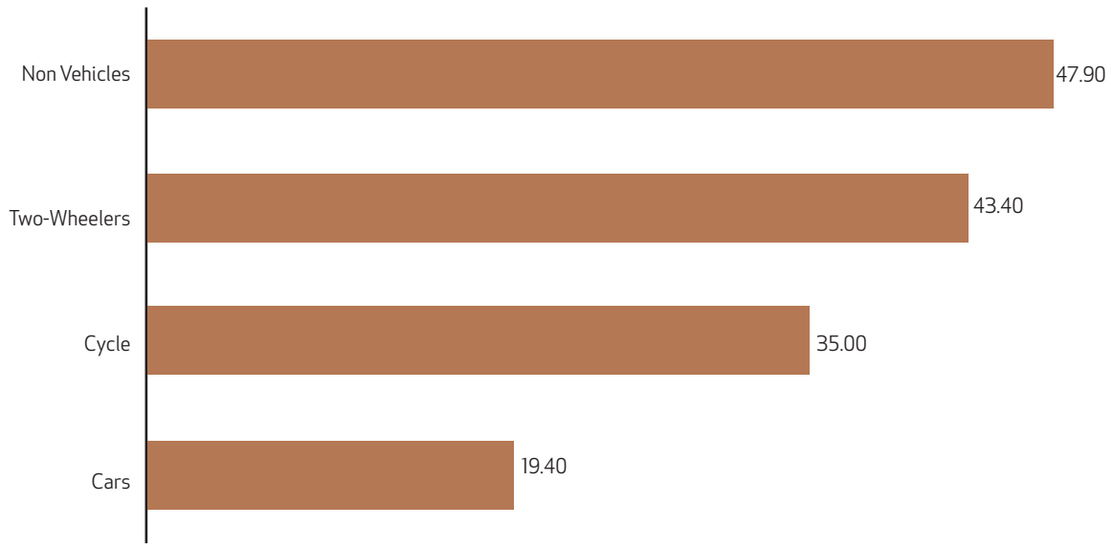
18. Health Effects Institute (2012).

Figure 5.4
Registered Motor Vehicles in Some Large Cities, March 2011
(Figures in '000s)



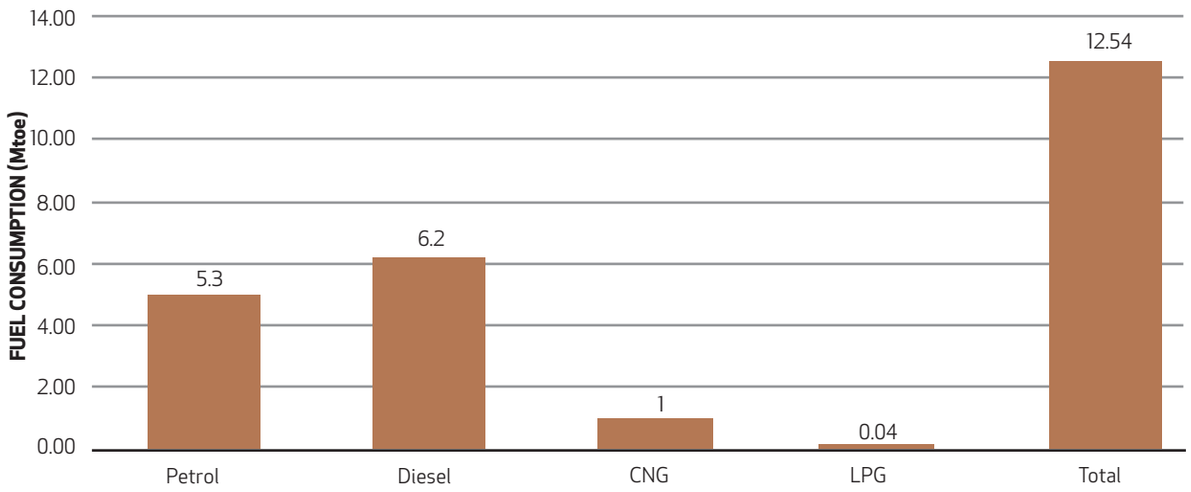
Source : Ministry of Road Transport and Highways (2012).

Figure 5.5
Vehicle Ownership in Delhi, 2010
[Per cent of Households]



Source: RITES (2010); adapted from EMBARQ.

Figure 5.6
Estimated Fuel Consumption of Motorised Transport Activities in 23 Million-plus Cities (2001)



Source: RITES (2010) adapted from CMBARQ.

itored, that were not complying with the NO_x and PM standards. The number has most likely increased since.

The complexities of the problems have led to much debate in environmental policy and in the role of transportation. The transportation sector is often subsidised by the public sector, especially through the construction and maintenance of road and mass transit infrastructure and through subsidies in operation. Total costs incurred due to the increasing use of petroleum-based fuels are generally not fully assumed by the users. The lack of consideration of the full costs of transportation could explain several environmental problems. Yet, a complex hierarchy of environmental costs is involved, ranging from internal (mostly operations), compliance (abiding to regulations), contingent (risk of an event such as a spill) to external (assumed by the society). If environmental costs are not included in costing and pricing, the usage of the car is consequently subsidised by society and costs accumulate as environmental pollution. This requires due consideration as the number of vehicles, especially automobiles using petroleum-based fuels, is steadily increasing.

Most recent reports are unanimous in recommending that cities try to arrest their current pattern of transportation growth in order to bring down their energy consumption by adopting the 'Avoid, Shift and Improve' approach to transport planning and management as articulated by the Bellagio Declaration (May 2009) and advocated by many others.

SAFETY PERFORMANCE

As in other low-income countries, fatalities linked to the transport sector, in India, especially road fatalities are expected to increase by more than 80 per cent over the first two decades of the 21st century, while high-income countries are expected to show continuous fatality reductions. As per a WHO report[19], road traffic injuries caused an estimated 1.24 million deaths worldwide in 2010. The outlook is ominous for India, as road fatalities in the South Asia region are projected to increase by 144 per cent from 2000 to 2021[20]. In 2010 as per the Accidents, Deaths and Suicides in India, National Crime Records Bureau, Ministry of Home Affairs, Government of India, 133,938 people were killed in road traffic accidents crashes[21].

The most recent Government report on this issue[22] states that in 2011 the total number of persons killed was 142,485[23]. As per the 'World report on road traffic injury prevention' by the WHO, road injuries are now among the top three causes of death for those in the 15-44 age group, compared to fifth place worldwide, and among the top 10 causes of death among children in the 0-4 age bracket

19. WHO (2013).
20. Kopits and Cropper (2003).
21. NCRB (2010).
22. MoRTH (2011).
23. GOI (2011b).

Box 5.2
Valuing Reductions in Premature Mortality from Air Pollution

Studies of the air pollution effects on premature mortality predict how many fewer people are likely to die if air pollution is reduced. For example, a 10 percent reduction in PM10 in Delhi, might result in 1,000 fewer deaths each year, though we do not know exactly which thousand people will be the victims.. This is equivalent to reducing the risk of dying by a small amount for all people living in Delhi so that the risk reductions multiplied by the population adds up to 1,000 fewer deaths. Since reducing air pollution reduces risk of death by a small amount for each person in an exposed population, what, in principle, we wish to estimate is what each person in the population would pay for this small risk reduction. If this willingness to pay (WTP) were added across all 10 million residents of Delhi, it would represent the value of saving 1,000 statistical lives. Dividing the total WTP by the number of statistical lives saved yields the average value of a statistical life (VSL)—the sum of WTPs for risk reductions that save one statistical life.

WTP for a reduction in risk of dying is usually estimated from studies on compensating wage differentials in the labor market, or expenditures to reduce risk of death. These studies are usually referred to as revealed preference studies because they are based on actual behaviour.

Transferred values can be compared with the direct estimates of a value of a statistical life in Delhi (Bhattacharya, Alberini and Cropper, 2007). In the study, 1,200 commuters were asked what they would pay to reduce their own risk of dying (a) as a pedestrian, (b) as a driver of a two-wheeler, and (c) as a commuter, regardless of travel mode. The responses to these questions were pooled to estimate the value of a statistical life in a traffic safety context. It was found that mean WTP to reduce one's risk of dying increases with income and education, and also with baseline exposure to risk, measured by commute time, by whether the respondent travels as part of his job and by whether he drives a two-wheeler. Mean (WTP) is three times larger for a respondent who drives a two-wheeler and travels on the job than for one who does not. It was also found that those responses were sensitive to the size of the risk change valued. For all respondents the elasticity of WTP with respect to the size of the risk change is approximately 0.55. For respondents with a high school degree this increases to 0.80, while for respondents with a bachelor's degree the elasticity is not significantly different from one.

The preferred estimate of VSL—approximately Rs 1.3 million or $150,000 Purchasing Power Parity (PPP)—is based on the mean WTP of a commuter with a high school degree who drives a two-wheeler and travels while on the job. This represents the benefits to a person with high exposure to traffic risks of a reduction in risk of death. This number exceeds the VSL currently used in evaluating the benefits of road safety projects by the World Bank (generally, foregone earnings) or in Indian studies (Mohan [2001] uses Rs 535,000). It is, however, smaller than the VSL that would be used if official values were transferred from high income countries to India assuming an income elasticity of one.

comparable to countries with much higher vehicular densities[24].

If one takes into account not just deaths, but injuries, related economic losses and losses due to damage to vehicles, these are large enough to seriously threaten development in many countries. Global losses due to road traffic accidents are estimated at around $518 billion, as per WHO estimates[25], and cost governments between 1 and 3 per cent of their gross national product. An estimate by the Planning Commission in 2002[26] puts the social cost of road accidents in India, at 3 per cent of GDP, more than the government spends on education or health. Affected families often have to bear huge burdens due to loss of life or serious injury to wage-earners, and medical and rehabilitation costs.

But the extent of the problem, the categories of people affected, and many of the reasons behind this modern epidemic, certainly marks India out as an especially bad case. But the problem is yet to receive the highest priority in government[27].While most view road fatalities as a simple 'fact of life,' a perception aided by the very word 'accident', they are nothing of the kind. They are caused by a combination of inadequate road design, unsafe vehicle design, lack of enforcement and lack of expertise dealing with road safety.

While the data presented here can be used to indicate broad-brush trends, it is also important to note that this may reflect only accidents that are registered with the police, which usually happens only with respect to fatalities. Also, much of the information

24. Peden et al. (2004).
25. Ibid.
26. Ministry of Road Transport and Highways (2007).
27. Mohan et al. (2009).

on causes are products of clearly subjective inferences at local levels since it is well known that no serious accident cause analysis is carried out by the police except in rare cases of notoriety attracting public attention. A large number of cases are not properly recorded and reported, hence the figures here may be an understatement[28].

Delhi had the highest number of road accident fatalities in 2010 (2,829) with a rate of 60.3 per million population. The lowest was in Dhanbad (45) and the highest other than Delhi was Bangalore (832). Delhi accounted for 25.1 per cent deaths of bicycle riders, 18.8 per cent deaths of pedestrians, 16.6 per cent deaths of two-wheeler riders and 9.2 per cent deaths of three-wheeler riders in 35 mega cities.

None of the cities in India have safe or adequate facilities for pedestrians and bicyclists. This can be corrected only if road building authorities are forced to design roads by enabling legislation. In addition, it appears that vehicle speeds may be higher than desired especially during non-peak hours along with unchecked driving under the influence of alcohol. This would require the provision of a better trained and adequate traffic police force in every city of India.

Existing institutions are not fully equipped to deal with the increasing traffic on the roads or to adopt the advancements made in the techniques and technology that would promote road safety. The National Road Safety Council (NRSC) does not have adequate statutory backing, budgetary resources or the mandate to be an effective Organisation for executing road safety plans in a mission mode. Therefore to implement the above the institutional arrangements and systems around the improvement of safety aspects of transportation systems need to be strengthened. Responsibility for transportation safety is diffused and there is no single agency to deal with a range of problems associated with safety and there is also no effective mechanism for coordinating the activities of the different agencies dealing with safety. The role of key ministries and public sector agencies in improving road safety is currently seen as peripheral. This will have to change and transportation safety will need to be viewed as a priority area in the county's agenda for development.

The Report of the Committee on Road Safety and Traffic Management, 2007, also known as the Sundar Committee report, by the Ministry of Road Transport and Highways (MoRTH), had compared road safety institutional arrangements in various countries. It further laid out a comprehensive road-map for improving road safety conditions in India, which could have a significant impact on urban transport safety and NTDPC is of the view that the Sundar Committee recommendations should be implemented urgently.

CENTRAL GOVERNMENT INTERVENTIONS

URBAN TRANSPORT THROUGH THE FIVE YEAR PLANS AND THE NATIONAL URBAN TRANSPORT POLICY

The first explicit statement of interest in urban transport came in the 6th Five Year Plan (1982-87), which also mooted the need for a National Urban Transport Policy (NUTP). Despite this early start, a National Urban Transport Policy could be finalised only in 2006, the terminal year of 10th Five Year Plan.

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UT was, until recently, covered within the ambit of intercity rail and road travel. It was only in 1986 that the Allocation of Business Rules of the Central Government were modified and the Ministry of Urban Development was made the nodal ministry for policy and planning at the national level for rail-based UT. But all the responsibilities for the technical planning for rail-based UT systems were retained with the Ministry of Railways[29].

The 8th Five Year Plan saw a shift of the 'Urban Transport' subject from 'Transport' chapter of the Plan document to the chapter on 'Urban Development', signifying some sort of ownership of the problem by the Ministry of Urban Development. It also that noted that the traffic had continued to multiply with the result that the UT infrastructure in all large cities is on the verge of a breakdown. In the absence of reliable public transport and convenient and safe walking and bicycling facilities, people are compelled to resort to private vehicles, which have aggravated congestion, pollution and energy intensity. It also pointed out that there is no single agency to plan, coordinate or execute transport policies and programmes in urban areas. It was in this context that the subject of planning and coordination of Urban Transport was entrusted to the Ministry of Urban Development in 1986 and in 1988-89 an Urban Transport Consortium Fund was set up.

The 9th Plan accepted that the UT problem was an institutional orphan and there was critical need to develop UT institutions. It also accepted that there was no escape from upfront investment in the rail-based mass transit in metropolitan cities but that private sector financing was not the answer for the same and metro rail could be financed only with the

28. Mohan (2011).
29. GOI (2011a).

No Indian city has safe or adequate facilities for pedestrians and bicyclists. This can be corrected only if road building authorities are forced to design roads by enabling legislation.

active support of Central and state governments, including direct equity participation and tax incentives. The Plan also mandated financing of metro rail through dedicated levies on both users and nonusers and for the first time mooted the idea of setting up of a 'National Urban Transport Fund'. It emphasised an active co-operation and joint collaborative action by Central, state and city governments as the only solution to combat the deteriorating UT scenario in cities and towns of India.

The National Urban Transport Policy first mooted in 6th Five Year Plan, was finally adopted in 2006, the final year of the 10th Plan. The Policy acknowledges the existence of Central Acts and Rules dealing with the urban transport issues and their being administered by the central government, and for the first time focused on the central principle of investment for moving people not vehicles. It also mentioned that the objective of the policy was to ensure safe, affordable, quick, comfortable, reliable and sustainable access for the growing number of city residents to jobs, education, recreation and such other needs within our cities. It recommended that UT become an important parameter at the urban planning stage itself; and encouraged integrated land use and transport planning in all cities so that travel distances are minimised and access to livelihoods, education, and other social needs, especially for the marginal segments of the urban population is improved.

It promoted the greater use of public transport and non-motorised modes by offering Central financial assistance for this purpose and sort the establishment of institutional mechanisms for enhanced coordination in the planning and management of transport systems. It also focused on the introduction of new Intelligent Transport Systems for traffic management and addressing concerns of road safety and trauma response and reducing pollution levels through changes in traveling practices, better enforcement, stricter norms, technological improvements, etc. The NUTP was quite successful in setting out the broader frame of a sustainable UT system. It also outlined an implementation framework, of which Unified Metropolitan Transport Authorities (UMTA) were the centrepiece.. The policy remains a key statement of the direction that the UT sector needs to traverse in India. Major funding for urban transport was made available under the 10th and 11th Plans through the JNNURM programme discussed in the next segment.

More recently, in 2009, the MoUD, which has been anchoring the National Sustainable Habitat Mission as part of the **National Action Plan on Climate Change,** has produced an mission document which has a strong chapter on UT.

The report lists some broad strategies for reducing GHG emissions in the transport sector include:

- Greater Use of Non-Motorised Mode
- Improving Access and Reducing Passenger and Freight-Kilometres
- Emphasis on Railways for Passenger and Freight Transport
- Implementing Tough Fuel Economy Standards
- Use of Alternate Fuels
- Use of Battery Operated Vehicles (BOV) and Hybrid Vehicles (HV)
- Use of Hydrogen
- Use of Compressed Natural Gas

JNNURM

In December, 2005, the Government of India launched the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) to invest over Rs 1,200 billion in urban infrastructure improvements and basic services to the urban poor. The transport sector has received 11 percent of the total JNNURM investment[30]. Till May 2013, 143 UT projects have been approved, with the majority (80 per cent) in cities with populations of at least 4 million.

Some of the highlights and positive developments under JNNURM :

- Requiring Comprehensive Mobility Plans (CMPs) is a significant reform, which aims at putting local bodies at the centre of urban transport planning, and has encouraged cities to think about mobility in a more holistic way. Although reviewers have found the plans of mixed quality[31], the process has ensured that India's larger cities are now aware of the general principle of 'moving people not cars' embedded in the NUTP.
- Guidelines have been issued and some support for preparation and implementation exist.
- JNNURM has been a significant source of public investment into public transport through its investments in buses and BRT projects

Table 5.11 shows the percentage of JNNURM investment in large cities that have gone into the urban transport sector. This does not include funding for urban buses also made available to certain cities

30. IIHS (2011).
31. TERI (2011).

Box 5.3
JNNURM and Urban Mobility

Funding for the procurement of buses came as a late addition to the JNNURM programme. The JNNURM programme reform conditions related to mobility were embedded in the guidelines that accompanied the procurement of buses for the concerned cities. Much of the issues on which action from state government and urban local bodies was sought was in line with the National Urban Transport Policy. Some of the key commitments sought by the Central government were priority for public transport, dedicated lanes for buses, special purpose financing and PPPs for setting up BRTs, dedicated transport fund to be set up through additional vehicle registration fees, setting up congestion and green tax regimes. Other than this it also called for the setting up of the Unified Metropolitan Transport Authority, setting up of fee-based parking systems and the use of urban specifications for buses.

While JNNURM provided an impetus to thinking and action on urban mobility and pursuing the National Urban Transport Policy, Indian cities are far from achieving any significant success in achieving the NUTP outcomes.

Source: Adapted from Sivaramakrishnan (2011).

under the scheme. Further, analysis of cities' budgets show that, as in Pune, although the CMP sets out goals of achieving 50 per cent mode share from non-motorised transport and 40 per cent from public transport, they allocated 61 per cent of their 2011-12 budget to motor vehicle-related projects[32]. Only 18 per cent of Pune's budget was allocated to public transport projects and 9 per cent to non-motorised transport.

In short, while JNNURM has been quite successful in creating a focus for investments in urban infrastructure in India and the programme is important as the nation's first concentrated effort to try and improve urban infrastructure, there is still much room for improvement in India's urban transport infrastructure. There are a number of lessons to be learnt from the implementation of the programme both in terms of the reforms being pursued as well as the projects funded through the programme.

MOUD'S SERVICE-LEVEL BENCHMARKS

A key initiative undertaken by the Ministry of Urban Development in recent years has been the setting up of service-level standards for various urban services. For UT service-level performance benchmarks have been identified for the following areas of intervention:

a. Public transport facilities
b. Pedestrian infrastructure facilities
c. Non Motorised Transport (NMT) facilities
d. Level of usage of Intelligent Transport System (ITS) facilities
e. Travel speed (Motorised and Mass Transit) along major corridors
f. Availability of parking spaces
g. Road safety
h. Pollution levels
i. Integrated land use transport system
j. Financial sustainability of public transport

The parameters highlight the performance as would be monitored by the Urban Local Bodies (ULB)/ Development Authorities/Parastatal Agencies. These performance measurements will need to be carried out by the service delivery agencies themselves, reported to higher levels of management and also disseminated widely to the public.

The Ministry of Urban Development, will take the lead for disseminating these service level performance benchmarks. Further SLBs will also be institutionalised through the JNNURM and other programmes of the Ministry.

State governments and their nodal agencies in the urban sector have a critical role in driving performance of ULBs. A state government will need to periodically examine the SLBs as an input for its decisions related to policy, resource allocations, providing incentives and penalties, channelising technical and manpower support SLBs will also be an important input to State Finance Commissions.

ULBs/parastatal agencies are the most important stakeholders for institutionalisation of SLBs. As service delivery institutions, ULBs will find it useful to institutionalise systems for performance management using SLBs. Benchmarking with other cities within the state or with similar cities would facilitate a healthy competitive environment for continuous improvement.

32. Parisar (2011).

Table 5.11

Transportation Projects under Urban Infrastructure and Governance Component of JNNURM, March 2013

URBAN TRANSPORT AS PART OF JNNURM SUB-MISSION ON URBAN INFRASTRUCTURE AND GOVERNANCE				
BROAD SECTOR	**SECTOR (JNNURM MIS)**	**NUMBER OF PROJECTS SANCTIONED**	**COST OF PROJECTS SANCTIONED (RS MILLION)**	**ACA COMMITTED (RS MILLION)**
Urban Transport	Roads/Flyovers	100	82,213	33,833
	Mass Rapid Transport System	21	52,110	23,731
	Other Urban Transport	17	7,804	3,655
	Parking	5	8,604	3,372
Sub Total		143	150,732	64,592
Drainage	Storm Water Drainage	73	84,272	34,605
Drinking Water	Water Supply	157	203,409	99,730
Sewerage	Sewerage	113	149,934	71,608
Urban Renewal	Urban Renewal	11	4,865	2,035
Solid Waste Management	Solid Waste Management	45	20,087	10,513
Heritage	Development of Heritage Areas	7	2,254	1,441
Preservation of Water Bodies	Preservation of Water Bodies	4	1,167	686
Total		553	616,723	285,213
Urban Transport as percentage of Total		**26**	**24**	**23**

Source: http://www.JNNURM.nic.in (accessed 14 May 2013).

LARGE URBAN PUBLIC TRANSPORT PROJECTS

In India there has been a tendency to plan large UT projects without adequate analysis of existing transport patterns in cities. What is needed is an understanding of demand patterns in order to take an integrated view which should include, mass rapid transit, BRTs, buses, IPT, NMT, etc. Much of the attention has gone to designing and implementing large standalone expensive projects without much focus of integration with the rest of the UT system or with wider land-use planning.

Kolkata was the first city to develop mega projects with the initiation of metro rail. The Metropolitan Transport Project (MTP) was set up by the Railways in 1973, which recommended a Mass Rapid Transit System. The MTP prepared a master plan envisaging construction of five rapid-transit lines for Kolkata, totaling a route length of 97.5 km. A second line is now under construction and four other lines are being planned.

The proposal for a mass rapid transit for New Delhi first emerged from a traffic and travel characteristics study carried out in 1969. Over the next several years, many official committees were commissioned to examine issues related to technology, route alignment and governmental jurisdiction. In 1984, the Delhi Development Authority and the Urban Arts Commission came up with a proposal for developing a multi-modal transport system, which would consist of constructing three underground mass rapid transit corridors as well as augmenting the city's existing suburban railway and road transport networks. The Government of India and the Government of Delhi jointly set up a company called the Delhi Metro Rail Corporation (DMRC) in 1995. The first line of the Delhi Metro was operationalised in 2005 and it became the second underground rapid transit system in India, after the Kolkata Metro. Recently a number of other rail-based mass transit systems have been initiated in a number of cities such as Bangalore, Chennai, Mumbai, Jaipur, Hyderabad and Kochi. The 12th Plan document outlines a very liberal technical approach to identifying cities and corridors for metro projects, without simultaneously addressing financial and affordability concerns of residents and cities.

Box 5.4

Metros and the Future of Urban Transport: Two Technical and Planning Issues

Other than costing and financing a number of related issues are presently misunderstood, by decision makers. First, the issue of speed and trip/travel time. Contrary to popular impression, high travel speeds of mass transit systems don't necessarily help reduce door-to-door travel time, which is the most relevant indicator for users and should inform the choice of MRT options. As documented (Mohan 2008), elevated and underground public transport systems do not provide time saving compared to car or motorcycle use unless there is congestion on the road or the trip is very long, due to the time lost on escalators and long walking distances inside underground or elevated metro and monorail stations. The metro only becomes efficient for trip distances greater than 12 km, while options including walk, bicycle and Bus rapid transit are efficient for trip lengths of 1-2 kms; 3-4 kms and 6-7 kms respectively .

Ridership capacity is another area where projections and reality have not matched. The original feasibility study for developing a metro system for Delhi justified its economic feasibility by projecting a daily ridership of 3.1 million passengers by 2005 (RITES 1995)[2]. This was later reduced to 2.18 million passengers on the first three corridors (65.8 km) when completed in December 2005 as stated by the DMRC CMD, and then in 2005 further reduced to 1.5 million a day. The system was actually operating at around 0.6 million passengers per day at the end of 2007, (and in 2012 on a festive day it recorded a historic peak of 2.2 million passengers on both the phases together close to 200 kms length) less than 20 percent of projected capacity. Similarly, the Kolkata metro is operating at about 10 percent projected capacity[3] [Singh 2002]. Peak Ridership capacity in a single direction is also often considered during decision making but never realised in everyday use. While metros are most required at 40,000-50,000 passengers per direction, in reality most often peaks achieved in the system are 1/3rd to 1/4th of this. Also aspects such as costing for reduction in pollution and accidents etc, are often over stated and in reality such benefits are not realised (Mohan 2008).

Source: Mohan (2008); RITES (1995); Singh (2002).

While there is a degree of enthusiasm around cities developing and implementing large and costly mass transit projects, we need to note that there are a large number of inherent risks in taking to large fixed infrastructure projects. With the Metro projects themselves, there are a number of concerns that need to be taken into account before decision making and which are not given adequate attention in the current policy context. Questions related to the high construction costs and the availability of modern, alternative, and more cost effective options are not adequately considered. The decision making process on costs is also inadequately informed as often, funds for capital costs are provided by external sources and the full operations and maintenance costs are not factored in and if at all they are, the O&M costs are often paid for by sources other than direct revenue from the project, making them uncertain and often unsustainable in the long run. As discussed in this chapter and earlier in this report, local governments should be the primary decision-making tier of the government regarding large urban public transport projects in their city and should use a life cycle costing methodologies to inform their decision-making process. Furthermore, the project cost should include the cost of feeder systems, public bike sharing and pedestrianisation in the influence zone of metro stations and project plans should include strategies for this complementary infrastructure.

Over the last decade, improvements in computing and communication technologies, and successful demonstration of improved and higher-capacity bus transport projects in a bunch of Latin American cities have led to the implementation of a number of BRT projects globally as well as in India.

With the advent of the JNNURM, a number of new initiatives like BRT systems and procurement of

Box 5.5

Regulating Intermediate Public Transport

There are three main types of arrangement for regulating intermediate public transport (IPT), which consists of privately operated small buses and vans.

The first arrangement is for IPT to be viewed as normal public transport and to be subject to the same regulations as traditional bus services. This is the regime under which IPT became part of the main supply of service in Uzbekistan and the Kyrgyz Republic. In these cases, the fragmented operators were encouraged to form associations to bid for route franchises. While the process was not entirely smooth, it resulted in lower fares on small vehicles, while discipline increased. This approach has also gained currency in Brazil.

The second arrangement is for the regulation of IPT to be undertaken by a separate public authority. In Sri Lanka, a public body was created with powers to issue permits to private companies, and to set fares. The issuance of permits became a form of political patronage and there was a large over-issue of permits. As a result, a proportion of buses were kept off the road each day, leading to underutilisation of vehicles and higher costs per passenger. The legislation was later reversed and regulatory powers were passed back to the original transport commissions.

In Bogota, while the new Transmilenio BRT system was regulated privately, the Transport Ministry was in charge of issuing permits for other modes; licensees were able to sub-contract operations to other operators (taking a fee from each) who could compete with the Transmilenio services. This resulted in over-provision of small vehicles of poor quality, and high levels of road congestion. To improve coordination, the role of issuing permits was transferred to the Transmilenio company. The heart of the problem in both Bogota and Sri Lanka is that the existence of a separate regulatory regime for one part of the sector resulted in the administrators acting as the protector of the sector's private interests rather than as a regulator in the public interest.

The third arrangement is for the IPT sector to be allowed, or encouraged, to regulate itself. In Accra, Ghana, the operation of small vehicles (called 'tro-tros') is left to associations, by far the largest and strongest of which is the Ghana Public Road Transport Union (GPRTU), which is itself a federation of a number of smaller associations which operate specific terminals. To provide service, a supplier must be accepted to operate a route from one of these terminal associations. While operation is disciplined, the route structure is very fragmented and inefficient.

Source: Gwilliam (2011d).

buses have been taken by various state governments. BRT systems already exist in Pune, Delhi, Ahmedabad and Rajkot, with new ones coming up in Kolkata, Vishakapatnam, Vijayawada, Surat, Naya Raipur and Hubli-Dharwad. Modern low-floor buses can be found in many cities like Delhi, Mumbai, Bangalore, Nagpur, Chennai, etc. JNNURM has also funded 15,260 buses in 61 cities.

However, BRTs are not the only way that buses need to be deployed in Indian cities. Buses provide a large number of advantages if a bus system is deployed as the citywide system of choice for public transport. A combination of different energy efficient and clean buses is the most modern, convenient and viable public transport system which provides the backbone to public transport in most cities across the globe. In India too, dense bus-based public transport along with efficient paratransit systems needs to be provided if the public transport system is to become convenient and affordable for commuters to shift from private transport to public.

SUSTAINABLE URBAN TRANSPORT POLICY

Indian cities today suffer from inadequate urban services and environmental degradation. All categories of road users face problems in commuting. Pedestrians do not get a safe, conflict, and obstruction-free path to walk; and both cyclists and pedestrians have to fight for the right of way with fast moving motorised modes of transport, many a times risking their lives. The user of public transport faces long waiting periods, uncertainty in travel time and difficult conditions of travel. Personal motorised modes of transport are slowed down by the slow moving traffic and face significant delays. Road users get restless leading to road rage, rash driving, and accidents.

By 2030, all this should change in cities and urban agglomerations, as well as satellite towns. Public transport should be citywide, safe, seamless, user-friendly, reliable and should provide good ambience

with well-behaved drivers and conductors. Citizens should get access to jobs, education, social services and recreation at affordable costs and within reasonable time. Transport should be more efficient and less polluting.

Clearly, to attain this kind of Vision 2030 for urban transport, policies, planning and investments needs to be directed towards sustainable urban transport with emphasis on making public transport, walking and cycling attractive, cost-effective, efficient options. This shift in emphasis also needs to be supplemented with the rapid uptake of cleaner technologies, a stringent fiscal regime including rigorous analysis of project costs and social benefits as well as strategic use of targeted subsidies, along with the use of intelligent transport systems.

The policy context, in terms of issues, concerns and objectives, has been steadily evolving and effects policies for transport in general and urban transport in specific. The institutional context to support these policies, however, needs to be developed even as overall urban governance and planning processes are evolving. This report's chapter on Institutions for Transport System Governance (Chapter 5, Volume II) lays out a broad framework for UT governance in India's federal context. The next section in this chapter discusses more granular details.

Both policy and the institutional framework will have to take shape in challenging circumstances with new pressures of resource scarcity and a more limited environmental 'budget' for climate-changing and air-polluting emissions. More developed countries, have developed their UT systems under very different circumstances and policy mandates. A decade ago issues such as climate change, safety, security, and fuel efficiency were low on the policy agenda in India. Now, institutions in India, like elsewhere around the world, are responding to these emerging issues and preparing for investing significant resources in an attempt to achieve improvements in these areas. This Committee is of the opinion that these policy concerns should be the key issues around which UT policy and systems are shaped over the next 20 years.

Barcelona, Bogotá, Curitiba, Dublin, Hong Kong, London, Munich, Seoul, Singapore, Stuttgart, Vancouver and Zurich are often quoted as examples of cities that have developed sustainably in important aspects of urban transport. These cities have not reached these goals by accident, but by purposeful action that has been maintained over time. No single best practice project alone can turn a city around; sustained effort toward well-defined goals is required. Indian policy makers must ensure that city governments seek not only technological fixes but also not ignore the fact that real results come from integrated and systematic policy action as a whole.

UT also functions as a nexus between issues of urbanisation, land use, energy use and climate change. Before energy efficiency and climate change became central policy concerns, sustainable cities defined sustainable UT policies as access-based transport planning oriented around planning for proximity of uses. To control traffic congestion, two tools have been used: provision of public transport (the 'carrot') and demand management (the 'stick'). In 2005, Wright and Fulton[33] showed that when economic and planning measures are added to control vehicles and fuels, goals for energy efficiency and climate change mitigation are also met, thereby proving that the new policy paradigms are consistent with the approaches that have been adopted by sustainable cities.

No single best practice project alone can turn a city around. Indian policy makers must ensure that city governments seek not only technological fixes but also not ignore the fact that real results come from integrated and systematic policy action as a whole.

While a number of reports covering urban transport such as the MGI (2010), HPEC 2011, and the Recommendations of Working Group on Urban Transport for 12th Five Year Plan have been published recently, the NTDPC is of the view that UT policy, planning and investment needs to be more responsive to safety, energy, environment and health concerns. It is only by following an integrated view including these policy concerns that urban transport can over the medium term i.e., by 2030, be expected to change towards sustainable transport, that would put peoples mobility issues ahead of access requirements for cars and personal transport modes.

OUTLINE FOR A NATIONAL APPROACH

NTDPC, like the National Urban Transport Policy, recommends three well-recognised and internationally-accepted strands of urban transport policy known as 'avoid, shift, and improve'. To pursue this approach, policy makers will need to focus on (a) the information and metrics basis for planning, design and operating aspects of UT infrastructure, (b) developing and implementing a strong transport demand management regime, and (c) improving implementation of projects and coordination between investments in the urban transport system. The key aspects of the proposed policy approach for sustainable urban transport are discussed in detail in this section. The next section goes on to discuss physical design issues related to developing improved facili-

33. Wright and Fulton (2005).

In recent times, indiscriminate land use planning and the increasing development of peri-urban areas by businesses and households have forced residents to make greater use of motorised transport.

ties for sustainable urban transport and the economic instruments for transport demand management that should be incorporated to incentivise behaviour change in commuters.

Avoid: Sustainable transportation is about moving less. Reduction in the need for travel by promoting city structures and urban densities as well as imaginative use of Information and Communication Technologies, for example, may lead to a reduction in the passenger km and freight-km required to sustain the urban economy.

Shift: Change modal choice to promote lower fuel consumption per passenger-km and/or freight-km and manage traffic and reduce fuel consumption as well as air pollutants.

Improve: Increase the energy efficiency of vehicles and use of efficient and cleaner fuels to decrease impacts of distances travelled and reduce the greenhouse gas footprint per litre of fuel consumed.

There is also an established hierarchy within these three complementary objectives, best explained by a transport emission specialist, who noted in 2011, that 'a gallon of fuel conserved, or a tonne of air emissions avoided due to reduced vehicle travel (the result of mobility management—defined to include improved transport options, efficient incentives, and land-use management) is worth an order of magnitude more than the same energy savings and emissions reductions provided by increased vehicle fuel efficiency or shifts to alternative fuels. This occurs because mileage reductions also reduce traffic congestion, road and parking facility costs, consumer costs, accidents, pollution, and sprawl, and often improve mobility options for non-drivers[34]. Initiatives across all the three elements need to be undertaken based on peculiarities of individual ground realities in different cities. It also therefore implies that single actions without integrated and systematic policy actions often do not result in reaching the desired outcome.

Other than Avoid, Shift, Improve, the other theme that India needs to focus on simultaneously in the short and medium term to develop sustainable urban transport services is the decision making about and financing of mega projects in UT.

AVOID: REDUCING THE NEED FOR TRAVEL

Accessibility requires mixed land uses in dense cities where arteries are not blocked by congestion. Historically, many Asian—including Indian—cities have measured up well to this ideal, with a range of services and amenities located in each neighbourhood and non-motorised transport and para-transit providing good access. In recent times, however, indiscriminate land use planning and the increasing development of peri-urban areas by businesses and households seeking lower-cost land have forced residents to make greater use of motorised transport. The remedy is judicious land-use planning that reduces residents' need to travel and cuts back on urban sprawl, pollution and congestion. Mixed-income neighbourhoods are also very important as lower skilled service industry workers such as electricians, plumbers, house-helps, etc., need to find employment in the vicinity of their own homes, while higher skilled and better paid workers can afford to travel larger distances for work. Mixed land-use policies include integrating residential and commercial neighbourhoods and moving away from concepts of strict zoning by activity. It is recognised, of course, that the efficacy of this approach does have limits as cities grow and people do live at increasing distances from their places of work, schooling and leisure.

SHIFT: CHANGING MODAL CHOICE

Where travel cannot be avoided, policies need to promote the use of public transport over private modes.

Both the 'stick' of traffic restraint and the 'carrot' of attractive public transport are necessary to reduce transportation-related problems. While it is rarely politically feasible to control car ownership, controlling car use meets with less resistance. Indian cities should consider implementation of economic measures to restrain traffic such as parking policies, congestion charging across cordons or within areas, car-sharing schemes and other measures. Where these policies are not possible, cities may consider fuel surcharges along with vehicle license duties that reflect the vehicle's impact on air pollution and other externalities. The net revenues from these measures should be invested in improving the public transport system to secure acceptance for necessary but unpopular policies.

In addition to these measures to prod cities along a sustainable path, competition can be introduced into the supply of funding for public transport services. This is necessary to develop efficient, market facing services. Also an early integration of bus priority ways, busways, BRT, into cities' expansion and development plans would help integrate transport and urban development while maintaining the flexibility to reroute public transport arteries as the city develops. Rail-based metro systems can be considered for some cities with more established patterns of residential and commercial development, after careful examination and attention to the opportunity costs

34. Litman (2011).

of investing in relatively expensive fixed infrastructure.

IMPROVE: INCREASING THE ENERGY EFFICIENCY OF VEHICLES AND FUELS

The agendas for energy efficiency and climate change require controls on vehicles, and fuels used. Transport policy packages that include these controls greatly mitigate the adverse consequences of motorisation by decreasing distances travelled and reducing carbon dioxide emissions per litre of fuel consumed. They also produce co-benefits by reducing local air pollution (nitrogen oxide, sulphur oxide, and particulate matter) (See Chapter 7, Volume II on Energy and Environment).

Achieving these objectives requires inventive technology, measures to encourage the rapid take-up of that technology, and regulation as well as effective enforcement that controls in-use emissions by ensuring that vehicles are properly maintained.

This also requires careful consideration of the close links between vehicle technologies and fuel technologies. New fuels permit new technologies and new technologies perform better as a result of lower vehicle weights, less aerodynamic drag, lower tyre rolling resistance, and lower-friction lubricants. India's emissions standards currently vary among cities and between rural and urban areas, in part due to differential availability of low-sulphur diesel compatible with the latest emissions control technologies. Cars and trucks that pass between emissions zones often end up damaging their emissions filters by refueling with lower-quality fuel. Also, as King[35] emphasised, carbon dioxide emissions must be considered throughout the life cycle of fuels. There is an ever-present danger of unintended consequences when these matters are ignored. When the contrary occurs, however, the possibility arises that 'technology and the right policies will solve environmental problems…by 2050 so that environmental factors need not be restraints on road traffic growth. Some local areas of poor air quality need to be addressed by other means'[36].

Whether India will progress on the paths advocated in these initiatives depends on its openness to latest technology and the replacement rate of the vehicle fleet in response to standards and enforcement. The Bureau of Energy Efficiency has developed the Passenger Car Fuel Economy Labeling & Standards Framework, which needs to be implemented across the country and similar initiatives should also be undertaken for other categories of motorised vehicles, such as two wheelers and heavy vehicles. Policy decisions should also be taken in line with the Corporate Average Fuel Economy (CAFÉ) standards[37], regarding the phased predictable implementation of progressive standards, over the next decade. India currently is five years behind western developed countries in these matters and the government should ensure quicker implementation of improved standards with regard to both vehicle as well as fuel standards[38] (Chapter 7, Volume II on Energy and Environment).

BOON OR BANE? LARGE URBAN TRANSPORT PROJECTS FUNDED WITHOUT CITY CONTROL

Large projects can be agents of change in a city but are also risky by nature. Not all large projects are beneficial; major radial expressways, for example, can increase car usage and undermine sustainable urban transport policy. This simple question (whether a mega transport project [MTP] is required) demands many varied and interrelated responses. In the context of MTP planning, appraisal and delivery, these include taking a view on understanding how well risk, uncertainty and complexity have been treated; and, acknowledging the importance of context in decision-making and, most importantly, in making judgments about 'success'[39].

> Both the 'stick' of traffic restraint and the 'carrot' of attractive public transport are necessary to reduce transportation-related problems. While it is rarely politically feasible to control car ownership, controlling car use meets with less resistance.

Flyvbjerg et al.[40] study a large number of mega projects internationally, highlighting the fact that major risks have shown up consistently in mega projects over time and across nations. They demonstrate that mega transport projects globally have nearly always had cost overruns: these range from 26 percent in the case of Oresund's coast-to-coast link in Scandinavia, to 196 percent in Boston's artery/tunnel project in the US. They conclude that in such projects it is impossible to trust cost projections. With respect to demand projections too, they found that a minimum deviation of +/- 20 per cent and up to 70 per cent should be considered during decision making. The extent and magnitude of actual environmental impact are not well understood and so post project auditing should be a must in all these projects. The wider substantial, regional or national or international benefits commonly claimed in such projects are difficult to ascertain as the links are quite weak. Actual project viability typically does not correspond with forecast viability, where the latter was often found to be brazenly over optimistic. They conclude that due to

35. King (2007).
36. RAC Foundation (2005).
37. http://www.nhtsa.gov/fuel-economy (accessed 23 October 2013).
38. Europe is already into a regime of Euro V and VI standards.
39. OMEGA Centre (2012).
40. Flyvbjerg et al. (2003).

One must approach large projects with caution and ensure that the institutional framework is flexible enough to adjust quickly to inevitable surprises. Large projects, while providing a huge opportunity to cities also have enormous associated opportunity costs.

DMRC PROJECTIONS AND ACHIEVEMENTS

		Ridership per day (m)	
Phase	**Length**	**Projected**	**Realised**
I	60 km	2.8	0.6
II	180 km	4.5	1.8

these aspects not only does the economic efficiency suffer, but also democratic accountability. Those who bear the brunt of the risks involved in mega-projects must have a commensurate voice in decision-making about the projects.

The lesson is that one must approach large projects with caution and ensure that the institutional framework is flexible enough to adjust quickly to inevitable surprises. Large projects in India too, while providing a huge opportunity to cities also have enormous opportunity costs associated with them. As an example in India, whereas the Delhi Metro rail project (Phase 1 of 65 kms) cost Rs 191 billion, the Golden Quadrilateral highway project connecting the four major mega cities in India by four-lane highways cost approximately Rs 300 billion for 5846 kms[41]. The Delhi Metro, including its three phases will provide for less than 15 per cent of commuter trips in the city. (The average metro trip being longer than other trips will, however, account for a greater proportion of urban travel in terms of passenger kms). Similarly, the Kochi metro represents the largest Government of India investment in the state of Kerala. These examples demonstrate that large urban transport projects have significant opportunity costs especially where a variety of basic infrastructure across sectors needs to be improved, and hence decisions to undertake such projects require careful ex ante cost benefit analysis.

There is an increasingly strong momentum in urban India, to take such decisions on megaprojects in a participatory manner involving affected stakeholders. However to implement, support and inform a structured consultation exercise, there is a strong requirement, especially if megaprojects are being conceived, that technical expertise and institutional capacity is set up in all five million plus cities. As discussed later in this chapter and also in Chapter 5, Volume II on Institutions for Transport System Governance, the nodal agency for transport in such cities should be an independently funded agency with statutory backing and a permanent technical staff. We refer to this proposed body as the Metropolitan Urban Transport Agency (MUTA). The NTDPC has recommended the setting up of an 'Office of Transport Strategy (OTS)' at both the Central and state government levels (see Chapter 5 on Governance). The MUTA would function as a metropolitan-level counterpart for the OTS for all cities with over 5 million population. The OTS should be responsible for analysing alternative project possibilities and technologies and then undertaking a broad based consultation exercise to inform decision makers on the options. The state-level OTS could support similar exercises in other smaller cities across the state. These institutional arrangements should also be backed by improved instruments for appraisal and decision making.

FULL LIFE CYCLE ACCOUNTING OF URBAN TRANSPORT SYSTEMS

Advanced decision-making tools are used by successful cities to solve complex problems and assist in taking difficult decisions. Full life cycle accounting (LCA) for costing of infrastructure and services is increasingly used internationally for decision-making, but is still a relatively new concept. Unlike typical government projects which account for the capital costs alone, life cycle accounting includes costs associated with the operation and maintenance and repair during the life span of the facility created. It also includes costs to the environment: pollution created and energy used during the construction phase as well as the operation phase. This comprehensive way of accounting for the costs of an urban transit systems provides a more accurate basis on which choices between different technologies can be made.

LCA can significantly change the comparison between transport options. TERI's[42] LCA of transport modes, commissioned by the NTDPC and discussed in more depth elsewhere in the report, found that modes which involve greater capital costs in infrastructure have a larger environmental impact. Although the results of this study are discussed in detail elsewhere in this report, the issue related to urban transport is presented in Tables 5.12 and 5.13.

The report also points out that metro rail has a significant cost of infrastructure construction and maintenance due to energy consumed and CO_2 emitted. It also shows that while electric systems are cleaner for the urban areas where they are installed, the process of electricity generation remains polluting and environmentally damaging. Thus, the external costs to the environment are often just passed from one location to the next.

41. http://www.delhimetrorail.com/projectsupdate/project_cost.aspx (accessed 15 January 2014).
42. TERI (2012).

Table 5.12

Comparison of Options for Mass Public Transport Based on Results of LCA Study by TERI for NTDPC: Fixed Infrastructure

LIFE CYCLE ANALYSIS OF EMBODIED ENERGY AND CO_2 IN MASS PUBLIC TRANSPORT MODES: FIXED INFRASTRUCTURE					
BRTS	**Phase**	**Embodied Energy**	**Unit**	**Embodied CO_2**	**Unit**
Fixed Infrastructure Construction	1 Km Bus lane only	12.3	TJ/km	371.7	T/km
	1 bus stop	3.6	TJ/stop	346.8	T/stop
Fixed Infrastructure Maintenance (30 yrs)	1 km Bus lane only	16	TJ/km	446	T/km
Metro Rail	**Phase**	**Embodied Energy**	**Unit**	**Embodied CO_2**	**Unit**
Fixed Infrastructure Construction	1 km metro line and one station	245.1	TJ/km	23,246.1	T/km
Fixed Infrastructure Maintenance (30 yrs)	1 km metro line and one station	8.8	TJ/km	792	T/km

Source: Life cycle analysis of transport modes,TERI (2012).

The study shows that infrastructure-heavy urban transport modes which are 'fixed' in nature, and have large life spans, limit the flexibility of the city to innovate with new more environmentally favourable technologies, as they arrive. Long lock-in periods with chosen modes precludes the implementation of other options as they are developed.

The NTDPC recommends that advanced, international, contemporary instruments such as the LCA framework should be included in the methodology to evaluate and appraise programmes and projects, especially mega projects, before decisions on funding are made. This is particularly important for projects that may be funded by multiple levels of government but concentrate risk on state or metropolitan governments.

ECONOMIC MEASURES FOR TRANSPORT DEMAND MANAGEMENT

It is not enough to improve traffic flows by building more roads and flyovers, and augmenting urban transport facilities alone. There is also substantial room to use existing infrastructure more efficiently through more effective demand management and traffic regulation. Road space requirements in urban and town planning norms currently in use in the country are most often more favorable for motorised vehicles than for other road users and citizens in general. Road right of ways are designed for peak traffic times which could last for very short time spans in the day, but become detrimental to the livability and walkability of the space. Sustainable transport cities have reversed this and provide the least priority to personal transport vis-à-vis other road users, especially for in-city transit.

There is a need to control the growth in transport demand. Otherwise supply of public transport may never be able to catch up with demand and personal vehicles will increase congestion and negative externalities of urban transport. An economic policy regime to strongly support transport demand management (TDM) needs to be put in place in India.

The time has come in India, especially in cities with the higher motorised vehicle populations to consider the implementation of restricted registration programmes and linking ownership to proof of ownership/availability of parking place, and limiting accesses to zones/areas through measures like congestion charges, high parking fees, restriction on availability of parking in areas served by public transport. Programmes restricting private vehicle registration have been quite successful and have demonstrated their use in countries such as Japan, Mexico, Singapore and Hong Kong, and more recently in Beijing too.

These TDM measures offer individual commuters a tangible economic benefit or dis-benefit related to the use of one or more travel modes. Some economic instruments that should be used to control the use of

Table 5.13
Comparison of Options for Mass Public Transport Based on Results of LCA Study by TERI for NTDPC: Rolling Stock

BRTS	Phase	Embodied Energy	Unit	Embodied CO_2	Unit
BRT Rolling Stock - Diesel Buses	Manufacture	1.7	TJ/bus	140	T/bus
	Maintenance (full life)	0.3	TJ/bus	22	T/bus
BRT Rolling Stock - Diesel AC Buses	Operations 2014	458.1	KJ/PKM	36.9	g/PKM
Metro Rail	**Phase**	**Embodied Energy**	**Unit**	**Embodied CO_2**	**Unit**
Rolling Stock	Manufacture	2.2	TJ/coach	130	T/coach
	Maintenance (full life)	1.8	TJ/coach	81	T/coach
	Operations	86.4	KJ/PKM	19.7	g/PKM

Source: Life cycle analysis of transport modes,TERI (2012).

personal vehicles in large Indian cities are presented in Table 5.14.

COMPREHENSIVE MOBILITY PLANNING

The conventional UT planning approach has focused mainly on flow of motor vehicle traffic. Since the National Urban Transport Policy, 2006, some attention is now also being placed on 'moving people not cars'. Increasingly, the focus is shifting to accessibility (the ability to reach desired goods, services and activities) and mobility of people, as against mobility for motor vehicle. Thus, planning should aim at improving accessibility, mobility and traffic flow in that order.

The transport modes to be used and the modal mix will depend on the city population, city form and size, availability of road surface and the trip length. The objective should be to restore balance in the use of road space for walk and non-motorised transport and promotion of the use of public transport, above private motorised vehicle use. Priority in planning for modes should be as follows in descending order:

- Walk and bicycle
- Public transport including para transit
- Personal vehicle transport

Table 5.15 shows desirable modal shares for different city sizes based on trip length distributions in Indian cities.

IMPLEMENTING MIXED LAND USE AND HIGH DENSITY DEVELOPMENTS AND AVOIDING URBAN SPRAWL

Urban Planning for mixed land use, high density and mixed income neighbourhoods, are being recognised all over the world, as the best way to ensure safe and sustainable urban development while minimising the risks and negative effects of transport. Land management is a key element of the Avoid strategy of the 'Avoid, Shift and Improve' approach.

Indian cities have developed over time in a mixed land use format. Only with the segregated design of cantonments under British rule and thereafter new city master plans was this principle first put aside. Thereafter, with the adoption of British town planning parameters, such mixed land use high density development has been discouraged. However, in practice most cities have still developed with considerable mixed land use, high density and mixed income localities, due to the widespread need of poorer people needing to stay closer to work places, which these plans have not provided for. As also discussed in an earlier section, most Indian medium-sized and large cities have higher densities than many cities around the world which have successful public transport systems.

Over the last decade, along with income growth and greater use of private motorised transport, new suburban developments around larger cities are being witnessed. These low density gated communities,

Table 5.14
Economic Measures for Transport Demand Management

TYPE OF INCENTIVE OR DISINCENTIVE	POSSIBLE ECONOMIC INSTRUMENTS	SELECTED ECONOMIC MEASURES
Curb motorised vehicle ownership	Tax/charge on vehicle purchase/ownership/ scrappage	Annual Vehicle Tax Registration Tax/Charge (re)Sales Tax/ Charge Scrappage Tax/Charge
	Restricting the number of vehicles and/or new registrations	Auction schemes/competitive bidding for new licenses Licensing car ownership
Discourage motorised vehicle use and encourage switch to public or non-motorised transport	Tax/charge on vehicle use	Fuel tax Pay-at-the-pump (sur)charges
	Tax/charge on road and/or infrastructure use; Restricting access to urban centres or special areas	Parking fees City tolls Road pricing Bridge tolls Cordon/area pricing Congestion pricing
	Subsidies for public transport and/or multi-modal transport (modal subsidies)	Subsidised public transport fees Subsidies for public transport networks and operation Tax-deductable public transport expenses P&R schemes
Encourage lower emission technology use and innovation	Taxes/Charges on vehicle purchase/ownership/scrappage; Taxes/Charges on vehicle use; Taxes/Charges on road and/or infrastructure use	Tax differentiations based on emissions Carbon/energy taxes Emission fees Emission-based surcharges Subsidies, tax rebates for lower emission vehicles/technologies

Source: NTDPC Research.

do not provide for mixed land use or mixed income neighbourhoods. These suburban outgrowths lead to significant increase in trip lengths while making public and mass transport solutions less viable and effectively promote increased car dependency, which is posing a critical challenge to sustainable transport in the immediate term. *The NTDPC is of the view that future urban development plans over the next 20 years, should be based on principles that create mixed land use, high density and mixed income neighbourhoods, based on norms for persons per hectare and not FSI alone.* This should be addressed through the appropriate changes in the urban planning norms and should be incorporated into planning standards such as the Urban Development Plan Formulation and Implementation Guidelines (UDPFI) which are followed by planning and development agencies in most states.

Also to be kept in mind is the fact that even in our richest cities, over the next 20 years, affordability levels of users of urban transport systems will remain low, inspite of the high economic growth levels expected. This implies that a large number of users will have limited resources to spend on long distance intra-city travel. Mixed land use, high density and mixed income neighbourhoods also provide for the proximity of different economic strata of society which have to rely on one another to be productive, which augurs well for the city, especially given that the skills and human resource intensive service sector contributes the largest share of the city's economy. High-density mixed land use neighbourhood design also has added safety benefits and new research shows that due to mixed use the neighbourhoods are busy throughout the day which help keep away crime and violence (Box 5.6).

INTEGRATED LAND USE AND TRANSPORT PLANNING

Urban transport is a derived demand closely linked to urban growth policies. Therefore integrated land-use and transport planning to minimise transport

Table 5.15
Desirable Modal Shares for Different City Sizes

CITY SIZE IN MILLIONS	0.05-0.1	0.1-0.5	0.5-1	1-2	2-5	>5
Walk	30	30	30	30	25	25
Cycle	25	20	15	12	10	10
Rickshaw	12	10	8	6	1	1
TSR	8	3	5	3	3	1
PT	12	15	15	20	33	38
Cars	1	1	2	4	8	10
MTW	12	21	25	25	20	15

Source : Urban Transport Working Group, NTDPC 2012.
Note: MTW: Motorised two-wheeler; PT: Para-transit; TSR: Three-wheeler scooter rickshaws.

demand is essential. Some types of land use patterns increase the use of car, while others reduce the amount of vehicle travel needed to access goods, services and activities. Some transport policies such as increase in road capacity and speed, generous parking supply, low road user charges and fuel taxes, poor walking and cycling conditions, inferior public transit service, high public transit fares, tend to encourage use of private motorized transport and also support the development of city sprawl.

In the coming years, much of India's population growth will take place in urban areas. At the same time, increasing wealth, declining household size, central area redevelopment, and other factors are causing a rapid drop in urban density even in India/Asia (Figure 5.7). These trends make most developing cities likely to at least double in physical area over the next two decades.

With the exception of cities in the People's Republic of China, few Asian cities are addressing this issue in a concerted or proactive way. Nonetheless, attention to this aspect is also increasing in India. The process of integrating land use and urban transport, should be driven by the principle that lower income workers should be closer to their employment areas while higher income workers, can afford to travel larger distances for work.

In addition to being geographically feasible, land-use plans must also be financially and politically feasible—i.e., they must be possible to implement. This requires stakeholders to accept that development is not allowed in certain areas. It also requires authorities to enforce planning regulations and construction standards. In most developing cities, achieving these conditions will require a considerable change in attitudes, greater technical capacity in planning departments, and institutional modifications that place these departments at the heart of the urban management process. While this may seem challenging, cities that have embraced sustainable transport principles have been through these challenging issues and the impacts are now seen on the ground as in Copenhagen (Figure 5.8).

A few Indian cities are also exploring the concept of Transport oriented Development (TOD), which suggests that there should be commerce and settlements around public transport nodes. This idea was vital for Northern American cities with high incomes and low densities such as Portland, Oregon, which have densities of 15-25 persons/hectare. In our context however, since we have a prevalence of mixed use high density development in most of our cities, it is important to promote high density in newer developments too with smaller block sizes across the whole city and not only at transport nodes. However, the densities in Indian cities need to be further increased along the mass transit corridors through a process of redevelopment with smaller block sizes to promote walking, cycling and easy access to public transport.

Box 5.6

Advantages of High Density Mixed Land Use Planning Though Urban Environmental Design

A number of recent researchers using comparative statistics and victimisation surveys show that environmental design can be used as an urban planning tool to reduce crime and violence in our cities and transport systems. Safety from crime and violence can be ensured through neighbourhood design elements in place of vast emptiness and suburban development, as in older inner city neighbourhoods. Bill Hillier (2010) had analysed how low burglary in dwelling spaces has a direct linkage with the inter-mix of multiple uses in streets. Researchers have developed a bunch of Urban Planning Strategies aimed at increasing the safety taking into account existing social and physical structures; guaranteeing accessibility and avoiding enclaves; creating vitality (blending functions and activities, attractive layout); providing mixed status (blending socio-economic groups, avoiding segregation); creating adequate urban density to allow vitality and natural surveillance; avoiding physical barriers (due to infrastructures etc.) and waste land.

Urban Design Strategies for safety should include layout considerations such as continuity of urban fabric and pedestrian/bicycle routes; specific location of activities; time schedules coordination to guarantee continuous natural surveillance; visibility (overview, sight lines between e.g., dwellings and public space, lighting, etc.); accessibility (orientation, alternatives routes, limiting access for un-authorised people); territoriality-human scale, clear public/private zones, compartmentalisation; attractiveness (colour, material, lighting, noise, smell, street furniture); and robustness (materials e.g., street furniture, fences).

Source: Gronlund (2013).

WALKING AND NON-MOTORISED TRANSPORT

Provision of pedestrian and bicycling facilities which are safe from road accidents and crime by design is the third most important learning from successful cities for the Indian context. Infrastructure for walking and bicycling needs to be improved urgently across urban India to (a) provide for safe and convenient transit for the large number of commuters who currently use this mode and (b) to attract more commuters to use these modes.

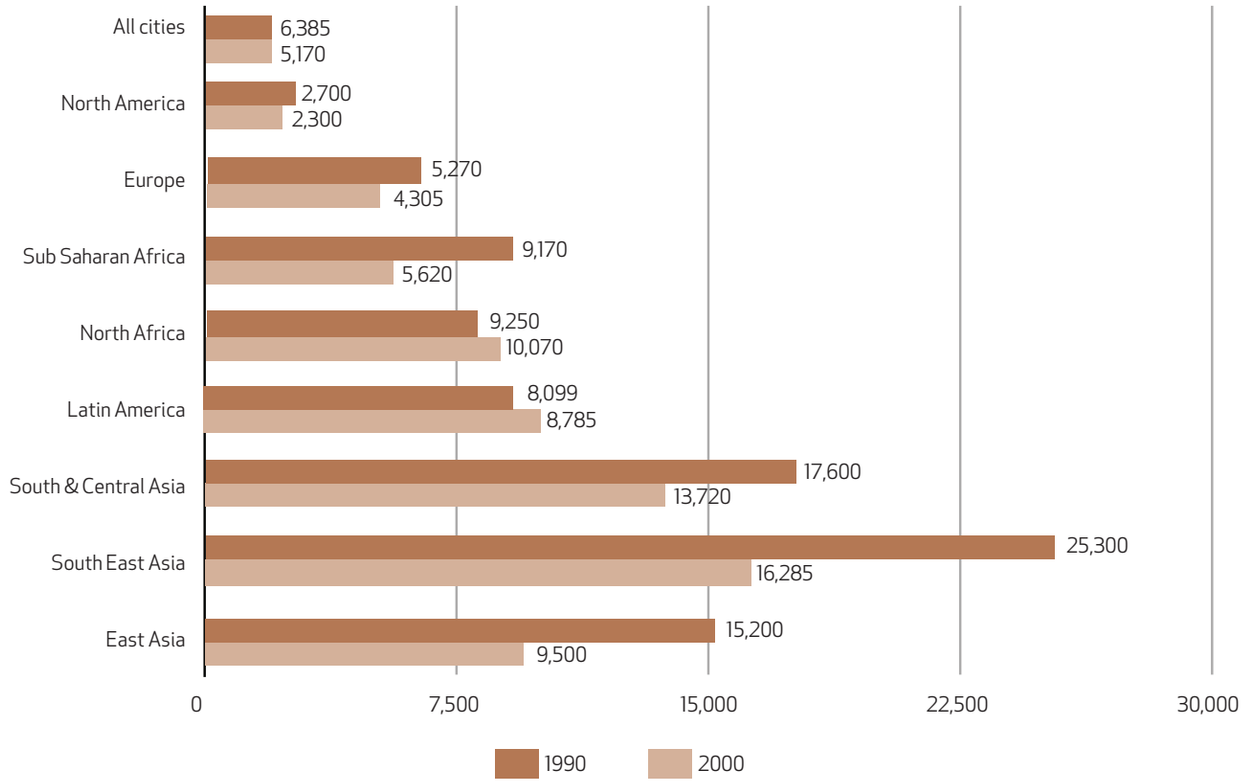
Walking and bicycling represent the largest share of trips in most cities with low affordability and mixed land use. In spite of this, often there is neglect of facilities for safe use of these modes, which needs to be corrected in the short term. Walking and to a large extent bicycling are also inexpensive, emission-free, use no fossil fuel, offers important health benefits and, for those without substantially impaired mobility, is accessible regardless of income. But walking and bicycling in all Indian cities is more challenging due to the poor quality of infrastructure and amenities for pedestrians and bicyclists. Pedestrians are particularly vulnerable, and account for about 35-50 per cent of road traffic fatalities in most Indian cities. Walk facilities should be designed and managed to accommodate a wide range of uses. People walk alone and in groups, walk pets, push strollers and carts, run, skate, bicycle, stop to gaze and talk, play and eat on sidewalks and paths. Footpaths serve as both travel-ways and stopping areas. Walking isn't only a mode of transportation but is also very important to social life in a city. The vitality of a city is closely associated to citizens being outdoors on the streets. However due to risks and perceived safety risks to walking and bicycling, these modes are losing favour among those who have choices (upper and middle income households) quickly and this trend needs to be reversed soon, to achieve sustainability in urban transport.

Lowering motorised traffic speeds is a key to improving pedestrian safety and can be done by introducing traffic calming designs and wider pedestrian paths (see Box 5.7). This also would help those who have impaired mobility, such as mothers negotiating traffic with young children, walkers carrying heavy items or older pedestrians and the differently abled. Special facilities and amenities for universal accessibility for wheelchairs also need to be made part of street design. In India, whenever new urban transport projects such as city roads and mass transit systems are being planned, it is recommended that facilities for pedestrians are integrated suitably in the main project itself. This needs to be ensured by national, regional and local legislation.

Many of the strategic macro-level points raised in a recent report of the International Transport Forum, are also important for Indian cities and need to be adopted as listed below.

(a) Implementation of clear administrative

Figure 5.7
Urban Densities in 1990 and 2000



Source: Angel et al. (2005).

responsibilities, with the urban local body in the centre, but across all levels of government for coordination of initiatives to promote walking.

(b) As mentioned before, the MoUD has come up with Service Level benchmarks, and it is important that the SSLB be implemented for measuring, reporting and monitoring pedestrian accessibility and mobility. A 'system' approach is needed for the design of walking environments, where the 'safe system' recognises that road users make mistakes and requires road design to take account of this to reduce the risk of serious injury.

(c) Implement the pedestrian planning guidance for local administrations. Each local body should develop, notify and implement, their own guidance and controls on street and road, such as in the city of Chicago, and include targets for future levels of walking and cycling.

(d) Encourage employers to create incentives for employees to walk and cycle to work.

(e) Implement traffic-calming zones and designate 30 km/h zones in all residential areas, school and hospital areas and shopping districts, areas with high pedestrian activity and local streets.

(f) Review current traffic codes to strengthen the legal and financial protection of pedestrians.

Safe facilities for NMT i.e., footpaths and dedicated cycle lanes should be developed on priority basis along with accompanying facilities such as parking booths, drinking water kiosks and street furniture. These should be citywide to assure the commuter that he can complete his journey all the way by walk or bicycle if he so chooses. NMT facilities should become a national norm and get first priority in infrastructure development and funding. Funds allocation for major transport infrastructure should be linked to achieving targets for creating facilities for NMT.

A number of guides and resources including from IUT for the MoUD, by the UTTIPEC and more recently from the Chicago Department of Transportation provide theoretical principles and information on best practices for improving non-motorised travel

Figure 5.8

Copenhagen: From Car Domination in the 1970s to Pedestrian-Friendly Streets and Bicycling City

Source: Risom and Mookerjee (2013).

Box 5.7

Complete Communities

'Many communities were not designed to make it easy for residents to walk, bicycle or use public transportation. The streets may be too wide for safe crossing, or a lack of sidewalks may inhibit a walk to the store or transit stop. Now, states are embracing "complete streets", which entails planning, designing, constructing, maintaining and operating transportation projects and systems, keeping in mind the needs of all users—motorists, bicyclists, pedestrians and transit passengers—regardless of age and ability. Twenty-six states, the District of Columbia and Puerto Rico have some form of complete streets policy; in 17 states, policies were enacted by the legislature. In 2011, New York and Washington enacted complete streets legislation, and such measures typically are considered by a number of states and localities each year. The District of Columbia also enacted its Sidewalk Assurance Act, which requires installation of sidewalks to ensure a safe and accessible environment for pedestrians and those with disabilities. The law provides that, for road segments that lack sidewalks on both sides of the street, road reconstruction or curb and gutter replacement must include installation of a sidewalk on at least one side of the street. At the federal level, the U.S. Department of Transportation issued a policy statement on bicycle and pedestrian accommodations in March 2010. It states that, "The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide—including health, safety, environmental, transportation, and quality of life —transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes". It encourages states to adopt similar policies, which many states already have done.'

Source: Shinkle (2012).

In India, whenever new urban transport projects such as city roads and mass transit systems are being planned, it is recommended that facilities for pedestrians are integrated suitably in the main project itself. This needs to be ensured by national, regional and local legislation.

conditions. Some key design elements are as listed below:

- Integrate non-motorised planning into all transport and land use planning activities
- Educate all transportation professionals in non-motorised transport planning principles
- Fund non-motorised transport at a comparable rate as other travel modes
- Ensure that all roads are suitable for walking and cycling unless these modes are specifically prohibited and suitable alternatives are available
- Use current planning practices and design standards, including Universal Design (inclusive design for the differently abled)
- Include non-motorised travel in transport surveys and models
- Create pedestrian-oriented Commercial Centres and neighbourhoods
- Perform user surveys to identify problems and barriers to non-motorised travel
- Improve sidewalks, crosswalks, paths and bike lanes
- Correct specific roadway hazards to non-motorised transport (sometimes called 'spot improvement' programmes)
- Improve Non-motorised Facility Management and Maintenance, including reducing conflicts between users, and maintain cleanliness
- Develop pedestrian oriented land use and building design
- Increase road and path Connectivity, with special non-motorised shortcuts, such as paths between cul-de-sac heads and mid-block pedestrian links
- Street furniture (e.g., benches) and design features (e.g., human-scale street lights)
- Traffic Calming, Streetscape Improvements, Traffic Speed Reductions, Vehicle Restrictions and Road Space Reallocation
- Safety education, law enforcement and encouragement programmes
- Integrate with transit (Bike/Transit Integration and Transit Oriented Development)
- Provide Bicycle Parking
- Address Security Concerns of pedestrians and cyclists
- Public Bike Systems (PBS), which are automated bicycle rental systems designed to provide efficient mobility for short, utilitarian urban trips
- Pedestrian ways, which are indoor urban walking networks that connect buildings and transportation terminals
- Create a Multi-Modal Access Guide, which includes maps and other information on how to walk and cycle to a particular destination
- Provision of multi-storey car parks for residents (paid for by residents) in order to gain public space on the road and gradually reducing parking space on the streets in order to promote cycle and walking
- Monitoring of public parking space with a special control task force
- Additional park and ride facilities at the periphery of the city

The NTDPC recommends that all cities should be responsible for pedestrian ways and facilities, which should be embedded in a law, linked to targets for improving streets and their maintenance within a period of 10 years.

PUBLIC TRANSPORT MODES

Public transport consists of:

- Mass rapid transit;
- Intermediate public transport; and
- Personalised public transport.

Mass rapid transit is the backbone of city transport in large cities as it is the mode that carries a very large number of commuters using minimum space. Intermediate public transport, i.e., tempos and mini buses supplement mass rapid transit in large cities and are the main mode of public transport in nearly all medium and small size cities. Personalised public transport i.e., autos and taxis and cycle rickshaw cater to the demand of commuters seeking a substitute for personal transport.

MASS RAPID TRANSIT

The main modes of mass rapid transit are:

- High capacity: Metro rail, commuter rail, BRT, LRT, monorail, HSST (Mag lev), Linear Metro, Automated guide-way transit (AGT), Automated people mover (APM), inland water transport and several other modes, which are grade-separated from other traffic.
- Lower capacity: Trams and buses of various sizes operating in mixed traffic metro cable in hill cities.

High capacity metro rail and commuter rail (suburban rail) are already in use in India; so are buses of various sizes. BRTs have also started operating in Ahmedabad, Rajkot, Delhi, and Pune. An increasing number of cities in India are constructing/planning facilities to operate BRT. Use of Modern Tram (also called Light Rail Transit) may be possible in many cities. Broadly, the light rail system is similar in design and operation when compared to closed BRT systems. Modern Tram being at grade is very

Box 5.8

Financing Urban Transport : Non-Motorised Transport-Financing Cycle Paths and Cycles

Both segregated cycle paths and sidewalks for pedestrians are generally assumed to be part (or not part, as the case may be) of the normal design and financing process for roads. Finance for them thus comes usually from the road budget. The most extensive segregated network in the developing world is the 340 km cycloruta network constructed in Bogota during the same three years as the initial phase of Transmilenio. The $50 million which this cost was funded from the city investment budget. In such circumstances the critical issue is whether provision for NMT is contained within the national urban road design standards. Bogotá prepared and has available a Design Manual and Good Environmental Construction Practices guidelines for public works on its cycle way system.

There are some recent signs of development of earmarked finance for NMT. In 2008, the South African government published its draft proposals for NMT, which included the obligation for NMT plans to be prepared at both the provincial and local levels, and for an NMT fund to be established from part of the national Road Fund revenues (South Africa Department of Transport 2008). A similar initiative is being pursued in Botswana.

In poorer countries bicycle ownership has been a constraint. An early attempt to provide credit for cycle purchase in Lima, Peru failed because of the problem of collateral with the traditional municipal bank, as did an early lease programme in Tanzania. But group savings programmes in Kenya were more successful, as have been promotional bicycle sales in South Africa. Government support is critical, as in the South African shova kalula programme inaugurated in 2001, which now aims to roll out a million bicycles by 2014, but had only introduced 72,000 bicycles by early 2011. Other interesting recent contributions have been the bicycle recycling project in which old bicycles from the city of Aachen in Germany are recycled to the poor in Cape Town, South Africa; and the development of a short term bicycle rent programme in Hangzhou, China. Security of bicycle property is still a problem satisfactorily tackled in Japan and the Netherlands but not yet overcome in many poor countries.

Source: Gwilliam (2011c).

convenient for commuters. It doesn't cause any local pollution when compared with BRT. It allows for the possibility of operation of both trams and buses on the same tracks, depending on local circumstances.

Monorail, HSST (Mag lev), Linear Metro, (AGT), (APM) and several other modes are currently available internationally but are not in use in most cities as public transport systems. They are mainly used in special lines such as airport connection lines, local entertainment areas, amusement parks etc.

Medium capacity modes such as electric trolley buses or buses can be used for mass transit. These vehicles when used at grade with mixed traffic allow for low capacity but are often more flexible and convenient for commuters, especially over short distances.

Choice of MRT mode depends mainly on urban form, costs and benefits, demand level on a corridor, available ROW and the capacity of the mode. Other considerations are land use along the corridor, the location of building lines, and the potential for increasing the ROW, financing options—including how costs for capital investment and operation and maintenance are to be shared, etc. Other features such as convenience, cost, safety, eco-friendliness, energy and land conservation, aesthetics and local technology maturity from maintaining the system should be given due weight.

An important issue is at-grade or grade-separated construction. At-grade MRT is the most convenient facility for the commuter. Grade-separated modes increase trip time by 10 to 15 minutes to account for the need to go up or down. At-grade construction should therefore be the default priority.

In the metro rail projects undertaken so far, the concern to keep costs within manageable limits has seemingly resulted in a preference towards elevated construction. MRT projects have a very long project life. Elevated structures are often more land-intensive than underground modes. Cost calculations most often do not take into account the long term opportunity cost of the land. Underground metro rail has the advantage in keeping the city landscape more aesthetic. Elevated modes, road or rail have not been laid in the last few decades in any developed country and many important western cities have

Box 5.9
Designing Safe Public Transport

Research now shows clear evidence that the success of Public Transport systems is often dependent on the safety and perceived safety that it provides to commuters. Public transport safety needs to be guaranteed during the whole length of the trip: on the routes of access to stations or stops, during the waiting time and on vehicles. Old people and women are particularly sensitive to the problems of personal safety on public transport networks, and require special consideration in design. Communication and information, is an essential ingredient of a safe public transport system. It is necessary to offer as much information as possible and as clearly as possible so that public transport users are not disoriented or feel vulnerable in unknown areas. The reliability of the service is often seen as a key element in making for a secure experience of travelling. In public transport systems, unexpected failure to deliver punctually creates disorientation and generates anxiety, leading to commuters feeling unsafe. Interventions such as, a reliable night bus service makes an important contribution to safe local transport. Maintenance and design is another key factor in making people feel comfortable and safe. Lighting, good design, visibility at stops and stations are an essential component in creating feelings of safety and security. The immediate surroundings of public transport stops and stations have also to be checked in terms of safety.

Source: Cardia (2013).

also destroyed these structures to rejuvenate cities and street. Therefore the desirability of elevated systems needs to be examined very carefully.

In Indian cities however there is a requirement for affordable, dense and safe MRT networks that should be financially sustainable based on city resources, as far as possible. The MRT services should be designed as an integral part of any new development in urban areas. Dense, integrated public transport is required in our cities. Only such dense MRT (based on buses if they are to be majorly funded by city governments) can support transit in the already dense parts of our cities and can assists a shift towards high-density, mixed-use walking and transit-oriented urban environments. A city as a first step should organise the existing public transport into an integrated network to cover the whole city. These services can be operated by buses of various sizes as appropriate to demand level. Actual ridership will guide adjustments in the capacity needed and to be provided on each route. When the demand level exceeds the capacity of bus services and BRT, other guided MRT modes may be considered.

The safety and safety perception of MRT modes is a key factor in its wide based use and should be a key feature in the design on an MRT network. If the public MRT is not safe or perceived to be unsafe its usage cannot be ensured or improved, as large sections of users would avoid using such systems.

As per a recent analysis, 'the high rate of various taxes are one of the important reasons for the financial unviability of MRT modes, especially buses in India. Besides, as compared to other modes of transport, the levies on the MRT modes are quite inequitable'[43]. An important step that the government needs to take to promote MRT is to reduce/remove all taxes on MRT and taxis and make them more attractive.

PARA-TRANSIT/INTERMEDIATE PUBLIC TRANSPORT MODES

While para-transit modes are not a major mode in most developed country cities, many cities in the developing world including in east Asia have proactively worked out solutions to meet the varied requirements of users at affordable costs.

In India too some cities have been trying to integrate informal para transit with MRT. The informal para-transit systems are often organised in India, and with some Organisation al support from city governments they could be converted into formal public transport modes while improving the quality of service provided by them. New Technologies need to be used to improve service quality and provide more efficient urban transport, such as on-call cycle rickshaws, smart cars/battery-operated taxis and solar motor cycles. Para transit has essentially grown in market segments at price ranges that are not catered to, by the formal sector and therefore offer a very valuable service to users. This mode also has to be supported to develop dense integrated sustainable public transport systems across Indian cities.

These para-transit modes have the flexibility to move from acting as personalised transport to mimicking public transit by operating on fixed route for multi-

43. Knarola and Tiwari (2008).

Box 5.10
Importance of Perception of Safety in Public Transport

Equally important, violence and fear undermine attempts to improve active living, including active transportation, thereby exacerbating existing climate effects and illnesses, and also in multiple ways increasing the risk for onset of disease. The presence of violence also contributes to a diminished community environment and has social and economic costs, including decreased business development and fewer educational and employment opportunities for community members. The perception of violence exerts the same weathering effect as violence itself. Violence in the environment promotes a deep level of community-wide fear, which can lead to pervasive feelings of distrust, suspicion, and isolation and a subsequent drop in social interactions. Compromised social interactions contribute to decreased social cohesion and, consequently, underutilization of local assets, such as community centres walking paths, and parks that would otherwise facilitate healthy behaviors

Source: Cohen et al. (2013).

ple passengers. Radio taxis are increasingly becoming popular in large cities, while para-transit as public transport is expanding its role in small cities and some large cities in areas where the formal public system is not needed for the commuter demand. Improved technology in user interface as well as in vehicle efficiency and the inclusion of road space for locating these para-transit services can go a long way in making the service provided by these modes more convenient and effective for commuters while ensuring sustainability.

As stated earlier, use of intermediate public transport in Indian cities is extensive. Para-transit modes are playing an important role in providing mobility to a large section of the population. They are attractive for commuters as they often provide transit services at a variety of more affordable price points than other modes. While a number of safety and convenience factors in these modes need to be improved, they have a potential of providing clean mobility. Manufacturers should be encouraged to invest in improving the technology of these vehicles by:

- Setting up emission and safety standards under the Motor Vehicles Act.
- Banks and financial institutions providing low interest loans for small scale industry producing these vehicles, and attractive replacement schemes for operators.
- Dedicating 10 per cent of the cess money available with the Ministry of Industry from the transfer of technology for vehicle manufacturing for the improvement of intermediate public transport vehicles.
- Move from a 'closed permit systems' to an 'open permit system', for para-transit/intermediate public transport modes to make public transport more convenient[44]. This regime change should be accompanied by strict training and maintenance norms.

MULTIMODAL INTEGRATED AND CITY WIDE PUBLIC TRANSPORT NETWORK

Transport is inherently multimodal. Transport demand varies from corridor to corridor and so does the capacity of various modes. For an economic public transport network, the mode for a corridor should suit the demand level on that corridor. NUTP requires that a public transport system is coordinated and well integrated with efficient inter-change infrastructure and should offer a seamless journey to the users (NUTP, Para 21). The public transport network should be citywide so that the commuter is assured that he can complete his journey all the way by using public transport.

An essential adjunct of Multimodal Transport is the interchange points where commuters shift from one mode to the other. Efficient interchange points that avoid conflicting movements and impose minimum time penalty have a very important role in providing seamless travel to the commuter. This will make the commuter decide to use the public transport network as a matter of choice.

It is equally important that public transport is made user-friendly so that the commuter uses it voluntarily. The most important aspect is Multimodal integration; Physical integration, network integration, fare integration, Information integration and institutional integration. Besides the passenger information display system, integrated ticketing for all modes (common mobility card) and interchange facilities, use of intelligent transport system, facilities for handicapped, safety and security against hooliganism, vandalism and terrorism, national public transport helpline number are critical to promote public transport and should be a part of planning.

44. CiSTUP (2012).

Box 5.11
Uzbekistan: Mobilising the Informal Sector in Secondary Cities

Uzbekistan has a population of 24 million, with over TWO million living in the capital city Tashkent. No other city is as large; major secondary cities have populations of 500,000 or less. Rigid control of public transport fares in successor companies to the Soviet-era state transport agency Uzavtotrans led to a severe squeeze in operating margins, resulting in a decline in service and maintenance standards. In most urban areas, bus enterprises were only able to provide less than half of the planned capacity. In 2000, with an average age of over 10 years, 30-35 per cent of buses were unavailable for service at any given time and out of the buses that were put on the road on any given day, 25-40 per cent broke down after a few hours of operation. The decline in state urban transport services has been partly compensated by the emergence of private bus operators, which are typically single owner-operators with minibuses of seven or 11 seats. Their growth is fueled by cheap credit available to purchase seven-seater 'Damas' minibuses produced by Uz-Daewoo. Even though the private sector was performing an important role in maintaining an adequate level of service, it was undercapitalised and was deemed to operate in a uncoordinated and undisciplined way.

To introduce discipline and quality into a fragmented informal sector, the government reorganised the road transport sector in 2001, with Uzavtotrans dissolved into 400 Joint Stock Companies (JSCs).

This leveled the playing field by exposing JSCs to competition from private operators through competitive tendering for the allocation of urban passenger routes. By 2006, 941 urban passenger routes operated in Uzbekistan, and over 93 per cent were allocated on a tender basis. Consequently, the share of the private sector increased from 40 per cent in 2000 to about 70 per cent in 2005. Following the success of the franchising experience for urban bus routes, the government allowed open tenders for the allocation of suburban, long distance and international passenger routes.

A fundamental problem concerned the financing of new vehicles. The danger was that direct financing by the IFIs of vehicles for the traditional public transport undertakings would undermine the developments which had been achieved in the shift towards a more competitive sector, and would drive out the existing private sector undertakings. An independent bus leasing arrangement (Uztransleasing-UTL) was introduced in 2004 to overcome this; it would be able to satisfy the IFI requirements for finance without giving an unfair access to cheap funds for the traditional operators. The process was supported by technical assistance to develop financial management and operational procedures, model contracts to be used by UTL for bus leases, provisional agreements for prospective lessees, as well as substantial support for the staffing and training of the company.

The main aspects of this experience which appear to be of relevance to India are:

- The introduction of a competitive tendering system capable of handling both small and large operators in the bidding process
- The necessary restructuring of the public sector bus operation to make competitive tendering work effectively
- The development of leasing institutions that can assist small and medium enterprises to compete

Source: Gwilliam (2011a).

'Door-to-door' planning should be done in terms of time, cost and convenience to the commuter. Improved accessibility and last mile connectivity should be a vital feature of transport planning.

- Regular and dense public transport stops, within close walking distance from homes/office
- Places for bicycle parking at the public transport stops
- Safety and perceptions of safety at bus stops can be enhanced through proper design, maintenance as well as regularity and frequency of the public transport mode itself[45].

REGIONAL AND SUBURBAN TRANSPORT

The influence of urban centres extends to towns both in the immediate neighbourhood and those at some distance. These requirements should be met by suburban and regional services respectively. An important criterion in suburban and regional transport planning is the trip time and the level of comfort during travel.

Once the suburban rail enters the city, it becomes a part of the urban transport system. Regional/suburban transport services should be integrated with the

45. Cardia (2013).

Box 5.12
Modal Integration in Public Transport

To attract customers to public transport, which is necessary to solve congestion and environmental problems, it is essential to deliver a convenient and affordable product. A high level of service integration allows multimodal journeys to be undertaken without significant penalties either in total journey time or total journey cost. The first requires physical integration and the second requires commercial integration between the modes.

Efficient physical integration can be achieved using a hub-and-spoke philosophy, with slower modes or smaller vehicles serving low density residential areas feeding to a trunk network of higher speed modes. The trunk services in this sort of arrangement are not necessarily all conventional metros. For larger cities, such as London, Paris and Munich, suburban rail systems perform major trunk movement functions. In many Latin American cities, such as Bogota, Colombia, and Curitiba, Brazil a segregated BRT system operates.

Without a through ticketing system or an electronic travel card system accepted on all elements of the system, the monetary costs of modal transfer may preclude transfer, however good the arrangements for physical integration. While physical integration requires a long planning horizon for big infrastructure projects, commercial integration is cheaper and faster. Commercial integration can be achieved by a common payment mechanism that allows seamless transfers with automatic transfer rebates. In London the introduction of the electronic 'Oyster Card' made interchange between privately operated buses, private suburban railways and the London Underground carry no greater penalty than a change of line within the underground system itself. While negotiations of sharing of revenues can be difficult, the evidence of London suggests that there is sufficient overall benefit from co-ordination for all modes to benefit.

In many cities this sense of integration has been achieved by the establishment of a 'brand image' so that travelers can feel confident that there really is an integrated system at their disposal. The existence of a single marketing company for integration, sitting above the individual operating companies is often the critical requirement. The system in Curitiba is an example. Curitiba's buses are owned by 10 companies, managed by a quasi-public company that handles marketing.

Source: Gwilliam (2011d).

city network for easy dispersal. Institutional mechanisms need to be put in place to enable this integration. Currently, suburban rail is under the Ministry of Railways and the contribution of the state/city in the development of the stations is nil. There needs to be put in place a corporate institution, with the agreement of both the Railways and the city transport system, which will articulate the integration of the suburban rail services with the city mobility services. The area around the stations can be developed by the corporate entity on the principles of transit oriented development and it could be the platform for enabling common protocols like the common Mobility Card.

URBAN FREIGHT TRAFFIC

Freight traffic and movement of goods within the city and 'passing through' intercity traffic affects overall city mobility. Passenger movements are concentrated in the morning and evening peak hours; freight movements are spread over a 24-hour period. The size, low maneuverability, noisiness, and high pollution output of goods vehicles make their presence particularly objectionable. Goods pick-up and delivery in city centres are also seen as seriously problematic because of limited parking too. At the same time, goods vehicles, which typically are 10-15 per cent (GOI 2010-11) of the registered vehicles in a city, are vital to the economy and well-being of society. Commerce is dominated by goods vehicles, and the logistics industry in particular is dependent on road transport for pick up and delivery. Globally 'in urban areas, freight contributes considerably to both environmental and social challenges: upto 20 per cent of the traffic, 30 per cent of street occupation and 50 per cent of greenhouse gas emissions are generated by freight[46].Garbage pick up and fire protection are among many essential services that are vehicle oriented.

Logistics and freight transport in urban areas are a key input for the productivity and economic vitality of cities. There is a direct relationship between freight and urban jobs. In high-density mixed-use planned neighbourhoods and in western Europe

46. Savy (2012).

Once the suburban rail enters the city, it becomes a part of the urban transport system. Regional/ suburban transport services should be integrated with the city network for easy dispersal. Institutional mechanisms need to be put in place to enable this integration.

and Japan, with the changing demands on freight distribution new designs are being adopted. These new designs include laying out of the street, so as to facilitate deliveries, efficient management of delivery places and harmonising all elements of operation regulation (size of vehicles, time of access, etc.) at the scale of urban areas based on the trade-off between job creation and logistics nuisances.

Urban freight is a complex system, in constant change due to change in demands (decrease in door to door informal traders, more malls, more internet shopping, etc) and has economic, technical, political and social dimensions. It also has to straddle the bridge between these and there is no single decision maker, likely to transform the situation, but a constant effort of comprehensive innovation and cooperation of various stake holders. Several new concepts are being tried out which include delivery relays in commonplace shops, logistics shops, electronic lockers (Germany), drive-in retail shops, reliable home delivery and differentiation according to products (value, size and weight of consignments).

Currently, in most Indian cities the vehicles used are old, polluting vehicles operated with little professionalism, low productivity (direct cost), high nuisances (social cost) and have numerous illegal stops (second lane, middle of the street) and present a worsening congestion, an important hidden social cost. However land prices as well as some larger cities' strategies are driving Logistics exchanges/'mandis' further and further into the urban outskirts. This practice then leads to longer final haulage, potentially contributing to increased pollution, cost, and congestion. This is another area in which choices about land use and transport practices must be jointly considered in order to arrive at the optimal approach.

In urban India, especially in the large cities, over the next 20 years the urban freight sector will be a very important component, either aiding or constraining urban economic development. Currently for local authorities, urban logistics are not yet integrated within their concept of territory and their know-how but their inputs often have a significant impact on the sector and in turn on the productivity of the city's economy. The subject needs to be studied in depth to evolve planning norms that permit goods movement without affecting passenger movement. The current strategic trend of restricting and pushing out logistics and freight vehicles and interchanges to the outskirts of the city needs to be relooked at for better integrating urban freight to support job creating in cities and improve the vitality of cities.

Urban planners and policy makers have now proposed a set of measures to help improve the efficiency of goods vehicle operations. Some measures adopted from Arne Wittlov[47],include:

- Providing space on streets for loading and unloading of goods vehicles
- Supporting urban consolidation centres
- Measures to encourage night delivery services
- Installing shared bus and lorry lanes
- Improving vehicle design and customization
- Integrating planning and not pushing logistic depots into the cities periphery
- Encouraging the use of information systems and telematics applications
- Providing lorry maps in paper form and outline
- Providing information about prevailing traffic conditions and relevant facilities
- Encouraging the use of environmentally friendly goods vehicles

PARKING

It is now well recognised that parking demand is insatiable, in an environment of rapid increase in private vehicles in larger cities. Conventional policies encourage more parking supply to meet ever-increasing demand. The approach should instead shift to modulating supply to maintain a sustainable level of vehicle traffic and space devoted to parking rather than other urban amenities. NUTP, for example, has advocated levy of high parking fee that represents value of land occupied and to allocate parking space to public transport and non-motorised transport on priority.

Under the on-going reform process in India, cities are expected to make the transition from the conventional approach of providing more parking facilities, to using parking as a demand management tool. This is the case in most developing country city contexts as elaborated in Box 5.14. The strategy should be to minimise and avoid serving each building with its own parking. It is more judicious to build parking for the neighbourhood. If the policy can be reoriented to provide parking for each development area instead of each building then the parking requirement will also be modest. Standards can vary from zone to zone or city to sub-urban areas within the city and may be reviewed periodically and revised if necessary. The key message is that parking should be shared, common and not individually owned, and it should be priced. However this of late has led to the propagation of the construction of a number of multi-storied parking facilities, as 'cities are clueless about the ultimate goals of parking policy and how

47. Wittlov (2012).

Box 5.13

Parking as a Restraint Measure in National Urban Transport Policy

It is also time to assess if the new investments in parking are consistent with the policy position of the Government of India. The policy position emerges from the NUTP which is administered by the Union Ministry of Urban Development. It is important to note that the NUTP has taken on board the travel demand management principles very explicitly. It states:
Land is valuable in all urban areas. Parking places occupy a large part of such land. This should be recognised in determining the principle of parking space.

Levy high parking fee that represents value of land occupied.

This should be used as a means to make use of public transport and make it more attractive. Graded parking fee should recover the cost of the land.

Public transport vehicles and non-motorised modes of transport should be given preference in the parking space allocation. This along with easier access of work places to and from such parking spaces, can encourage the use of sustainable transport.

Park and ride facilities for bicycle users with convenient interchange are a useful measure.

In residential areas also, byelaws need changes to free the public carriageway from parked vehicles impeding the smooth flow of traffic. Make provisions in the appropriate legislation to prevent the use of right of way on road systems for parking purposes.

Source: CSE (2012).

the multi-level car parks fit, if at all, into the overall policy paradigm'[48].

Parking standards should vary from zone to zone or city to sub-urban areas within the city and may be reviewed periodically and revised if necessary. The key message is that parking should be shared, common and not individually owned, and it should be priced.

The NUTP has advocated levy of high parking fee that represents value of land occupied and to allocate parking space to public transport and non-motorised transport on priority. It treats parking as an essential infrastructure that must service all buildings and recommends that public infrastructure funding should be tied with it. Some positive principles which need to be followed are:

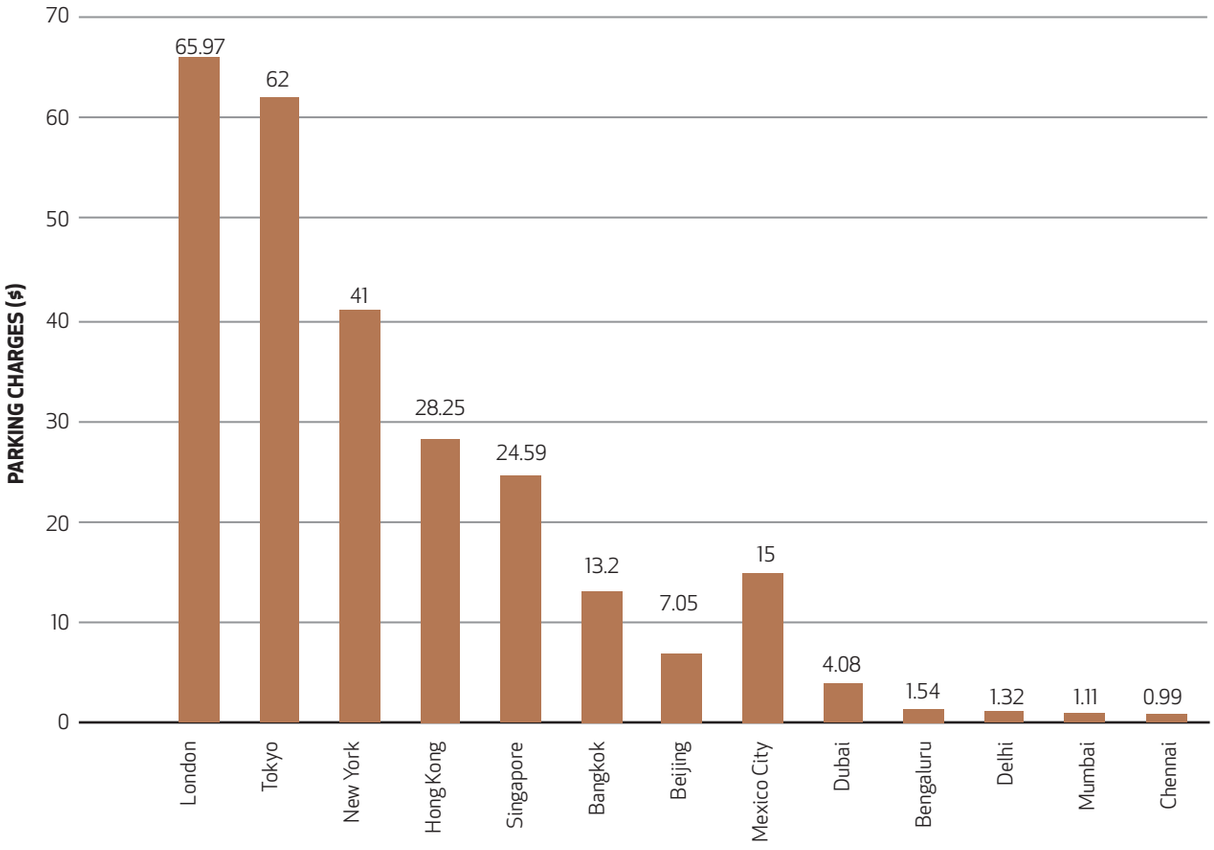
- Parking management is to be used as a demand management tool—to decrease use of private vehicles and thus reduce overall demand of parking, and shift travel to public transport, para-transport and non-motorised modes.
- Parking is a consumer commodity, not a legal right. No subsidised parking is to be provided in public spaces. User must pay full cost of parking facility based on land opportunity cost, capital cost, operation and maintenance (O & M) costs and temporal demand.
- Private vehicle must be parked on 'a fully-paid rented or owned' space. Proof of the same must be furnished before registering a private vehicle.
- Spaces already designated for parking must be utilised to highest efficiency and financial viability.
- In the influence zones of the MRTS stations, a maximum limit on parking spaces should be imposed so as to enable shift to public transport from personal transport.
- On-street parking should be discouraged to the maximum extent possible or should be highly priced as compared to off-street parking.
- Off-street parking must be provided with park and ride facility and the responsibility of keeping the streets, in the vicinity of multistory parking, free from unauthorised parking with the help of traffic police should be with the multistory parking operator.

TRAFFIC MANAGEMENT MEASURES

Smart traffic engineering and management optimisation measures do not carry major costs and are critical to avoid congestion. A traffic management unit is therefore essential in each city. Table 5.16 shows the typical Functions and Responsibilities of a Traffic Management Unit.

48. CSE (2012, p. 1).

Figure 5.9
Comparison of Parking Charges in Various Cities, 2011



Source: Collters International (201)- CBD Daily parking charges (in US $).

SAFETY

The need to improve safety in urban transport in India does not need any justification. Fatalities in India per million of population have steadily increased. The actual situation may be much worse as a number of accidents are not even reported. Within adequacy of the existing road infrastructure to handle the ever increasing traffic, road safety is deteriorating rapidly and requires urgent attention. A MORTH Committee on Road Safety and Traffic Management, also known as the Sundar Committee, estimated about 50 per cent increase in road accidents over a 10-year period (2005-15)[49].

Some of the major concerns regarding road traffic safety are[50]:

- Traffic fatality rates have been increasing in most cities
- Pedestrians, bicyclists and two wheeler riders comprise of 60-90 per cent of the total fatalities
- Motorcyclists represent a large portion of urban fatalities (about 25 per cent)
- Several studies indicate that the involvement of trucks in fatal crashes is high
- Nighttime driving in India is substantially riskier than daytime driving
- Alcohol involvement in road traffic crashes has become a serious concern

All million plus cities should have measureable urban transport safety plans and indicators developed in the short term. There should be a programme that ensures that the plan is implemented over the next 10 years. The measures/strategies for road public transport safety should include specialised facilities for non-motorised transport; should curtail speed of vehicles in arterial roads and in local streets to help enforce all safety aspects as prescribed in the Motor Vehicles Act.

Today no single agency or department is responsible for improving safety in a comprehensive, scientific and a systematic manner in a city. The organizational framework to deal with all road safety related issues should be provided by creating a Safety Board at state level with safety cells in cities with dedicated personnel and budget. Relevant R&D shall be a part of the research programme to minimise injury and the consequences in the event of an accident. Rescue services should be organised to provide relief in the fastest time possible. Also protocols of Road Safety

49. Ministry of Road Transport and Highways (2007).
50. Mohan et al. (2009).

Box 5.14
Controlling Private Vehicle Use: Parking Policies

European cities have reallocated street space in favor of pedestrian, bicycle, and public transport use by reducing available parking spaces. Copenhagen has used parking removal to create a network of pedestrian areas, and Strasbourg, where on-street parking was removed and placed underground to make way for a tram line. In recent years, some larger European countries have instituted maximum limits on the total number of parking spaces (on-street and off-street) that may be provided in congested city areas. European cities deploying these measures include Budapest, Copenhagen, Hamburg, London, Paris, Strasbourg and Zurich. This reform has required changing building codes to freeze the existing supply and ban any future development of parking spaces. For every off-street space created in central area of Zurich an equal number of on-street parking spaces must be eliminated. These maximum limits in European cities have had a positive effect in reducing traffic congestion. Similar to establishing parking quantity by zone, several European cities also regulate parking duration by zone. These zonal designations are developed to better tailor parking pricing and duration to the land uses, densities, and transit characteristics in these zones. This policy is also followed in some Asian cities.

It is now standard practice for all large European cities charge for on-street parking in areas with significant parking demand. However, as city size becomes smaller the application of paid on-street parking becomes less common. For example, all cities in the Netherlands with a population of over 100,000 levy street parking charges. In contrast, only 1/3rd of cities with 20,000 to 50,000 persons have paid street parking, and only about 15 per cent of cities with fewer than 20,000 inhabitants use paid parking systems.

While the primary purpose of charging for parking should be to limit traffic and to better ration the use of available parking spaces, revenues from parking can be substantial. In Amsterdam, a city of approximately 1.4 million population, the city was estimated to collect EUR 130 million (approximately $175 million) in parking fees during 2009 or nearly a quarter of its total tax revenues. London, (population 7.6 million), also collects substantial sums from motorists from on-street parking amounting to 170 pounds sterling (approximately $270) per registered vehicle during the fiscal year 2008/09.

Source: Gwilliam (2011b).

Audit (RSA) by an independent and well qualified auditor who reports on any deficiencies in safety aspects and prepares recommendations on improvements that may be necessary, need to be put in place.

With respect to other aspects regarding improving safety, the recommendations of the Sundar Committee report on road safety and traffic management, should be speedily implemented. A more detailed elaboration of safety issues is presented in Chapter 12 on Safety in this report.

SECURITY

The need for security against vandalism and crime is increasing by the day. Security is needed for commuters, particularly women and children and operators and staff on duty. It needs to be dealt with in a systematic manner. Security is important over all parts of the journey: stations, stops, shelters and on-vehicle. It covers both passengers and operators.

The presence of young people and people who have been drinking tends to make other passengers more uneasy. Young people are more likely to be bullied or intimidated by other young people than by adults. People with learning disabilities are particularly subject to harassment and bullying. Majority of incidents of harassment or intimidation go unreported. Developing an Effective Strategy is the need of the hour and should include:

- Design solutions including the use of robust materials, good lighting, clear sightlines
- Management solutions such as the presence of trained staff, effective surveillance, procedures for reporting incidents
- Partnership initiatives such as effective liaison with the police, work with schools, and sponsoring initiatives which promote public transport to young people
- Planning for security should become a part of urban transport planning
- Use of principles outlined by professionals promoting Crime Prevention Through Environmental design (CPTED)

Table 5.16
Typical Functions and Responsibilities of a Traffic Management Unit

DIVISION	FUNCTIONS AND RESPONSIBILITIES
Traffic Management Policy	Formulate and Implement city wide 'Traffic Management Policy' to comply with objectives defined by the 'city council' which would include, at least such areas as determination of (i) a functional road hierarchy; (ii) the appropriate balance between transport system users (private transport/public transport/NMT/pedestrians; (iv) priority programmes for action; and (iv) a 'five year' investment plan'.
Traffic Research	Assemble/survey, monitor, analyse and evaluate all traffic and accident data to enable trends to be identified, problems quantified and traffic management plans and improvements to be prepared.
Traffic Management Plans and Improvements	Plan, design, implement, monitor, evaluate, fine-tune and continuously up-date traffic schemes and policies to realize the agreed Traffic Management Policy. The programme would cover all motorised road based modes (cars, public transport, trucks, etc.) and all non-motorised modes (pedestrians, cycles). Plans and improvements would range from simple junction improvements or marking and signing programmes through to far reaching city wide strategies such as extensive bus priority or pricing. Safety considerations are part of any scheme planning and design process but specific safety programmes and accident counter measures would be a responsibility.
Traffic Control Devices	Plan, design, install, operate, and maintain all traffic control devices including (i) traffic signal systems including computer-controlled systems; (ii) road markings; (iii) road signs and, (iv) enforcement devices (cameras etc.)
Traffic Regulations	Formulate traffic regulations to realise the proposed Traffic Management Plans and Improvements, for enactment by city government and for enforcement by the traffic police.
Parking Management	Prepare off- and on-street parking policies and programmes including approval for the location of and access to parking areas proposed by others. Parking enforcement and administration (for example, where paid parking applies) would be carried out by a separate parking authority' or equivalent.
Approvals and Co-ordination	Evaluate and advise city government on all schemes (e.g., new roads) and developments (developed both by public and private sector agencies and including major new land or building developments) which have a significant traffic impact to ensure that they are consistent with agreed traffic policy. In effect carry out traffic impact studies for all major development proposals.
Consultation	Consultation with the public and stakeholders on traffic policy and on the impacts of specific schemes and measures.
Budget	Preparation of an annual budget for submission to city government for (i) implementation of Traffic Plans and Improvement Schemes; (ii) traffic operations and maintenance of control devices; and (iii) the continuous work of the traffic management agency.

UNIVERSAL ACCESSIBILITY

The Constitution of India ensures equality, freedom, justice and dignity of all individuals and implicitly mandates an inclusive society for all including persons with disabilities (Box 5.15). In the recent years, there have been vast and positive changes in the perception of the society towards persons with disabilities. It has been realised that a majority of persons with disabilities can lead a better quality of life if they have equal opportunities and effective access to rehabilitation measures.

Universal accessibility needs to be provided, by the UT systems, both at the systemic level and the infrastructure level.

- Accessibility at the systemic level implies that components of public transit systems like trains and buses, their stations and stops, the ticketing and any other user interfaces should be within reach of people with different types of impairments.
- At the infrastructure level, pedestrian paths and crossings, parking facilities and access to public land uses should be inclusive in their design for differently abled persons.

NEW TECHNOLOGY APPLICATIONS

New technologies have the potential to address the key challenges for UT and change the way we commute. New transportation innovations and linking and optimising them could provide convenient, affordable door-to-door trips for users.

Sustainable mobility is not only about private motorised vehicles becoming more smart, which however can contribute to improved environmental outcomes through hybrids engines, plug-in electrics, or even about alternative fuels like ethanol. While many private manufacturers are investing in improving technology to make vehicles safer, more fuel-efficient and environmentally sound, the real contribution would be to improve the performance parameters in Public Transport and para-transit modes. Clear policy directions would encourage mass transit modes to mainstream greener vehicles. Sustainable mobility is a system where public transportation is central and personal vehicles are peripheral, but both operate on improved environmental norms and standards.

Recent efforts of technical innovators aligned with public transport managers has been to rapidly infuse all these disparate modes with Information Technology (IT) and telecom interfaces, thereby creating passenger-information platforms that can tell commuters beforehand, through a mobile phone or any device, when their bus will arrive, or when and which metro train to board for their onward journey. It would also promote common ticketing across modes.

The auto sector is attempting to reduce congestion and grid-locks on roads and in the short term this is expected to give a fillip to vehicle-to-vehicle communication technologies and collaborative consumption like car sharing. While the private car industry is investing heavily into improving technologies, serious attention needs to be paid to improving technologies for public transport and para-transit. Some companies have been improving buses and bus systems. Recent technology allows a person at a base station to monitor if the driver of a bus is accelerating too fast, braking aggressively, or whatever, and much of this data can be gathered. However more effort would be required to improve the efficiency of inter-modal transfers through IT-based methods. Also more emphasis is necessary of using intelligent systems to integrate taxi and auto rickshaws, para-transit, public and personal (dedicated autos/cycle rickshaws, etc.) with the public transport network on a round the clock basis, as this could also go a long way to make public transport more attractive to users.

SECTOR INSTITUTIONS AND GOVERNANCE

INSTITUTIONAL FRAMEWORK

India's ability to meet the ambitious goals for transformation of urban transport as part of a larger urban development strategy requires more than policy commitment. The institutional framework for defining, refining, and implementing policies will also have to be strengthened and integrated with India's larger federal governance structure. The Constitution of India, does not specifically list the urban transport sector, making it to a large extent a constitutional and institutional orphan. The present institutional arrangements to manage urban transport are fragmented and the responsibility is diffused. At the city level, several agencies are involved in the management of various components of UT (see Annex D). At the state level, UT is managed either by the Urban Development, Municipal Administration, or by the Transport Ministry as a subject, though often there are a number of agencies that provide urban transport services that may not report to these departments administratively. At the Central Government level, UT is being managed by three Ministries Urban Development, Railways, and Road Transport and Highways. Other than this the laying down of standards and norms for urban roads is being undertaken by the Indian Roads Congress.

Box 5.15

Long Way Ahead for Disability Access on The Ground

'I have been in a wheelchair for the last five years and in all this time, accessibility has not improved one bit in public spaces, at least not enough to enable me to venture out on my own. People on the road still stare, awareness continues to be limited', reveals a former ace swimmer, who is now on a wheel chair after a swimming accident. Articles 14, 19 and 21 of the Indian Constitution recognises that persons with disabilities shall be provided accessibility on an equal basis with others to the physical environment, transportation, information and communications, and other facilities and services provided to the public, both in urban and in rural areas. Yet, inspite of the estimated number of differently abled people being as high as 70 million in the country, they continue to be an 'invisible minority'.

A new updated disability bill draft is being considered by the government. The new bill aims at updating provisions, while widening the definition of disability. It also envisages the establishment of national and state disability rights authorities.

However many experts and social activist feel that new laws are meaningless and regulations have remained on paper, after decades of neglect and continued stigma, they are not convinced that new laws will see any improvement on the ground. Disability planning needs to be streamlined at all levels. Disability is now being captured in the Census data. The 1995 Disability Law clearly stated that public spaces should be made accessible for persons with disabilities, there still is a long way to go to achieve this goal. Even new buildings that have been constructed post-1995 are yet to be made barrier-free. At a daily level, the barest of daily activity that the 'abled' take for granted in India's big cities are mostly inaccessible: 'None of the traffic lights are audio-enabled. Pavements are not smooth enough for a wheelchair. Even in supposedly inclusive systems like the Delhi Metro, there is only one entry-exit that has an elevator. What if you need to cross the road? The metro feeder buses are inaccessible. At most bus stops, there is no seamless movement from the platform into the bus. The BRT system too is flawed—how will a person with physical disability get to a bus stop planted in the middle of the road? And now there is talk of replicating it, despite protests,' says the founder of non-governmental agency AccessAbility, .

Most government effort to address better accessibility has been sporadic, while what is required is that civic agencies come together to build long-term, large-scale barrier-free infrastructure. Some private companies are now trying to engage differently abled persons and developing offices which are barrier-free. New ways of partnership are required to make disability access a national movement so that all public spaces and relevant private spaces provide equal access opportunity for the differently abled.

Source: Adapted from Bhatt (2012).

This state of affairs is not conducive to the provision and growth of urban transport along a sustainable path. Rectification of this weakness has become all the more urgent in view of the huge investments projected to be made in this sector.

Urban transport institutions also require investment in appropriate expertise, both in terms of human capital as well as data and decision support systems.
Proposed institutional framework

Chapter 5, Volume II on Governance highlights the two overarching priorities for urban transport: (a) building up expertise on urban transport strategy, particularly at the urban and state levels where decisions on responses to varied needs will need to be taken; (b) defining the locus of responsibility and accountability for urban transport in a way that encourages and enables integration across modes and between urban transport and broader urban development efforts. This chapter provides additional detail on how such changes could be initiated.

In order to provide dedicated attention to urban transport to enable it to grow along a sustainable path and to incur the level of expenditure envisaged, the institutional framework to deal with this sector is proposed as follows:

- The primary responsibility for UT should lie with state governments. This report has recommended creation of state-level Offices of Transport Strategy which may be the locus for urban transport, in collaboration with agencies for urban development. Devolution of expertise, formal notification of jurisdiction in keeping with the Constitutional division of powers, and rapid investments in

building state capacity for safe, environmentally sustainable, urban transport must be undertaken. Urban transport is a key component of urban development, which as per the Schedule 6 of the constitution is a state subject, Therefore, the key responsibility for urban transport should explicitly lie with the state government and the Urban Local Body.

- States should also enact comprehensive urban transport laws, with the possibility of model guidance from the Centre. The Centre can set out the roles and responsibilities of the multiple city and state-level entities with regard to public transport, land use and public transport integration, multi-modal integration, safety, facilities for walk and NMT, etc.
- Over time, UT responsibilities should be devolved to metropolitan and city authorities, particularly for cities of more than 1 million. This report has recommended strengthening of the Metropolitan Urban Transport Authorities as a counterpart to state and national OTS. The 74th Constitutional Amendment 1992, which aimed at transferring a number of urban service responsibilities to urban local governments, did not mention urban transport/public transport, but transport responsibilities are integral to the urban planning functions recommended for the Metropolitan Planning Committees to be established in larger cities. This arrangement is also consistent with the principle of subsidiarity guiding recommendations in Chapter 5 on Governance. Box 5.16 on Recife provides an example of this kind of arrangement. The national government will inevitably retain an important role in financing urban infrastructure, given India's fiscal structure. Such funding should be technology-neutral as far as possible, and linked to mobility, access, environmental, and other system outcomes rather than specific approaches to urban transport.
- The national government may also play a role as technical advisor while state expertise is being created. This report proposes creation of a national Office of Transport Strategy which would liaise primarily with the Ministry of Urban Development, and also with Rail, and Road Transport and Highways as needed to generate overarching strategy guidelines.
- The national government would be responsible for creating standards for urban transport performance, including safety, environmental impact, and other national goals.

The Central government cannot be directly responsible for urban transport in each city in a federal set up like India, with a wide diversity of contexts. Central government oversight of urban transport, other than in setting standards for national goals such as safety, efficiency, and environmental impact as well as public investment management, is inconsistent with international experience as well as economic logic.

States are a natural locus for urban transport in India's current circumstances. Larger cities can and should assume the primary responsibility for metropolitan transport as broader urban reforms catch up with constitutional commitments. The arrangement in London, a city with approximately the same population as Bangalore (and less than Bangalore Urban Agglomeration) is elaborated in Box 5.17 as a reference point.

However, states would continue to play a role in ensuring equitable development of urban transport and efficient use of expertise for smaller cities that may not have the economies of scale to develop their own urban transport strategies.

This new institutional framework would redirect lines of accountability from existing agencies engaged in implementation and operation of UT-related projects to ensure that they would continue in their present implementing roles, but guided by more integrated decision-making.

ROLES OF DIFFERENT STAKEHOLDERS

Within this broad framework, the roles and responsibilities need to be clearly defined.

CITY GOVERNMENT

Most of India's cities would work closely with their respective state governments to design transport strategies appropriate for their size and growth. Cities should be expected and empowered to be the locus for data collection on traffic pattern, land use patterns and proposed land use changes, and other factors feeding in to the transport strategy. In this way, urban local governments could 'learn by doing' as they grow.

Cities to which urban transport authority has been devolved must be provided with a strong institutional framework, an effective organisational set up with a dedicated agency to look after planning, coordination and implementation of urban transport services, legislation, a resource generation policy and adequacy of skills. A three-level organisational set up is therefore proposed for the city.

- Metropolitan/District planning committee/ inter-municipal cooperative arrangement.
- Dedicated authority for urban transport (MUTA).
- Other existing city transport agencies.

METROPOLITAN PLANNING COMMITTEE

The constitution and activation of the 'Metropolitan/District planning Committee' (MPC/DPC) as envisaged in the 74th constitutional amendment for

Box 5.16

Voluntary Collaboration in The Recife Metropolitan Region, Brazil

Brazil is a federation of states, with the attribution of responsibilities between the jurisdictions contained in the formal constitution. Each level of government has a democratically elected government to implement the powers attributed to that jurisdiction by the constitution.

The Recife metropolitan region (RMR), in the north east of Brazil, consists of 14 contiguous municipalities with an area of 2,208 km^2 and a total population of 3,337,000, at a density of 1232 per km^2. The state capital, Recife accounts for 1,422,000, and the three central municipalities (including Recife) for 2,370,000 of the total.

Responsibility for urban public transport in RMR is divided between the state of Pernambuco (generally responsible for inter-municipal transport) and the constituent municipalities (generally responsible for intra-municipal transport). However, with the exception of Recife the majority of trips generated in all the municipalities are inter-municipal. For that reason, the governments of the state and the Recife municipalities, committed themselves to work together in a consortium to address the problems of urban transport. It is expected that the other municipalities will join the consortium as it develops. The formal sector bus services and the metro system were brought together in the Estrutural Integrado Sistema - SEI which consists of a network of services, integrated both physically and in terms of a through ticketing system, which allows interchange in closed terminals without payment of a second fare. The SEI is complemented by an open system, with ticket sold for single trips.

The tariff structure in the RMR is zonal, based on a set of semi circular rings around the centre of the metropolis. The number of zones, originally five, has been progressively reduced to two, with the last simplification being the merging of all trips above 32 km into a single zone, which occurred in 2004. There are also special tariffs for the trunk lines of the SEI and for some lines operated by microbuses. The metro system has its own tariff, but is also included in the SEI so that passengers can use the metro lines for trunk movements in multi-modal trips at the integrated tariff rate.

A social survey of April 2004 indicated that public transport is the transport of the relatively poor, with 53 per cent of the public transport users having family incomes less than 2 minimum salaries, and 89 per cent having less than 5 minimum salaries…However, the issue of the affordability of essential transport to the poor is dealt with directly by the 'vale transporte' system. If requested to do so by an employee any employer is obliged to provide a ticket for the journey to work, for which he can deduct a maximum of 6 per cent of the workers' salary As in principle the VT is only sold for use on the formal public transport system the it should tie employees to the formal public transport operators. In practice, however, the VT became a secondary currency, which could be used on informal transport as well as formal. To overcome this the VT has been converted into a personalised, electronically readable ticket.

The executive authority for implementation of policy is the 'Empresa Metropolitana do Transport Urbanos (EMTU). This body establishes the lines, schedules, frequencies, types of vehicle and all other matters pertaining to the control of inter-municipal bus transport in the RMR. The responsibility for control of intra-municipal bus services rests with the individual municipalities, though Recife and Jaboatao have delegated this responsibility to EMTU. In practice, therefore, the bulk of the bus services in RMR are controlled by EMTU, which makes all the effective decisions of a policy nature.

All bus services are provided by private companies. The maintenance of some less unremunerative services (and operators) by internal cross subsidy within the system is facilitated through a clearing house known as the Camara do Compensacao Tarifaria (CCT). Individual operators retain the direct fares that they collect, and the revenues obtained through cashing in of VTs with EMTU. Payments for student concessions go directly to CCT and form a buffer which is then distributed to balance the interests of different operators. The entitlement of each individual operator is calculated by a cost based formula including fixed costs (vehicle depreciation) and variable cost components. The payment is in the form of a price per vehicle kilometer planned, related to the particular fleet operated.

The state and the municipalities will establish a 'Consortium' and will transfer the integrated management and development of all public transport modes to this consortium. 50 per cent plus one of the shares of the consortium will be held by the State, 30 per cent by the municipality of Recife and the rest by the other municipalities in proportion to the magnitude of their participation in the sector. The small vehicles (kombis, VPP) which have operated in a very irregular and uncontrolled way have been driven out of the central municipal area of Recife, while some of the kombis are being integrated into the existing system through regulation and issuing of licenses through a tendering process.

Source: Excerpted from Annex 2 of Gwilliam (2011d).

cities especially with more than a million population is important to address both inter-sectoral coordination as well as geographic jurisdictional coordination, particularly for large regional urban transport projects. While the MPC/DPC has made limited progress so far, it is an important and constitutionally legitimized focal point for resolving inter-jurisdictional and macro regional decisions and coordination issues, which have significant investment impact. UT like other large network investment projects can be a strong beneficiary of such an institutionalised and capacitated system. The MPC would inevitably subsume the current Development Authorities.

DEDICATED AUTHORITY FOR URBAN TRANSPORT (MUTA)

The NTDPC is fully supportive of the National Urban Transport Policy 2006, that large metropolitan cities with population in excess of one million set up the 'Unified Metropolitan Transport Authority' (UMTA). The MUTAs proposed in this report could be thought of as fulfillment of this mandate. This authority should take care of the connectivity with the surrounding suburbs and region as well. As per the NUTP, the MUTA should not report to the Secretary of Urban Transport in the State Government, but to the MPC/DPC. The UMTAs created till date report to Development Authorities and would need to be re-aligned.

As discussed in Chapter 5, Volume II on Institutions for Transport System Governance, the current UMTAs act more like advisory committees and not as empowered technical decision making and coordinating bodies, more often representing state-level interests than local-level ones.

The NTDPC is strongly of the view that this is not a desirable approach and proposes that instead of calling the entity 'Unified', it could be called 'Urban', thereby putting to rest any ambiguity on the reporting/ownership arrangement of this entity. Thereby the 'Metropolitan Urban Transport Authority, (MUTA)' should either report to the MPC/DPC or to an inter-municipal cooperative arrangement created by the urban local bodies involved. Hereafter the mention of the MUTA means the Metropolitan Urban Transport Authority.

The 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 in the NUTP 2006, the MUTA should be further supported by a professional body that will study and make recommendations on various issues for consideration and decision by MUTA. Rather than have two separate bodies 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.

The MUTA should undertake all work related to urban mobility in the city. This will include: strategic and policy functions; regulatory functions; integrated planning; transport demand management; organising services; providing common services; resolution of day-to-day matters and monitoring the work assigned to implementing agencies both for the city and the surrounding region. For MUTA to be effective it should be backed by legislation and the entire funding for urban transport should be routed through MUTA. All one million plus cities should have an MUTA and this should be incorporated in an inter-municipal cooperative manner. In large five million plus cities, the MUTA should host its own counterpart to the Office of Transport Strategy (OTS), which would be a dedicated technical-strategy team looking at future plans and responsible for analysing alternative project possibilities and technologies and then undertaking a broad-based consultation exercise to inform decision makers on the options. This function of the OTS could be centralised at the state level for other million plus and smaller cities in the state.

While inter-municipal bodies are common in many countries there are, very few Indian instances. Some can however be witnessed, as in a couple of municipalities north of Mumbai, when a cluster of smaller towns cooperate to run common facilities such as

Box 5.17
Unified Transport Authority: The Case of London

The Greater London Authority is a unitary authority headed by a directly elected mayor. It is responsible for a number of functions including transport, policing, fire and emergency planning, economic development, land use planning, culture, environment, and health.

Within the transport sector the Mayor is responsible not only for public transport but also for the major road system and for traffic management and parking policy. By combining these functions he is able to formulate transport policy on a comprehensive and strategic basis, integrating the traffic and public transport functions and determining the priorities for expenditure in the sector. The Mayor sets bus, underground and taxi fares, and determines how much money is available for procuring tendered services. He might thus be regarded as a one-man elected Transport Authority.

While key strategic powers rest with the Mayor, operational responsibility lies with Transport for London (TfL), which is accountable to the Mayor and responsible for delivering an integrated and sustainable 'Mayor's Transport Strategy'. The Strategy covers all modes for which TfL has responsibility including buses, metro, roads, walking, cycling, freight and water transport. Although not responsible for sub-urban rail, the Strategy promotes a policy of partnership with the responsible agency.

In addition to the Strategy, Transport for London (TfL) is responsible for:

- Managing the 580 km network of major roads termed the Transport for London Road Network (TLRN)
- Managing/operating/owning all traffic signals (about 4800 installations)
- Managing London Buses through London Bus Services Ltd which regulates the service (provided by over some 3730 kms of bus routes), contracts the routes to the private sector (operating some 7000+ buses); TfL provides and owns infrastructure (stops, terminals) and finances on-road bus priority (currently 1000 bus lanes totalling 240+ kms) on both its own TLRN roads and Borough (2nd tier authority) roads
- Managing London Underground (the metro system)
- Managing/operating/owning some lesser public transport services such as London River Services, Trams (28km), and Docklands Light Rail (26km).

The Mayor obtains funds partly from transfers from the central government, partly from local taxation and partly from the congestion charge road-pricing scheme. The level of subsidy has varied greatly over the last two decades. From covering less than 50 per cent of costs from the farebox in the early 1980s, after the introduction of competitive tendering of services from private sector suppliers the deficit was reduced to nearly zero by 1998. Since then, a political decision to increase the quality of service, while keeping fares down has resulted in the deficit rising to about 40 per cent.

Source: Gwilliam (2011d).

fire stations, joint water source development projects, solid waste management facilities and common urban transport routes/buses.

Operation of bus, rail and other guided transit modes, Bus Priority Schemes, Water transport etc. are often entrusted to specialist agencies. This should continue. Construction of infrastructure, operation and maintenance thereafter will be by the relevant agency. Permits for stage carriage operation including para-transit should be issued only as approved by MUTA.

To enable the proposed institutional framework to deliver, it must be provided with adequate means and authority. The best way of imparting the desired strength to institutional framework essentially MUTA is to give it the authority for allocation of funds to various agencies in the city to undertake various UT-related activities. The performance of MUTA can be measured in terms of parameters such as the travel speed and the level of air pollution in the city. Thus the aim should be to have an authority with full powers, but which should be accountable. The mandating of this format of the MUTA needs to be part of any new model legislation on UT developed by the Central Government.

International experience offers two broad lessons for building strong metropolitan transport authorities: first, funding is necessary to create convening power and the ability to motivate coordination across

stakeholders; and second, other than access to funding, there is no one best answer for institutional form to ensure coordination.

There is no 'best practice' strategy for urban transport planning, in part because it is intertwined with other aspects of urban governance. Institutional frameworks can and do take many forms. The case studies summarised in Boxes throughout this report outline a wide range of institutional possibilities, starting with three levels of metropolitan transport coordination. Transport can be part of the duties of a metropolitan-level government, a special-purpose metropolitan-level transport agency that coordinates the systems for a number of city/suburb-level governments in an urban agglomeration, or a public transport authority focused on a public transport system operating on and alongside the infrastructure for private motorised/non-motorised transportation. The legal forms of institutions also vary, with some created by national law, others by state law, and some by voluntary association between municipalities. The organisational structures also vary from being a committee of the municipal government, independent agencies reporting to political appointees of local and in a few cases national government, or companies managed by a board representing stakeholders. It is difficult to rank the varying arrangements' performance given variation in their purposes, institutional context, and limited data.

THE IMPORTANCE OF MUTA FINANCIAL AUTONOMY AND AUTHORITY

The saga of the United States Metropolitan Planning Organisations (MPOs) (Box 5.18) is a particularly well-documented case of the timeframe for developing metropolitan planning organisations. It took five decades and at least three significant pieces of federal legislation in a context with otherwise strong city governments to get to the point where MPOs appear to be able to fight for their own institutional place as representatives of regional interests rather than subsidiaries of state governments in UT planning. It is useful to discuss the experience of these organisations in some detail.

Australia's efforts to integrate transportation illustrate what can happen when the 'integrating agency' does not have its own financial authority. Well-funded road-building departments were simply renamed and merged with lesser-funded agencies. The result: 'the power imbalance within the public service has tended to bias any attempt at "integration" of transport planning, which invariably came to mean a balance strongly in favour of roads.'

The Lagos Metropolitan Area Transport Authority (LAMATA), an accelerated 'big bang' version of institutional reform for specific metropolitan emergencies, was also centreed on creating a new agency with the power to direct investments. The LAMATA Law was signed in January 2002, and the corporate body charged with overseeing all aspects of metropolitan transport planning, from traffic management to public transport was launched in 2003. The independent 13-member Board of Directors comprises representatives of transport operators, transport unions in Lagos state, the organised private sector, the general public, local government areas, and transport related LSG agencies, with a full time Managing Director/Chief Executive Officer (MD/CEO). It functions as a corporation, with private sector levels of pay and open recruitment. LAMATA has the power to levy and collect user charges as well as tariffs, fees, and road taxes approved by the Governor, but also relies on the World Bank for 40 per cent of its funding (and 80 per cent when started). According to Gwilliam[51], 'LAMATA has already been successful in (a) preparing a strategic long-term plan for the transport sector in Lagos; (b) coordinating activities of the multiple agencies involved in the sector; (c) rationalising motor vehicle tax administration, resulting in a substantial increase in revenues; (d) maintaining, upgrading, and rehabilitating 632 km of the declared road network; (e) implementing a pilot Bus Rapid Transit (BRT) "Lite" system from Mile 12 to Church Missionary Society (CMS); and (f) most important, changing the attitude among users towards bus transport system'. It is not clear how widely applicable or scalable this model would be, nor is there substantial documentation of its successes and failures.

OTHER EXISTING AGENCIES

Existing agencies managing various components of urban transport will continue to be a part of the institutional framework as the third level in the cities for executing works as per the prioritised programme approved by the MUTA. The professional skill with existing agencies in implementation and operation will be much needed. It is important that the large number of agencies presently involved do not feel left out. The respective city agency will be responsible for maintenance of assets as well.

STATE GOVERNMENT

UT is intertwined with urban development which is primarily a state subject and hence the State Government should play a pro-active role in the growth of UT facilities in its cities. It should create a separate department to deal with UT within the urban development or municipal administration departments. The State Government should lay down policies, administer laws, rules and regulations, organise education and enforcement and allot funds to cities on a pre-determined basis. It should assist the cities with guidelines and manuals to plan and provide sustainable urban transport.

The regulatory functions of licensing, vehicle inspection and enforcement may continue with the Transport Commissioner. All other functions relat-

51. Gwilliam (2011d).

Box 5.18
Metropolitan Planning Organisations

The United States' Metropolitan Planning Organisations, today one of the more powerful local-level transport agencies in the world, came about when the Federal Highway Act (1962) required urban areas with population of more than 50,000 to form an MPO. These were advisory bodies in the early years; charged with representing metropolitan concerns in a 'continuous, comprehensive, and cooperative' planning framework but without the financial authority to transform these concerns into investments. They were nominally distinct from state governments, but state governments often sat on the consultative committees and staffed the technical agencies that supported MPO analysis. In some case the MPOs effectively acted as administrative subdivisions of the state departments of transportation (DOT). The MPOs appeared to be an after-thought to put a technocratic gloss on the political decision to include substantial funding for urban highways in the Federal Aid Highways Act of 1956.

Thirty years later, as national focus on the interstate system subsided and the challenges of connecting urban nodes into the national grid became more apparent, the national government passed legislation to strengthen the MPOs. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) reorganised the legal basis for MPOs to make state agencies stakeholders rather than advisees. The federal government began to provide significant transportation funding directly to MPOs, along with making their function and powers more uniform across metros. A fifth of ISTEA funds, or more than $9 billion of Surface Transport Programme funds, were to be spent by 137 of the larger MPOs covering populations of 200,000 or more. ISTEA also tasked MPOs with new responsibilities: to make sure that the metropolitan transport plans were fiscally consistent (could be paid for with funds that were likely to come in) and to run mandatory participatory processes for public and private stakeholders. Large MPOs were required to include representatives of local and state government as well as heads of transport system on their policy-setting boards. The legislation requires the MPOs' Transport Improvement Plans (TIP) to be included in the state's TIP without modification, though the states do have some discretion about how to allocate some parts of federal transport aid across jurisdictions.

The federal government re-affirmed the MPOs' position in the Transportation Equity Act for the 21st Century (TEA-21), providing more funding and new responsibilities for MPOs. The federal re-affirmation of the strong MPO seemed to help tip the scales toward MPOs, though an 2002 evaluation of six large MPOs found that the relationship between the MPO and state Department of Transport (formerly the dominant sub-national transport entity) varied and that the perceived quality of the relationship was correlated with the perceived extent of the performance on meeting long-run transport needs.

The power to determine how federal funding was spent was clearly a turning point for U.S. MPOs. The 1991 transfer of federal funding to MPOs was not a trivial change; it was the first time that federal gas tax revenues were transferred to any sub-national entity other than state transportation departments. Still, legislative empowerment did not immediately transform MPOs' actual ability to pull stakeholders including state government departments together. While ISTEA placed MPOs in charge of developing transportation plans and gave them new financial powers, it directed them to work 'in cooperation' with their state governments without specifying the details of 'cooperation'. Many states resisted.

Available evidence from the literature and our own research suggest that MPOs and state DOTs are only now beginning to discover how to make their new relationship operate effectively. As recently as 1995, MPOs generally gave poor ratings (an average of 3.07 on a scale of 1 to 10) to their relationships with state DOTs (Gage and McDowell 1995, pp. 148-49). Well into the mid-1990s, some states continued to resist granting MPOs their full statutory role in the transportation planning process, either by refusing to allocate federal funds to them or by dominating voting power within them. In five states, including Virginia and North Carolina, governors delegated veto power over MPO decisions to their state DOTs, effectively undermining MPO authority (Prendergast 1994, p. 41). The New York State DOT directly controlled the staff of the New York Metropolitan Transportation Commission, hampering the regional agency's ability to operate Metropolitan Planning Partnerships independently, reducing the full participation of local officials, and preventing the agency from taking a true leadership role in its region (vanderWilden et al. 1996, pp. 9-11). In several other cases (e.g., Milwaukee), MPOs have been given only partial project selection authority.

Tensions between states and MPOs on procedural matters continue: MPOs are supposed to develop plans to respond to air quality mandates, but the state actually compiles the full investment plans and determines what gets into the plan for meeting attainment goals. This has led to solutions that the MPO sees as ineffective for air quality and bad for transportation, while the air quality agencies feel that the MPO is not open enough about its plans as they are being formed and might be revised.

Today's MPOs, however, are significantly anchored in municipal government, with 42 per cent of the board seats held by municipal elected officials. Nearly all have legal and fiscal powers independent of the state departments of transport, though many are intertwined with regional councils of government or municipal governments. Still, the Association of American MPOs (AMPO) (http://www.ampo.org [accessed 21 January 2014]) continues to argue for more powers and funding to be devolved to MPOs from states. MPOs are responsible for large pools of federal money, but they do not have formal powers to coordinate or obtain information or plans or otherwise link to state agencies in order to fulfill their mandate. They have no taxation powers.

ed to planning and provision of services in the city should be looked after by the department of urban transport.

With respect to traffic safety the establishment of a high level, multi-agency working group, generating comprehensive safety programmes, has led to very significant and rapid improvements in road safety in cities as widely spread as Melbourne, Durban, and Brasilia. A board should be set up in each state to deal with safety issues in a comprehensive manner.

CENTRAL GOVERNMENT

The Ministry of Urban Development is the nodal ministry for urban transport at the centre. Two joint secretary level posts with some support staff are currently functional in the Ministry. NTDPC proposes that this UT department gets strengthened with a strong technical unit and data cell. As and when a new Ministry of Transport is developed, the UT department in the Ministry of Urban Development would focus on advising the Ministry of Transport on urban transport issues and their linkages with broader urban development goals. This integration of UT with broader transport strategy responsibilities is consistent with international practice.

The Central Government should lay down a national policy framework for urban transport; enact laws as required to uphold this framework; draft regulations and lay down planning standards and norms for national common standards (without restricting local operational efforts to achieve these outcomes); prepare guidelines and manuals including those for private sector participation; design, install and maintain standards for a common national database built from state and metropolitan databases; disseminate data; promote research in UT including safety issues; and organise capacity building.

Another important role for the Central Government is to supplement the financial support provided by states to cities on a pre-determined basis to enable them to plan and coordinate the implementation of major infrastructure augmentation schemes including bus and rail transit. Such funding should be designed to focus on incentives on outcomes while remaining technology-neutral for approach to urban mobility. In addition, the Central Government may help with the setting up of an effective institutional framework across states and cities.

LEGISLATION

There is no single legislation at present that covers the requirements of UT comprehensively. Urban transport will inevitably be influenced by a number of Acts, ranging from the Motor Vehicles act addressing vehicle licensing to the Air (Prevention and Control of Pollution) Act addressing ambient air standards and forming the basis for emissions controls, to frameworks for public-private partnerships and Acts governing specific modes of transport.

This poses two challenges: First, reworking of technology-specific Acts to ensure that they are coherent in their treatment of how states and cities approach a particular purpose. The Railway Act, Metro Construction Act, and Tramways Act, for example, should be examined and, if needed, amended to be mutually consistent in their treatment of rail-based urban transport. The second challenge concerns ongoing coherence in the policy framework given the many different goals for which laws are enacted.

The Office of Transport Strategy and the national Ministry of Urban Development could be focal

Too often, decisions are reactive, buffeted by events, and struggling to keep on course. A risk management framework has the potential to quickly transform a city's urban transport management style from reactive to proactive.

points for ongoing research and consultation to identify areas of conflict and suggest resolution.

States may also wish to enact comprehensive Urban Transport Acts addressing system characteristics, liability, pricing, safety, and other aspects. In the current Constitutional setting, however, these would not supercede national policy, so the Ministry of Urban Development would also have to develop an enabling framework for these State Acts.

UT plans have to be implemented over a period of time and hence require continuity. Urban transport however has many characteristics that need to be firmly established and would benefit from a legislation to set aside ambiguity and fragmentation that are negatively impacting the development of the sector in India. Such Acts have been implemented in Eastern Europe and Latin America in the recent past.

IMPROVING IMPLEMENTATION PROCESSES

At the implementation level, there is also a strong need to improve institutional and human capacity. It does not take long for city leaders to run up against challenges of implementation. Implementation currently at the city level is often confined to major roads. In instances where comprehensive plans were actually implemented, the results are not yet available. There is little evidence of effective asset management or performance monitoring.

This poor record can be explained by governments' failure to create processes to translate strategies and plans into operation. These processes are features of sustainable cities. Putting them in place does not require more effort per se but rather more effective effort. To achieve that, authorities need to manage cities and plan transport strategies and projects proactively. To do this, planners must analyse and manage strategic risk.

Too often, the sector decisions are reactive, buffeted by events, and struggling to keep on course. A risk management framework has the potential to quickly transform a city's UT management style from reactive to proactive. To make projects more adaptable, and suitable for the future, planners should create a technically sound strategy that has robust performance in the uncertain future and enjoys stakeholder support. To formulate coherent plans, to identify and develop effective projects and policies, and to manage the transport system proactively, one must employ strategic processes. Along with this, a transport asset and performance management process also needs to be adopted at the city level, wherein processes should facilitate the proactive management of the city's transport system and should create pressure for improvements, due to fair performance assessment and monitoring (e.g., Box 5.19 for the city of London).

Transport systems comprise valuable assets such as roads and equipment, which deteriorate and require investments for their maintenance, upgrading, or replacement. Politicians and city authorities of most cities ignore this responsibility, seeming to find new projects more appealing than the mundane management of the city's asset base. For this reason, asset management is often an 'elephant in the room'. Actors fail to recognise that the good functioning of the public and private transport system depends on well-managed transport assets without which the city would cease to function.

CAPACITY BUILDING

The second important requirement besides institutional clarity and a clear legislative framework, in meeting the challenge of sustainable urban transport, is to improve the skills, knowledge and capacity of decision makers and implementers at the city and state levels. Unfortunately the capability for undertaking a coordinated approach addressing the issues involved is lacking at the State Government- and City-level. There is an urgent need for capacity building; both institutional and individual.

Individual capacity building should be in two parts; city officials and university-educated professionals. The focus of training for existing city officials should be to develop awareness, skills and a deeper understanding of the requisite issues in urban transport. The focus of the education component should be to create a pool of skilled manpower to be available in the country for recruitment by various organisations engaged in UT. Alumni from such training programmes should be potential recruits for State Transport Corporations, State Transport Departments, municipal bodies etc. Simultaneously State Governments should be encouraged to create a cadre of urban transport professionals and create jobs for such professionals.

The Ministry of Urban Development, Government of India has initiated the establishment of centres of excellence, which are expected to create new knowledge and train UT professionals. Based on the success of this initiative the MOUD is keen to set up more such centres. These centres are important precursors to stronger MUTAs, enabling urban areas to build up expert groups with roots in the local context.

Box 5.19
City of London Performance Indicators

Every local authority in the United Kingdom is required to produce an annual monitoring report that charts its progress in achieving the policy objectives of its local plan. Objectives cover business development, housing, air quality, parking, and other aspects of civic life. Quantified performance indicators are identified for monitoring purposes and the results are made public to allow comparison between authorities. This creates pressure for improved performance. The City of London goes to great lengths to market its performance as a way of attracting foreign investment and to help ensure future prosperity.

Source: http://www.cityoflondon.gov.uk/Corporation/LGNL_Services/Council_and_democracyPerformance/Council-performance_indicators. htm (accessed on 21 June 2011).

These should be aided by incentives from the Ministry of Human Resources Development along with financial outlays from the MOUD, for creation of new faculty positions and provision of research scholarships. Alongside this the curriculum in universities should be reviewed from time to time to ensure that the graduating professionals, have imbibed the most modern knowledge base, such as planning and design of BRT, facilities for NMT, etc, in the current context.

A concerted effort is also needed to upgrade skills in the sector. Currently, most planning is done by consulting agencies appointed by cities. It now appears that neither do the consultants always have the desired level of skill in the assigned task nor do the cities have the necessary skills to supervise and monitor the work of the consultant. A compulsory system of certifying experts to handle specific tasks perhaps needs to be introduced. Capacity building is an ongoing need and hence should be institutionalised.

The MOUD has launched a comprehensive scheme for capacity building for UT. It involves the following 10 activities:

- Training
- Education: Development of curriculum and faculty development of academic Institutes
- Dissemination of information–Conferences and Journals
- Development of legal and administrative frameworks
- Development of manuals, codes and standards
- Development and strengthening of Institute of Urban Transport (India), a national level institute for, training, coordinating research and dissemination of information
- Development of a National database
- Promotion of National level consultancy organisations to provide a pool of professional manpower to assist state/city governments
- Setting up of institutions for the Research and Design; and safety certification of externally guided rail-based transit systems and other new systems that may be developed for urban transport
- Setting up of Unified Metropolitan Transport Authority (UMTA) and Urban Transport Cell in various mission cities.

This scheme is consistent with the institutional development outlined here, though the new UMTAs should be created along the lines of the MUTAs discussed here rather than as additional consultative committees.

This scheme should be run for a few years and then pursued based on its effectiveness. Presently UT is not the responsibility of any dedicated organisation in a city or state. UT professionals are generally not employed by transportation agencies which are essentially staffed by administrators. There is a general lack of UT skills amongst city/state officials of other departments involved in urban transport. For the training and skill building programme to be beneficial, states should be mandated to immediately constitute a dedicated agency for UT in each city with a million plus population and at the state level, create a cadre of UT professionals. States should also identify officials to be appointed to these agencies, send them for training and on return post them to these agencies/departments.

RECRUITMENT AND RETENTION OF PROFESSIONAL STAFF

Recruitment and retention of trained UT professionals in various cities is essential. The main reason for lack of professional skill in cities is that the few UT professionals today do not have career growth prospects in states/cities. Institutional framework must therefore be such that the professionals get their due place in the scheme of things in the city and are offered reasonable career prospects.

Recruitment and retention of trained urban transport professionals in various cities is essential. The main reason for lack of professional skill in cities is that the few UT professionals today do not have career growth prospects in states/cities.

It is proposed that the states create a new state cadre of UT professionals to be posted to various cities and managed by the UT group within the Office of Transport Strategy). These professionals would also be eligible to rotate through the UT group at the Ministry of Urban Development and Ministry of Transport (when formed).

KNOWLEDGE MANAGEMENT AND DATABASE

The virtual lack of a database has severely constrained the ability to formulate sound UT policies and plans and reliably assess the impact of different initiatives that have been taken. Action has been initiated by MOUD to set up a 'Knowledge Management and Database Centre' (KMC) with the support of some external funding agencies, but the efforts in this area need to be scaled up. The NUTP has recommended the setting up of a national level institute to build up a database and be a national store house for all UT sector related data and information. Similar database centres should be set up by state governments and large cities as well. These data centres are another precursor to building metropolitan capacity and integrated decision-making–they create a common understanding of the challenge.

This KMC at the national as well as state levels should have a full fledged library and a publishing wing. The library will include not only books but also national and international journals and periodicals, project reports, study reports, manuals, tool kits and all other such material. The library is to provide a single window for accessing relevant text and reference material, particularly by professionals, students, planners and researchers, with an e-catalogue on its website with appropriate linkages. Data from Masters and PhD thesis work will be channeled into the database. Regular collection of data and information, both from primary and secondary sources to keep the data base and the library at the proposed KMC up-to-date should be institutionalised.

RESEARCH AND DEVELOPMENT AND TECHNOLOGY UPGRADE

Research in UT in India is being undertaken mainly as an academic exercise without any coordination and without trying to match it with the need of the users. Over the last 10 years nearly 1,400 research projects on transport have been undertaken by 20 organisations as reported in the CRRI reports. These include 11 research organisations such as CRRI and nine academic institutes. Only about 200 projects relate to urban transport. Research in UT in the country needs to be stepped up urgently in a coordinated manner and its dissemination organised.

INVESTMENT REQUIREMENTS AND FINANCING

The funding requirements for UT is the largest when compared to other urban development and infrastructure services sectors such as water supply, sanitation, waste management, etc., including housing. Given that this sector has received meager funding in the past, it is essential that sufficient funds be available if the vision of sustainable UT is to be realised. However, while the funding made available has to be at the scale and size of the requirements providing for adequate funding isn't the only aspect of the financing challenge. Development of an appropriate financing and a sound funding system is central to ensuring that the high levels of funding that flow into this sector result in sustainable outcomes, across the country.

GOALS TO BE ACHIEVED BY THE YEAR 2032

For augmentation of public transport infrastructure goals as framed by the committee are listed below. The order of priority from a national perspective, in which the investments need to happen are in the order laid out below. The first two are essential and need to be prioritised at a nationwide level for safety and security purposes. However as discussed in the above section, these will essentially have to be choices made by each city and taken at the city government level and not imposed by either the Central or state Governments.

1. Creation of an effective institutional and implementation framework as well as capacity building arrangements to manage urban transport and projected investments
2. Walk and cycle lanes to be provided in all 100,000 plus population cities and state capitals
3. Development of organised dense city bus service as per urban bus specifications i.e. Vehicle tracking Systems (VTS) and Passenger Information Systems (PIS) in all 100,000 plus population cities and state capitals
4. As a thumb rule BRTs of approximately 20 km/1 million population in cities with population >1 million may be needed and investment requirements could be based on this assumption
5. Road network in all 100,000 plus population cities to be completed with missing links and with good surface and drainage
6. Smaller cities starting from 20,000 population should also have organised urban public transport, with the use of para-transit modes

7. Metro rail projects to be planned based on the findings of a comprehensive mobility plan for the city. Initially, to be restricted to cities with 5 million plus population if required. Principle should be the ability of the city to cover all costs through user charges or fiscal costs.
8. Safety, safety audit and security to be upgraded
9. Technology to be used for Multimodal integration, Enforcement and traffic management
10. Suburban rail services to be considered in urban agglomerations with population >4 million.

INVESTMENT REQUIREMENTS

The Working group on Urban Transport constituted under the NTDPC (WGUT) has made investment requirement projections for the urban transport sector till the year 2030. The estimates have been developed for three scenarios as listed below:

- **Scenario 1:** the Business as usual (BAU); which assumes that policies, strategies and trends continue as witnessed currently. The WGUT estimated that if current trends continue an investment of Rs 22.78 trillion, will be required over the next 20 years.
- **Scenario 2:** The intermediate scenario is a scenario which has been estimated by the WGUT to be in between the desired sustainable scenario and the BAU scenario Rs 17 trillion.
- **Scenario 3:** Desired scenario; is the scenario which will be closest to the sustainable urban transport scenario. The estimated investment requirement will be Rs 15 trillion.

Average annual outlays are in the range of **Rs 750 billion to Rs 1 trillion** across scenarios.

Investment of the order envisaged in the future far exceeds what has been achieved so far, though, it is difficult to estimate the total expenditure incurred by cities currently. It is very interesting to note that the investment required in the desirable scenario– which is a more environmentally sustainable scenario, is much lower compared to the BAU scenario. However, which scenario India achieves depends on how fast and how effectively various policy interventions needed to achieve the vision for 2030 are implemented. Given that capacities in the sector are currently weak it will take effort and time to scale up the expenditure to required levels. Assuming the intermediate i.e., scenario 2 is achieved, the investment during every five-year period in the next 20 years will be in the range Rs 2, 4, 5 and 6 trillion for each following plan period.

COMPONENT-WISE REQUIREMENT

As per the WGUT's projections, roads account for the largest share of investments, 70-80 per cent across all scenarios.

- On an average, 10-15,000 km of new streets need to be developed
- Another 10,000 km of road are to be reconstructed
- 20 per cent of estimated expenditure on roads is required for non-motorised vehicles (NMV) and pedestrian facilities

Also, public transport requirements in terms of network and fleet require significant investments (20-30 per cent)

- Although the WGUT has projected that 500 to 700 km of Mass Rapid Transit Network needs to be built every year, this does not appear to be feasible, or even desirable
- To sustain growth 50-60 per cent of trips should be on public transport.
- Buses form the backbone of transport in major cities (30-40 per cent share).
- Tempos/Auto-rickshaws are major modes of public transport especially in many small and medium sized cities. Since about 40 per cent of the urban population will reside in small and medium towns, this mode will continue to play a critical role as public transport provider (5-10 per cent share).
- Rail transit systems are likely to meet about 10-15 per cent of aggregate demand, mainly in mega cities.
- Every year 8-10,000 buses need to be added to take care of replacement needs as well as to accommodate new demand.

Difference in the three scenarios in terms of type of infrastructure and the corresponding investment needs is shown in Table 5.17.

Between the BAU to the desired Sustainable Transport Scenario the use of bus and BRT increases while the use of rail transit decreases. The spending on roads as a percentage of total however seems higher in the sustainable transport scenario, essentially because it also incorporates a range of sub components, aimed at improving the safety and convenience for pedestrians, non-motorised vehicles including cycle-rickshaws.

COMPARISON OF INVESTMENTS REQUIREMENT PROJECTIONS: THREE RECENT STUDIES

Table 5.18 compares the investments projected in Study reports by the McKinsey Global Institute (MGI, 2009), the High Powered Expert Committee (HPEC, 2010) appointed by the MOUD, and the study by the Need Assessment sub-group of the Working group on Urban Transport.

The investments estimated by all three studies/ reports are comparable at the aggregate level. However, the MGI study focuses much more on Mass Rapid Transit while the HPEC report lays much more

emphasis on Urban Roads, both attributing it to the huge backlog. The estimate by the WGUT is more in line with the HPEC projections. Details of the projection methodologies of the two reports are placed in Annex A.

FINANCING FOR NEW INVESTMENTS AND OPERATIONS AND MAINTENANCE

The estimates of investment outlined above need a financing strategy to support them. Given the distribution of taxation powers between the Centre, the states and local Bodies, currently the only viable method of financing the large scale investments required in UT including the establishment of new mass rapid transit infrastructure would be through capital funding support from the Centre (or state) to the cities for new projects, even if such funding can then be serviced over time through user charges and local imports.

The strategy proposed for funding capital cost and operation and maintenance expenses of UT projects is based on a two pronged approach. This consists on developing and promoting a consortium approach in which Centre, state and city, along with various agencies and the private sector participate in co-financing new investments and simultaneously creating robust **urban transport funds at the national, state and city levels.**

The creation of robust national, state and local funds, will ensure that diversity of funding instruments that are used to create sustainable financial structures that can add the requisite level of predictability and confidence to the UT sector. This, alongwith the use of consortium based funding for large mass transit projects or citywise – citywide, public transport improvement programmes, will also ensure (a) high levels of transparency and accountability around project development and implementation, and (b) evolving project/programme specific financial structures which are better tailored to the specific requirement of each project and city circumstance. However other than just raising the financial resources required for this system to function well and improve over time, clear affordability parameters, prioritisation principles and expenditure management responsibility and rules would need to be established. This also implies that institutional accountability and authority for UT have to be firmly entrusted to local government's, which have to be strengthened with adequate resources to shoulder this responsibility.

BASIC SOURCES OF FINANCES

Financing of the investment needed for consortium funding will come from six key sources; (a) user charges, (b) support from national Government, (c) tax concessions and dedicated levies, (d) Land Monetization, (e) recovery from non-user beneficiaries and (f) debt and PPP. These are discussed in detail below.

(a) **User charges:** The main source of direct funds for UT projects are user charges. However, most systems internationally and in India, do not rely on user charges alone. The low levels of affordability of a large section of society in India, alongwith political considerations do not permit full cost recovery through these. However, user charges are the most stable source of revenue for projects and strategies need to be adopted to try and achieve a situation where most of the project costs are met from user charges. User charges are essentially a local government or operator-levied charge and therefore the funds available represent the local contribution in a consortium funding scenario. User charges are often the most predictable revenue source for the project. They should essentially look to at least cover all operation and maintenance expenses related to the project. If this is achieved the quality of services delivered by the system will be free from uncertainties associated with all other financing mechanisms discussed later. However, operating and maintenance losses, when only user charges are taken into account, in public transport services are quite common. This is because user charges cannot be increased indefinitely as there is an optimal limit to them after which the revenue would decrease due to commuters limiting their use of the facility. Also, transportation projects are often planned not as revenue or profit maximising business enterprises, but because of their positive impact on the wider economic, social, environmental and physical landscape, thereby justifying the use of other sources of financing to be used to develop, operate and maintain some elements of the system.

(b) Support from national government is linked with the national budget, hence often unpredictable and inadequate, given the large number of national priorities. Central support can also be designed as schemes funded through the five year plans, such as JNNURM or RAY, though care must be taken to ensure that funding creates strong incentives for UT outcomes rather than approaches. While the JNNURM scheme has been funding urban transport projects in terms of grants, as discussed in an earlier section it is not well-designed for UT projects. Other than this, there is also a strong case that part of the Central Road Fund (CRF) should also become available for UT projects. Given that the CRF has already been used to fund the construction of national highways,

Table 5.17
Percentage Share of Investment Required: Three Scenarios

	SCENARIO-1	SCENARIO-2	SCENARIO-3
Street Infrastructure	70.08	71.90	78.48
Buses	1.19	1.63	2.00
BRTS Network-km	3.37	4.07	3.95
Rail Transit-km	23.74	19.77	12.25
Depot	0.51	0.74	0.86
Terminals	0.29	0.50	0.65
Workshops	0.08	0.13	0.15
ITS &ATC	0.42	0.72	0.95
Parking	0.29	0.50	0.65
Capacity Building	0.03	0.05	0.06
Grand Total	100.00	100.00	100.00

it is recommended that going forward the primary application of this fund could be for UT as the CRF's primary revenue source is a surcharge on petrol and about 80 per cent of petrol is used in urban areas.

Additional funding has to be generated from the last four sources.

(c) **Tax concessions and dedicated levies:** Tax concessions in India potentially reduce the funding requirements by nearly 20 per cent at the project cost level. This would be part of all national, state and local projects on which taxes are being foregone.

Central and state taxes constitute up to 15 per cent of the cost in rail transit projects and up to 19 per cent in the case of buses[52]. Since public transport is a social necessity, it should not be treated as a business venture. In the case of Delhi Metro, remission of taxes was extended for Phase-I and Phase-II of the project. To improve the financial viability of public transport, Central and state taxes concessions should be extended to all public transport systems at least for the next 10 to 15 years, by which time public transport will become the preferred mode of transport. These tax and duty remissions should be extended to projects undertaken by the private sector as well.

Subsidy in the form of cheaper electricity, etc can also be justified if public transport and intermediate public transport are not treated as commercial activities and accordingly, revenue generating activities. The fact is that these are social services and need to be viewed differently with the appreciation that all sections of the population are to be provided with safe, speedy, comfortable modes of public transport at affordable prices.

(d) **Land monetisation:** the value created in the proximity zones can be recovered through land monetisation; i.e., a 'Betterment Levy' or 'Land Value Tax' or enhanced property tax or grant of development rights. This will be a local body contribution in a consortium funding scenario.

(e) **Recovery from non-user beneficiaries:** Dedicated levies can be levied on non-user beneficiaries mainly users of private modes. This revenue source depending on which institution is best placed to capture it could

52. NTDPC, Working Group on Urban Transport, 2012.

Table 5.18
Comparison of Investment Estimates for Urban Transport by Various Committees (2010-30)

ITEM	MGI	HPEC	WGUT	WGUT	WGUT
			SPRAWL	INTERMEDIARY	DESIRED
Urban Roads	8.90	17.29	12.08	9.41	9.17
Transit	17.64	4.49	10.55	7.44	5.56
Others	0.50	0.90	0.15	0.15	0.27
TOTAL	**27.04**	**22.68**	**22.78**	**17.00**	**15.00**

Source: NTDPC Research.
Note: MGI: McKinsey Global Institute; HPEC: High-Power Expert Committee, Government of India; WGUT: Working Group on Urban Transport, NTDPC.

be part of the state or local contribution to a consortium-based funding arrangement.

It is now widely recognised that governments should (for ecological, equity and economic reasons) make a distinction between investments that generate value for public good, and those that generate value for private benefit. The incidental private benefit that accrues to private modes of travel from public investments in infrastructure should be tapped either to recover a portion of the investments or to develop new funds for future investments.

The source of income from private vehicles is through taxes levied on their consumption of fuel. Typically, cities can add taxes or cesses applicable within their jurisdiction, collecting money for use in making improvements to public transport schemes. Congestion pricing, parking fees, fuel taxes and cesses, all have one important feature—they are easy connectors between private use of scarce resources (urban space and fuel) and their application for public use (in transport systems, for pedestrian improvements, bicycle paths, etc). As such, they have considerable acceptance among the public, especially in these days of increasing consciousness about the environmental impacts of human activity.

Another source of funds that has emerged in recent years is carbon credits. However, the overall trading scenario around such credits is full of uncertainty. Effective planning around these trading regimes is complex, and they cannot be counted upon as consistent sources of revenue and funding.

Annual fees in lieu of lifetime taxes should also be considered for all users alongside public transport projects. There needs to be annual validation of driving license as well as registration certificate; and annual road tax instead of life time road tax. This is as per global practices and can be implemented now with the advent of technology and possibility of payment through the internet and other low cost/effort modes. This move will while improving safety and environmental compliance also enhance government revenues which can then be used to fund other public transport projects.

(f) **Commercial debt and raising initial project cost through PPPs:** This is another area which can make available significant resources through institutional credit and capital, in projects, which are well-structured and where the various primary revenue sources are secured and committed. In typical consortium based project finance structures for large projects due to increasing limitations on government funding, the private sector is being involved. Both the government and the private partner contribute equity and raise debt for the balance amount. Bilateral soft loans should be tapped and funding from multi-lateral agencies should not be ruled out.

PUBLIC-PRIVATE PARTNERSHIP

The experience of PPP has been mixed. One consensus view that emerged was that it may be prudent, to divide public-private partnerships in the transport sector into two phases—one, early-stage PPPs during the establishment of a project (say, during the first five to seven years) to bring in specific expertise pertaining to the creation of infrastructure, and two, for long-term operations, the terms for which can be identified after a running stability has been achieved for the project. While the loan life need not match life of assets and should be left to the market, in the case of megaprojects, if longer loan repayment periods can be worked out, it could become more viable.

Box 5.20

Financing Urban Transport: Avenues for Local Authority Borrowing

The most critical avenue for sustained financing of urban infrastructure will be domestic credit markets. In designing local credit initiatives to reduce the private sector's perceived risks of financing urban infrastructure and to mobilize domestic resources through domestic capital markets, a number of countries have adopted innovative measures that are some combination of the municipal bonds models of North America and Western Europe with access to long-term savings deposits and government contributions.

These initiatives to help mobilise domestic commercial debt resources for sub-sovereign infrastructure finance include the creation of:

- Quasi-independent municipal credit institutions—such as the Municipal Development Fund in the Philippines, the Municipal Fund for Infrastructure Finance in the Czech Republic, and the Tamil Nadu Urban Development Fund of India—to channel borrowed and grant funds to local governments
- Credit-enhancement mechanisms such as the Local Government Units Guarantee Corporation in the Philippines and the Infrastructure Credit Guarantee Fund in the Republic of Korea
- Special purpose vehicles such as the Water and Sanitation Pooled Funds in Tamil Nadu and Karnataka in India to raise finance for small municipalities through bonds, the Investment Fund for Urban Development in Vietnam, and the Urban Development Investment Corporations in China) to manage specific sectors of urban infrastructure in each of the major cities. Using special purpose vehicles as pilot issuers of municipal bonds is being actively considered in China.

Source: Gwilliam (2011c).

BOT finds extensive application in transport infrastructure projects. In the BOT framework, a public administration or any institution, which does not have adequate capabilities, resources or inclination to raise resources, execute and manage large projects by itself, delegates to a private sector entity, to design and build infrastructure and to operate and maintain these facilities for a certain period.

In general, a project is financially viable for the private entity if the revenues generated by the project cover its cost and provide sufficient return on investment. On the other hand, the viability of the project for the host government/institution depends on its efficiency in comparison with the economics of financing the project with public funds/borrowings. Other factors like, the expertise and efficiency that the private entity is expected to bring, as well as the risk transfer could warrant a BOT Model.

NATIONAL, STATE AND LOCAL URBAN TRANSPORT FUNDS

The second component of the financing strategy recommended is the creation of urban transport funds at the three tiers of government, which capture resources from the mechanisms described above along with enhancing fund availability though a few suggested sources, as described here.

Since there are huge investment needs for urban transport and competing demands for resources on the budgets of the Central and state Governments, traditional budgetary sources alone will not be adequate. The NTDPC recommends that new innovative financing mechanisms are put in place. Learning from the global examples, dedicated (non-lapsable and non-fungible) Urban Transport Funds (UTFs) should be set up at National, State and City levels. A National Fund has already been envisaged in NUTP, 2006. The UTFs, apart from meeting capital needs, may also be required to cater to certain operational needs of large infrastructure projects. The UTFs should be funded in a robust manner by implementing the following measures[53]:

- **Levy of a Green Cess of Rs 2 per litre on petrol sold across the country:** the rationale here is that petrol is consumed exclusively by personalised vehicles. A Green Cess on diesel is not recommended because of multiple uses of diesel and the problems anticipated in segregating diesel sold for personalised vehicles. However, we may need to reconsider this position if a significant fraction of personal vehicles start using diesel. The estimated

53. This funding mechanism for augmenting the resources for the urban sector has been recommended both by the NTDPC Working Group and by Planning Commission's Working Group on Urban Transport for 12th Five Year Plan.

Box 5.21
Land-Based Financing of Urban Transport : Public Sector Joint Venture

An alternative to the Central government corporation is the creation of a joint venture between Central government and the conurbation or municipal authority which is to be relieved by the overflow. Orestad in Denmark is a good example of this approach. Orestad is a new town outside Copenhagen connected to central Copenhagen by a 22-km automated metro serving 60 million passengers a year, which began operations in 2003. It was planned, developed, and financed through such a joint venture between central and municipal government. The government provided land amounting to 45 per cent of the 310-hectare site. Copenhagen owned and contributed the other 55 per cent of land. The two partners share ownership of the developer, Orestad Corporation, in proportion to their contributions of land. Both the infrastructure development for the new town and construction of the metro line are being financed primarily through land sales.

Orestad's development plan called for early construction of the metro line and phased development of six town centres within the overall development site. As a consequence, infrastructure and metro investment has been financed by commercial rate borrowing. At the end of fiscal 2006, total debt stood at DKr 13.7 billion, or $2.75 billion. The debt is being repaid primarily through land sales, supplemented by property taxes on new construction. While land market development was slower than expected, and metro construction was delayed, both land prices and land sales accelerated rapidly as development proceeded and commercial occupancy began. The Orestad Corporation now projects that all borrowing will be repaid ahead of schedule and that all infrastructure and metro construction will be financed, as planned, without government subsidy beyond the land contributions

Source: Gwilliam (2011c).

Box 5.22
Rail Mass Transit: Operations and Maintenance-Earmarked Local Taxes

Rail mass transit systems are usually loss-making. This is not necessarily a reason not to have them if they generate substantial external benefits in terms of reduced congestion and air pollution. But it does raise problems of finance for the responsible authority.

The grant of taxing powers to local authorities can still be used in a very purposeful way if earmarked and conditional on specified behaviour by the subsidiary bodies. The most striking example of this is the French 'versement transport'. Introduced in July 1971 and only applied as mandatory levy in the Paris region, the 'versement transport' payment of transportation (VT) has been successively extended, at the option of the authorities, to the transport authorities of any urban area of at least 10,000 inhabitants which chooses to identify an urban perimeter and introduce a transport organising authority. The VT must be paid by any employer of more than nine employees, except for foundations and non-profit associations whose activities are of social character. Employers who either house their workers or directly provide transport for the journey to work are also exempt. Ceiling rates are still fixed by the law outside the Ile-de-France, though the transit authority is free to set rates below the ceiling. The highest rates are in the Ile de France, where the tax is as high as 2.6 per cent in Paris and the Hauts de Seine, though lower in the outer departments. In 2008 the VT accounted for 35 per cent of the total revenue of the Ile de France transport authority STIF

Source: Gwilliam (2011c).

collection[54] of green cess from petrol in the base year is Rs 31 billion and over the period of first four years is Rs 140 billion.

- **Levy of a Green Cess on existing Personalised Vehicles:** All vehicles in India are required to be insured every year. There are several public and private sector enterprises in India which provides insurance to the vehicles at the rate of 3 per cent of the annual insured value both for car and two wheelers. It is proposed that an additional 4 percent of the vehicle's insured value shall be collected as Green Cess. It is estimated that during the first year the revenue collection will be Rs 180 billion and the collection over first four years will total to Rs 832 billion. For ease of collection, the annual cess will be collected through insurance companies. Insurance companies would return 4 per cent of insured value to the government to be put in the dedicated fund.
- **Levy of a Transport Cess on Purchase of New Cars and Two Wheelers:** at 7.5 per cent of the total cost of the petrol vehicles and 20 per cent in case personalised diesel cars. In case of diesel cars, the transport cess has been recommended at 20 per cent as diesel is available at substantially subsidised price and will continue to be so in near future. The matter of levy of differential rates of cess on diesel and petrol vehicles[55] can be reconsidered when the control on diesel prices is lifted. The estimated collection from this cess is Rs 180 billion in the first year and Rs 888 billion over the first four years.

A fixed proportion (say, 70 per cent or as presented in Annex B) of the resources generated by the above levies, as decided by the Central Government, should be earmarked for UT, and the remaining may be utilised for developing infrastructure for rural[56] transport. These levies will not only help in generating a dedicated pool of resources for taking up urban transport projects but would also serve as a significant disincentive for use of personalised vehicles, as part of the overall strategy for demand management. This will serve the twin purpose of providing quality public transport infrastructure and services at affordable cost and reducing congestion and curtailing travel demand on account of use of personalised vehicles. All these revenue sources have a high impact and high feasibility in terms of annual accrual to the urban transport funds.

At a time when the exchequer faces the dilemma of meeting ever growing demand from various sectors amidst constrained government sources of finances and in an environment where PPP can only marginally meet the financing needs of urban transport, the proposed UTFs present themselves as an effective means for funding urban transport investments. In fact, the actual potential of these sources is much higher than the present yields. **The total estimated yield from these three sources is Rs 400 billion in the first year; it adds up to Rs 1860 billion in first four years and reaches Rs 22 trillion in 20 years**. Detailed calculations and assumptions made are listed in Annex B. These estimates reflect the total availability of transport funds through these levies. As proposed here, a part of these funds could be earmarked for rural transport, and the rest would then go for urban areas.

This report has argued that responsibility for UT should essentially rest at the state and city levels. In the case of large cities with population of over 1 million, this should essentially be at the city level, whereas state governments would need to be responsible for the policies and organisation of urban transport in other towns and cities within their respective states. Consistent with this general proposition of decentralisation of responsibilities for UT, arrangements would need to be made so that UT funds thus collected devolve appropriately to the state and city levels.

Two components of the cesses proposed here, i.e., the cess on petrol and green cess on existing personalised vehicles, would need to be levied and collected by the Central Government[57]. Adequate provisions would have to be made in the budgetary process for the collection and distribution of these components. Until such time as the unified Ministry of Transport, as recommended by the NTDPC is set up, the Ministry of Urban Development could function as the nodal Ministry.

The third component of the cesses proposed, i.e., the transport cess on purchase of new cars and two wheelers, could be levied by the Central Government and collected by the state governments along with VAT at the time of sale of such vehicles.

The devolution of these resources to the state and city level UTFs should be on an entitlement basis and not at the discretion of the central government. The NTDPC recommends that this proposal may be examined by the Finance Commissions, preferably

54. The number of diesel cars has been assumed to be 30 per cent of the total cars as against 35 per cent of the present annual sales.
55. For example, these funds can help in augmenting the resources available for construction of rural roads.
56. As per news reports, in November 2012 the Supreme Court had asked for Government's response on an application that, on the basis of 'polluter-pays' principle, inter-alia asked for imposition of various taxes/charges on vehicles—including imposition of a levy on purchase of diesel cars, and an annual levy on private vehicles in the National Capital Region.
57. In May 2013, the Goa State enacted 'The Goa cess on Products and Substances Causing Pollution (Green Cess) Act 2013' that allowed a cess of up to 2 per cent to be levied on certain products/substances—including petroleum products—causing pollution. The objective of this legislation is to reduce pollution and the proceeds of the green cess shall be used for undertaking measures to reduce the carbon footprint. Even though a State Act has imposed the 'green cess' in this case, we recommend that Central Government legislate on this matter for the sake of uniformity of taxation structure and for administrative convenience.

beginning with the 14th Finance Commission, with a view to devising a robust framework for (a) division of total pool of available resources from the three levies between the urban sector funds (national, state, and city), and the rural sector (b) division of the available urban sector funds between the one national-level fund, various state-level funds, and various city-level funds, in a manner similar to the provisions for tax devolution to state governments that is normally proposed by the Finance Commission.

As proposed, the UTFs would be maintained at three levels—national, state, and metropolitan areas. The proposed national and state-level Offices of Transport Strategy and MUTA should, in due course, administer these funds respectively. Until such time these offices/agencies are set up, the nodal ministries/departments dealing with the subject of urban development at the National/State levels and the Municipal Corporations could administer these funds.

The nodal ministries/departments at the national and state level should distribute the funds collected in a timely and transparent manner as per a formula prescribed by the Central Government based on the recommendations of the Finance Commission. After ascertaining the actual collection of cess/surcharge/tax, the nodal ministry should release the funds expeditiously (on a quarterly basis) to MUTAs/municipal corporations (and other organisations) as mandated by the distribution formula. However, until the Finance Commission's recommendations on the matter are received, NTDPC recommends that at least 70 per cent of the total resources collected from the three levies be earmarked for the urban sector. Further, at least 50 per cent of the total resources earmarked for the urban sector should be transferred[58] to MUTA/municipal corporations, and at least 30 per cent of the total resources earmarked for the urban sector should be transferred to the state governments.

Resources from UTFs maintained at the state level should primarily be used for the transportation needs of smaller urban areas (sub-metropolitan areas). They can also supplement the resources of MUTAs for undertaking large projects. Resources from UTFs maintained at the national level should primarily be utilised for creating infrastructure for training, capacity building, and research activities, and setting up standards for national goals such as safety, efficiency, and environmental impact.

The UTFs at the State and city level could also be supplemented through other sources, like land monetisation, betterment levy, land value tax, enhanced property tax or grant of development rights, advertisement, employment tax, congestion, a cess on the sales tax, parking charges reflecting the true value of the land, traffic challans etc. A model where the National and State Level Funds also contribute to the city level funds over a period of time would ensure that the urban transport responsibility and accountability is well nested at the city level.

Pimpri-Chinchwad Municipal Corporation has already set up a dedicated UTF through land monetization and advertisement rights. Similarly, Karnataka has set up a dedicated UTF through MRTS cess on petrol and diesel sold in Bangalore which is being used to fund the metro rail projects.

Certain items, like employers' tax, have not been considered here because of their low contribution and difficulties in collection. Similarly, certain demand management measures, like congestion charges, have also not been included because of their small contribution.

AFFORDABILITY, PRIORITISATION AND EXPENDITURE RESPONSIBILITY

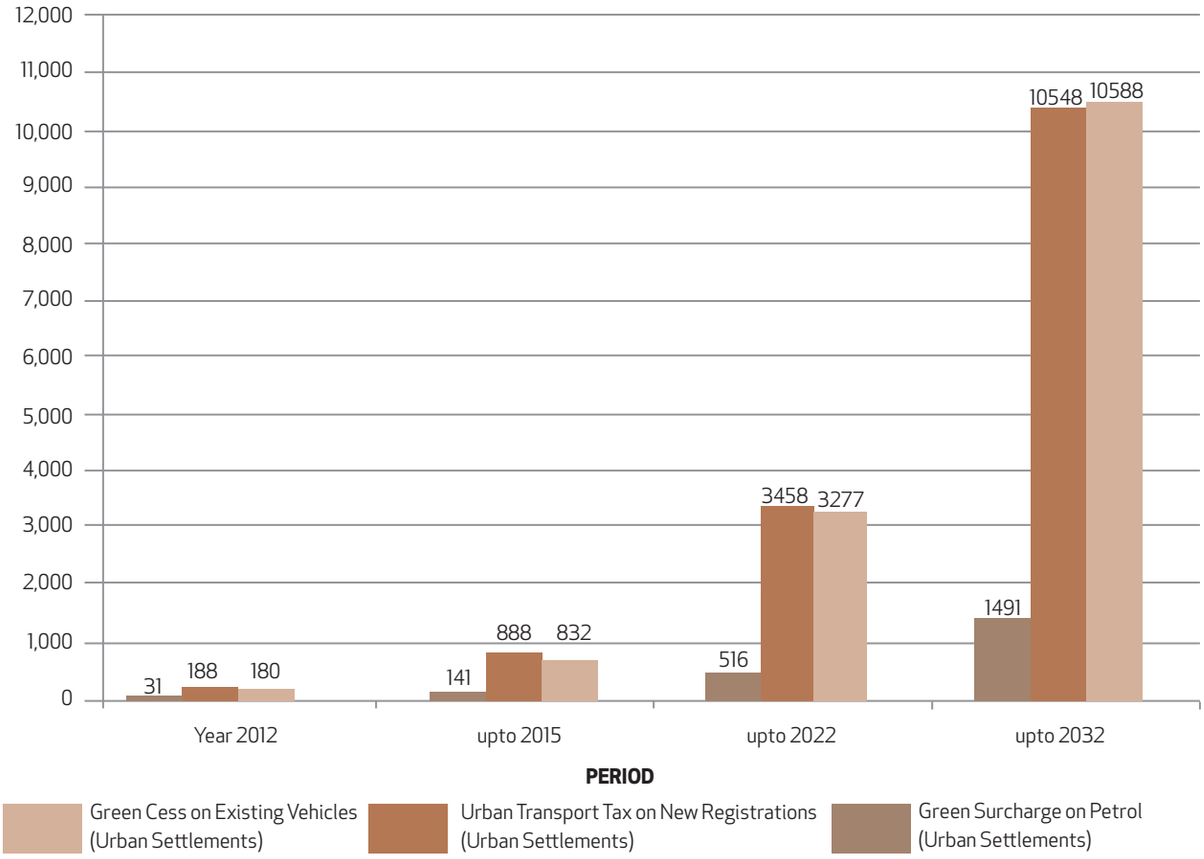
While the funding arrangements and structure recommended here, if implemented, would lead to significant resources for the sector, the full effectiveness and impact of that effort would materialise only if proper policies addressing affordability parameters, prioritisation principles and expenditure management responsibility are established and implemented.

In the current system, a significant portion of funding for mega UT projects comes from the central government. In principle, the municipal corporation and the state government concerned first approve such a project through their own approval systems. It is only after such approvals are obtained that these large projects are posed to the Central Government for funding. In principle, the central government may refuse to fund a project if it is found to be not viable. At present, it insists on an 8 per cent financial internal rate of return (FIRR) for metro projects.

The NTDPC is of the opinion that these procedures need to be strengthened further so that affordability and local prioritisation concerns are adequately addressed. Over time, it is essential that in large cities, the local bodies should be fully responsible for decisions on large UT projects and need to develop institutional capacity and resources to make such transport decisions over the next 20 years. For projects that need financial support at the national level, an improved institutional framework needs to be evolved, which puts the large cities at the centre of decision making. State governments and municipal corporations should not be incentivised to view central funds as being free leading to projects that may not be sustainable in the medium to long term.

58. A natural method of making the inter-se distribution amongst MUTA/municipal corporations is as per their population recorded in the last decennial census.

Figure 5.10
Urban Transport Proposed Sources of Funding
(Rs billion)



The key consideration for approval of such large projects should be their efficacy in providing urban mobility solutions at the local level, and the ability of the local economy to sustain them over the long term.

Core to the development of the investment requirements and the financing strategy, are the way affordability and investment prioritisation is established. In the JNNURM scheme, there are City Development Plans and Comprehensive Mobility Plans which are drawn up at the local government level and are seen as the primary instrument to establish the priority of the investments required. However, this methodology has proved to be inadequate given that the links between these plans and the projects are weak and remain unimportant since the projects grant based financial structure is predetermined, and do not require consortium-based specific tailor-made financial structures. With affordability of users and the city in mind, cities and transport agencies need to develop transparent mechanisms to identify activities and projects which are essential while others could only be considered important or desirable to be taken up in a medium-term horizon. Therefore it is important to define a public sector budget envelope that secures funding for essential activities and projects and only promises funding for other activities and projects.

The expenditure management policies of the UTF at the national level should put in place institutional mechanisms and policies to scrutinise difficult questions before agreeing to fund any proposal. Clear criteria for accepting proposals for funding should be placed transparently upfront. Proposals of funding from the NUTF should have (a) high Impact in terms of actual annual contribution to the NUTF; (b) use Polluters Pay principle; and (c) reduce the use of personal vehicles. Some project-level financing and prioritisation questions could be: Who pays? How are the payments made? How is the spending being prioritised? and Is there a role for the private sector in financing? These are all elements that are linked and need to be considered and structured so that the financing system is sustainable. The expenditure management policies of the UTF should be built to ensure that the following overall principles are fulfilled for stability and sustainability of the financing system.

- Financing for core public transit activities and projects such as must be secured and financing mechanisms must allow for flexibility to address risks emerging from uncertainty.

Box 5.23
Affordability and City Management: Manila

In 1982, Manila created an institutional context that allowed priorities to be determined against available financing. The city developed an investment strategy across all municipal sectors: highways, public transportation, water supply, sewerage and sanitation, garbage disposal, housing, social infrastructure, and others. Working from past expenditures and future prospects, planners identified a set of projects that could and must definitely be financed (the 'core investment' programme) and a second set of projects that could be implemented if additional funds became available (the 'core plus' programme).

Manila used a transparent, comprehensible system to separate unambiguously good from unambiguously bad projects and to classify the remaining projects using objective criteria and different weights for different scenarios. The strategy established the robustness of each project under a range of scenarios and provided a basis for dialogue among government agencies that questioned the rankings. Considerable progress was the result.

Source: Asian Development Bank.

- Lessons from cities that have developed sound financing systems, demonstrate that most funds must be obtained from users directly through tolls, charges, fare boxes, etc.
- According to economic principles too, users, other beneficiaries, and polluters should pay for the benefits they receive or for the costs they impose. Taxpayers should only pay when no other practical mechanism exists.
- Financing must be prudent and cost-efficient and credit ratings can reinforce the essential discipline of long-term financial planning.
- When inter-governmental funds are made available, it should be ensured that responsibility clearly lies with the city authorities and that they have a major stake in the development of the system. This prevents cities from competing for free central government funds that distort strategy and undermine good governance.

ROLLING PROGRAMME

A rolling five-year programme which would lead the sector investments has also been suggested. The rolling programme should be adopted alongside the financing strategy to lay out a macro-national-level trajectory for improvements in urban transport. The rolling programme is based on the 'service level bench marks' developed by MOUD and described in an earlier section. The SLBs provide for four levels of service. It is assumed that all cities are at the starting point (when under implementation, a rapid appraisal to establish the true starting points for each city would be desirable) and will move up one notch every five years up to 2030 through different routes chosen by themselves. Different size cities require different infrastructure. Short and long term actions are required to encourage use of Public Transport and to retain the existing modal share of NMT and walk. The City Mobility Plans are instruments that cities should use to plan to move to the desired and sustainable scenario, in a phased manner. The Rolling Plan is presented in Annex C.

SUMMARY AND CONCLUSIONS

OVERVIEW

The rapid economic growth over the last two decades has entailed a significant structural transformation of the economy away from agriculture and toward more employment in services. At the same time, India's cities have expanded and are likely to grow faster in the future. Urban India has been driving the country's economic growth recently and is expected to contribute 70 per cent of India's GDP by 2030[59]. These are centres of wealth-the per capita income in the largest cities is much higher than the average per capita income of the country as a whole and, in some cases more than double the national average–but they are also intertwined with the national and rural economy through consumption patterns, remittances, and other links. Over the next 20 years, there could be very significant variations in affordability across cities, thereby affecting and shaping the needs and demands for a desirable urban transport system, based on city size, category and income.

NTDPC's scope has been spread across a range of issues related to development of comprehensive and sustainable policy for meeting the transport requirements of the country through various modes of transport. Each of these modes must respond to the changes in demand of the movement of goods and services in the most integrated and cost effective

59. McKinsey (2010).

manner as possible. While looking at the changing nature of demand for transport and the particularities of each mode of transport, urban transport cannot be neglected since more often than not, it accounts for the last mile in any other inter-city transport trip. Urban transport cumulatively, in all country contexts is a significant percentage of the overall transportation trips. It is often productive, but also contributes significantly to congestion, environmental pollution, energy dependence and other social concerns. It is also complex: it is multimodal by definition and the overall performance of the system depends critically not only the individual components but also their interaction.

Urban transport in India is in need of an overhaul. At present, there is inadequate understanding of, and inconclusive data on, the modal share distribution between these various transport modes, across city types and sizes in India. There is also limited information on the extent of urban freight movement. What is clear, however, is that very few Indian cities currently, have organised, registered and regulated public transport systems. More and more urban residents are relying on personal vehicles and traffic congestion, air pollution, accidents, and fuel use are on the rise as a result.

Attention to urban transport in the past has been sporadic and fragmented. The first explicit statement of interest in urban transport came in the 6th Five Year Plan (1982-87), which also mooted the need for a National Urban Transport Policy (NUTP). Despite this early start, a National Urban Transport Policy could be finalised only in 2006, the terminal year of 10th Five Year Plan. The JNNURM has channeled significant investment in transport systems for some of India's largest cities, but much more remains to be done to increase the level and quality of investment. In particular, urban transport policy, planning and investment needs to be more responsive to safety, energy, environment and health concerns. Moreover, attention needs to be focused on the mobility needs of people rather than the facilitation of higher vehicle speeds.

This will require institutional as well as policy change. Authority continues to be divided within and across levels of government. The Ministry of Urban Development is the nodal ministry for policy and planning at the national level for rail-based urban transport whereas all the responsibilities for the technical planning for rail-based UT systems are with the Ministry of Railways[60]. 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 NTDPC are to build up on an 'avoid, shift, and improve' framework for urban transport:

Avoid: Sustainable transportation is about moving less. In recent times, indiscriminate land use planning and the increasing development of peri-urban areas by businesses and households seeking lower-cost land has forced residents to make greater use of motorised transport. The remedy is judicious land-use planning that reduces residents' need to travel and cuts back on urban sprawl, pollution, and congestion. Mixed land use policies include integrating residential and commercial neighbourhoods and moving away from concepts of strict zoning by activity.

NTDPC is of the view that urban development plans over the next 20 years, should be based on principles that create mixed land use, high density and mixed income neighbourhoods on the basis of persons per hectare and not FSI alone. Integrating land use and urban transport should be driven with the principal that lower income workers should be closer to their employment areas while higher income workers, could afford to travel larger distances for work. The current strategic trend of restricting and pushing out logistics and freight vehicles and interchanges to the outskirts of the city needs to be relooked at for better integrating urban freight to support job creating in cities and improve the vitality of cities.

These aims should be addressed through the appropriate changes in the urban planning norms and should be incorporated into planning standards such as the Urban Development Plan Formulation and Implementation Guidelines (UDPFI) which are followed by planning and development agencies in most states.

Shift, or change modal choice to promote lower fuel consumption per passenger-km and/or freight-km and manage traffic and reduce fuel consumption as well as air pollutants. Indian cities should consider implementation of economic measures to restrain traffic such as parking policies, congestion charging across cordons or within areas, car-sharing schemes and other measures. Where these policies are not possible, cities may consider fuel surcharges along with vehicle license duties that reflect the vehicle's impact on air pollution and other externalities. The net revenues from these measures should be invested

60. GOI (2011a).

Broadly speaking, the recommendations of NTDPC are to build up on an 'Avoid, Shift, and Improve' framework for urban transport.

in improving the public transport system to secure acceptance for necessary but unpopular policies.

PUBLIC TRANSPORT

Public transport also needs to improve, through an early integration of bus priority ways, busways, bus rapid transit (BRT), into cities' expansion and development plans would help integrate transport and urban development while maintaining the flexibility to reroute public transport arteries as the city develops. Rail-based metro systems should be considered only for some of the largest cities with more established patterns of residential and commercial development, after careful examination and attention to the opportunity costs of investing in relatively expensive fixed infrastructure.

Dense, integrated public transport is required in our cities. Only such dense MRT (based on buses if they are to be majorly funded by city governments) can support transit in the already dense parts of our cities and can support a shift towards high-density, mixed-use walking and transit-oriented urban environments. As a first step, a city should organise the existing public transport into an integrated network to cover the whole city. These services can be operated by buses of various sizes as appropriate to demand level. Actual ridership will guide adjustments in the capacity needed and to be provided on each route. When the demand level exceeds the capacity of bus services and BRT, other guided MRT modes may be considered. The safety and safety perception of MRT modes is a key factor in its wide-based use and should be a key feature in the design MRT network.

It is equally important that public transport is made high-quality and user-friendly so that the commuter uses public transport voluntarily. The most important aspect is multimodal integration: physical integration, network integration, fare integration, information integration and institutional integration. Besides the passenger information display system, integrated ticketing for all modes (common mobility card) and interchange facilities, use of intelligent transport system, facilities for the handicapped, safety and security against hooliganism, vandalism and terrorism, national public transport helpline number are critical to promote public transport and should be a part of planning. It is essential to improve the quality of all types of buses so that they are seen as a high mode of transport.

Improve, or increase the energy efficiency of vehicles and use of efficient and cleaner fuels to decrease impacts of distances travelled and reduce the greenhouse gas footprint per litre of fuel consumed. Achieving these objectives requires inventive technology, measures to encourage the rapid take-up of that technology, and regulation as well as effective enforcement that controls in-use emissions by ensuring that vehicles are properly maintained.

INTERMEDIATE PUBLIC TRANSPORT

This principle also applies to vehicles used for intermediate public transport in Indian cities; these play an important role in providing mobility to a large section of the population. While a number of safety and convenience factors in these modes need to be improved, they have a potential of providing clean mobility through emissions. Manufacturers should be encouraged to invest in improving the technology of these vehicles by:

- Setting up emission and safety standards under the Motor Vehicles Act.
- Banks and financial institutions providing low interest loans for small scale industry producing these vehicles, and attractive replacement schemes for operators.
- Dedicating 10 per cent of the cess money available with the Ministry of Industry from the transfer of technology for vehicle manufacturing for the improvement of intermediate public transport vehicles.
- Move from a 'closed permit systems' to an 'open permit system', for para-transit/intermediate public transport modes to make public transport more convenient[44]. 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

To pursue this approach, policy makers will need to focus on

a. The information and metrics basis for

planning, design and operating aspects of urban transport infrastructure, including, especially, a shift to full life cycle accounting,

b. **Developing and implementing a strong transport demand management regime leveraging all available policy and administrative tools, and**
c. **Improving implementation of projects and coordination between investments in the urban transport system.** It is especially important to improve the governance for large projects. The 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.

The institutional framework to deal with this sector is proposed as follows:

ROLE OF STATE-AND-CITY-LEVEL GOVERNMENTS

The primary responsibility for urban transport should lie with state governments. This report has recommended creation of state-level Offices of Transport Strategy which may be the locus for urban transport, in collaboration with agencies for urban development.

States should also enact a comprehensive urban transport law, which sets out the roles and responsibilities of the multiple city and state-level entities with regard to public transport, land use and public transport integration, multi-modal integration, safety, facilities for walk and NMT, etc. A model law can be developed by the Central Government to be then adapted by state governments as felt to be necessary. Over time, urban transport responsibilities should be devolved to metropolitan and city authorities, particularly for India's larger cities of more than 1 million. A three-level Organisational set-up is therefore proposed for the city:

- Metropolitan/District planning committee/ inter-municipal cooperative arrangement.
- Dedicated authority for urban transport (MUTA). The 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.

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.

ROLE OF THE CENTRAL GOVERNMENT

The central government will inevitably retain an important role in financing urban infrastructure, given India's fiscal structure. Such funding should be technology-neutral as far as possible, and linked to mobility, access, environmental, and other system outcomes rather than specific approaches to urban transport.

The Central Government may also play a role as technical advisor while state expertise is being created. This report proposes creation of a national Office of Transport Strategy, which would liaise primarily with the Ministry of Urban Development, and also with Rail, and Road Transport and Highways as needed to generate overarching strategy guidelines.

The central government would be responsible for creating standards for urban transport performance, including safety, environmental impact, and other national goals. The Central Government should lay down a national policy framework for UT; enact laws as required to uphold this framework; draft regulations and lay down planning standards and norms for national common standards (without restricting local operational efforts to achieve these outcomes; prepare guidelines and manuals including those for private sector participation; design, install and maintain standards for a common national data base built from state and metropolitan databases; disseminate data; promote research in UT including safety issues; and organise capacity building.

The central government cannot be directly responsible for UT in each city in a federal set up like India, with a wide diversity of contexts. Central government oversight of UT, other than in setting standards for national goals such as safety, efficiency, and

environmental impact as well as public investment management, is inconsistent with international experience as well as economic logic. States are a natural locus for urban transport in India's current circumstances. Larger cities can and should assume the primary responsibility for metropolitan transport as broader urban reforms catch up with constitutional commitments. Cities to which urban transport authority has been devolved must be provided with a strong institutional framework, an effective organisational set-up with a dedicated agency to look after planning, coordination and implementation of UT services, legislation, a resource generation policy and adequacy of skills.

INVESTMENT REQUIREMENT AND FINANCING

The Working Group on Urban Transport[61] constituted under the NTDPC has made investment requirement projections for the urban transport sector till the year 2030. The estimates have been developed for three scenarios as listed below:

- **Scenario 1:** The Business as usual (BAU) scenario; which assumes that the policies strategies and trends continue as witnessed currently. The WGUT estimated that if current trends continue an investment of Rs 22.78 trillion, will be required over the next 20 years.
- **Scenario 2:** The intermediate scenario is a scenario which has been estimated by the WGUT to be in between the desired sustainable scenario and the business as usual scenario. Investment needed will be Rs 17 trillion.
- **Scenario 3:** Desired scenario; is the scenario which will be closest to the sustainable urban transport scenario, the WGUT has worked out that, the estimated investment requirement in this scenario will be Rs 15 trillion.

Average annual outlays are in the range of Rs 750 billion to Rs 1 trillion across scenarios.

Given the distribution of taxation powers between the Centre, states and local bodies, currently the only viable method of financing the large scale investments required in urban transport including the establishment of new mass rapid transit infrastructure would be through capital funding support from the Centre (or state) to the cities for new projects, even if such funding can then be serviced over time through user charges and local imports.

The strategy proposed for funding capital cost and operation and maintenance expenses of urban transport projects is based on a two-pronged approach. It consists on developing and promoting a **consortium approach** in which Centre, state and city, along with various agencies and the private sector, participate in co-financing new investments and simultaneously creating robust **urban transport funds at the national, state and city levels.** This will ensure that a diversity of funding instruments are used to create sustainable financial structures that can add the requisite level of predictability and confidence to the urban transport sector. Financing of the investment needed for consortium funding will come from six key funding sources; (a) user charges, (b) support from national Government, (c) tax concessions and dedicated levies, (d) Land Monetisation, (e) recovery from non-user beneficiaries and (f) Debt and PPP.

The NTDPC recommends that new innovative financing mechanisms are put in place. Learning from the global examples, dedicated (non-lapsable and non-fungible) Urban Transport Funds (UTF) should be set up at the National, State and City levels. The UTFs, apart from meeting capital needs, may also be required to cater support to certain systems during the operations stage. The UTFs should be funded in a robust manner as per the suggestions below:

- **A Green Surcharge of Rs 2 on petrol sold across the country:** The rationale behind the fact that petrol is consumed exclusively by personalised vehicles.
- **A Green Cess on existing Personalised Vehicles:** At the rate of 4 per cent of the annual insured value both for car and two wheelers.
- **Urban Transport Tax on Purchase of New Cars and Two Wheelers:** At 7.5 per cent of the total cost of the petrol vehicles and 20 per cent in case of personalised diesel cars.

A fixed proportion (say, 70 per cent or as presented in Annex B) of the resources generated by the above levies, as decided by the central government, should be earmarked for urban transport, and the remaining may be utilised for developing infrastructure for rural transport. The total estimated yield from these three sources is Rs 400 billion in the first year, Rs 1860 billion in the first four years and reaches Rs 22 trillion in 20 years.

This report has argued that responsibility for urban transport should essentially rest at the state and city levels. Consistent with this general proposition of decentralisation of responsibilities for urban transport, arrangements would need to be made so that urban transport funds thus collected devolve appropriately to state and city levels. This devolution of resources to the state and city level transport funds should be on an entitlement basis and not at the discretion of the central government. This proposal could be examined by the Finance Commission, perhaps beginning with the 14th Finance Commission.

61. NTDPC (2012).

ANNEXES

ANNEX A: EXTRACTS FROM MGI AND HPEC REPORTS

MGI basis for suggesting high investment in Mass Transit are as follows:

- Transportation demand model was developed using a three stage process to estimate total transportation volume, splitting this volume into different modes and consequently forecasting the capacity required to meet the generated demand. The MGI Report also states that target share of public transportation was determined based on global benchmarks or as residual of increase in private transportation (p. 195).
- The report defines three scenarios (p. 196)
  - Private Sprawl (Scenario-1): Mono-centric city structure with FAR values in line with current trends and little investment in PT.
  - Public Sprawl (Scenario-2): Mono-centric city structure with FAR values in line with current trends and high investment in PT.
  - Public Compact (Scenario-3): Poly-centric city structure with high FAR values and high investment in PT.
- In scenario 2 and 3, the report fixed a target for public and NMT transport modal share and treated the private modal share as a residual.
- It has been assumed that rail-based mass transit infrastructure will be provided in each of the top 35 cities in India. For top 13 cities, requirement is immediate, while for the rest, infrastructure may be phased over the next 20 years. The report further assumes that public bus transport is applicable to all cities and that BRTS is provided in all cities above the population of 1 million (p. 198).
- MGI analysis reveals that more than half of the amount needs to be devoted to capital expenditure. Within capital expenditure, almost half the amount is necessary to erase India's existing infrastructure backlog in its cities and to their future needs (p. 63).

Report On Indian Urban Infrastructure And Services By HPEC

Local and sub-local roads are included in the definition of roads for this exercise(Pg.75, Article 3.3.2.) In many other estimates (11th FYP) for roads, only collector and major roads are included.

The large share for urban roads is on account for two factors. First, the service backlog for this sector is higher than those for other sectors' services. The backlog for this sector is very large ranging from 50 to 80 per cent across all Indian cities. Second, unlike sectors such as water where efficiency gains can be quantified, for example, by lowering the proportion of non-revenue water, in urban roads this is difficult. The efficiency gains in roads and transport are more external in nature (like better productivity through greater mobility or reduction in negative externalities of pollution and congestion) and do not necessarily translate into financial gains for the sector itself (p. 76, Article 3.3.3 and 3.3.4.)

A sensitivity analysis with respect to population densities, assuming other variables remain constant, highlights the possibility of reducing investment costs in urban roads and urban transport sectors. For example, an increase in population density by 2,500 per sq. km across all city size classes could reduce the investment requirement for urban roads and urban transport by about Rs 4 trillion, while a decrease in population density by 2500 per sq. km could increase the investment requirement by about Rs 6.5 trillion.

Annex B

Financing Urban Transport: National Urban Transport Fund

[Rs billion]

SOURCES	2012 UPTO 2015		UPTO 2022	UPTO 2032
Green Cess on Existing Vehicles (Urban Settlements)	180	832	3,277	10,588
Urban Transport Tax on New Registration (Urban Settlements)	188	888	3,458	10,548
Green Surcharge on Petrol (Urban Settlements in)	31	141	516	1,491
Total of three sources (Urban Settlements)	399	1,861	7,251	22,626

Detailed calculations are summarised as follows:

Annex B

1 A. Vehicle Population (in '000)

YEAR (AS ON 31 MARCH)	ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
1951	306	27	159	34	82	4
1956	426	41	203	47	119	16
1961	665	88	310	57	168	42
1966	1,099	226	456	73	259	85
1951	306	27	159	34	82	4
1956	426	41	203	47	119	16
1961	665	88	310	57	168	42
1966	1,099	226	456	73	259	85
1971	1,865	576	682	94	343	170
1976	2,700	1,057	779	115	351	398
1981	5,391	2,618	1,160	162	554	897
1986	10,577	6,245	1,780	227	863	1,462
1991	21,374	14,200	2,954	331	1,356	2,533
1996	33,786	23,252	4,204	449	2,031	3,850
2001	54,991	38,556	7,058	634	2,948	5,795
2002	58,924	41,581	7,613	635	2,974	6,121
2003	67,007	47,519	8,599	721	3,492	6,676
2004	72,718	51,922	9,451	768	3,749	6,828
2005	81,501	58,799	10,320	892	4,031	7,459
2006	89,618	64,743	11,526	992	4,436	7,921
2007	96,707	69,129	12,649	1,350	5,119	8,460
2008	105,353	75,336	13,950	1,427	5,601	9,039
2009	114,951	82,402	15,313	1,486	6,041	9,709

Source: Ministry of Road Transport and Highways (2012).

Annex B

1 B. New Vehicle Registration (in '000)

YEAR (AS ON 31 MARCH)	ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
1951						
1956	126	15	47	14	39	12
1961	248	48	111	11	51	26
1966	447	140	152	17	94	44
1971	788	355	235	22	89	87
1976	872	493	111	23	15	231
1981	2,745	1,582	397	49	210	507
1986	5,294	3,679	643	68	320	583
1991	11,009	8,080	1,210	109	510	1,100
1996	12,839	9,336	1,309	125	702	1,368
2001	**21,881**	**15,769**	2,938	194	958	**2,022**

YEAR (AS ON 31 MARCH)	ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
2002	**5,033**	**3,796**	696	14	85	**442**
2003	**9,261**	**6,770**	1,138	99	577	**677**
2004	**7,051**	**5,353**	1,024	61	327	**286**
2005	**10,237**	**7,915**	1,058	139	357	**768**
2006	**9,747**	**7,120**	1,412	118	486	**611**
2007	**8,881**	**5,681**	1,354	378	772	**697**
2008	**10,580**	**7,590**	1,554	104	584	**748**
2009	**11,705**	**8,573**	1,642	88	552	**851**

Source: Figures are derived from Table 1.a; (New Vehicle Registration = Year 2 - Year 1*98% [assuming 2% scrap]).

Annex B
1 C. Vehicle Population Growth (Per cent)

YEAR (AS ON 31 MARCH)		ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
5 Year Growth Rates	1951-56	39	52	28	38	45	300
	1956-61	56	115	53	21	41	163
	1961-66	65	157	47	28	54	102
	1966-71	70	155	50	29	32	100
	1971-76	45	84	14	22	2	134
	1976-81	100	148	49	41	58	125
	1981-86	96	139	53	40	56	63
	1986-91	102	127	66	46	57	73
	1991-96	58	64	42	36	50	52
	1996-01	63	66	68	41	45	51
Annual Growth Rates	2001-06	63	68	63	56	50	37
	2001-02	7	8	8	0	1	6
	2002-03	14	14	13	14	17	9
	2003-04	9	9	10	7	7	2
	2004-05	12	13	9	16	8	9
	2005-06	10	10	12	11	10	6
	2006-07	8	7	10	36	15	7
	2007-08	9	9	10	6	9	7
	2008-09	9	9	10	4	8	7
	Average Last 5 Years	10	10	10	15	10	7

Source: Figures are derived from Table 1.a; Vehicle Population Growth Rate = (Year 2 Vehicles - Year1 Vehicles)/Year 1 Vehicles.

Annex B

1 D. Growth in Registration of New Vehicles (Per cent)

YEAR (AS ON 31 MARCH)		ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
5 Year Growth Rates	1951-56						
	1956-61	96	229	135	-20	33	118
	1961-66	81	192	37	57	84	67
	1966-71	76	154	54	31	-5	98
	1971-76	11	39	-53	2	-83	167
	1976-81	215	221	258	115	1313	119
	1981-86	93	133	62	38	52	15
	1986-91	108	120	88	59	59	89
	1991-96	17	16	8	15	38	24
	1996-01	70	69	124	56	36	48
Annual Growth Rates	2001-06	65	70	65	58	52	39
	2001-02						
	2002-03	**84**	78	64	621	580	**53**
	2003-04	**-24**	-21	-10	-38	-43	**-58**
	2004-05	**45**	48	3	127	9	**169**
	2005-06	**-5**	-10	33	-15	36	**-20**
	2006-07	**-9**	-20	-4	221	59	**14**
	2007-08	**19**	34	15	-72	-24	**7**
	2008-09	**11**	13	6	-16	-6	**14**
	Average Last 5 Years	**12**	13	11	49	15	**37**

Source: Figures are derived from Table 1b; New Vehicles Registration Growth Rate = (Year 2 Registrations-Year1 Registrations)/Year 1 Registrations.
Note: The above table illustrates the year on year incremental growth in the number of vehicles in various categories and not the growth of total vehicle population. The above table is derived based on the year on year registration of new vehicles in various categories.

Annex B

1 E. Vehicular Composition (Per cent)

YEAR (AS ON 31 MARCH)	ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
1956	100.0	9.6	47.7	11.0	27.9	3.8
1961	100.0	13.2	46.6	8.6	25.3	6.3
1966	100.0	20.6	41.5	6.6	23.6	7.7
1971	100.0	30.9	36.6	5.0	18.4	9.1
1976	100.0	39.1	28.9	4.3	13.0	14.7

YEAR (AS ON 31 MARCH)	ALL VEHICLES	TWO WHEELERS	CARS, JEEPS AND TAXIS	BUSES	GOODS VEHICLES	OTHERS
1981	100.0	48.6	21.5	3.0	10.3	16.6
1986	100.0	59.0	16.8	2.1	8.2	13.8
1991	100.0	66.4	13.8	1.5	6.3	11.9
1996	100.0	68.8	12.4	1.3	6.0	11.4
2001	100.0	70.1	12.8	1.2	5.4	**10.5**
2002	100.0	70.6	12.9	1.1	5.0	**10.4**
2003	100.0	70.9	12.8	1.1	5.2	**10.0**
2004	100.0	71.4	13.0	1.1	5.2	**9.4**
2005	100.0	72.1	12.7	1.1	4.9	**9.2**
2006	100.0	72.2	12.9	1.1	4.9	**8.8**
2007	100.0	71.5	13.1	1.4	5.3	**8.7**
2008	100.0	71.5	13.2	1.4	5.3	**8.6**
2009	100.0	71.7	13.3	1.3	5.3	**8.4**
Average Last 5Years	100.0	71.8	13.0	1.2	5.2	8.8

Source: Figures are derived from Table1.a; Composition of Vehicle in Year I = (Total Vehicle in the category/Total Vehicle Population).

Annex B

2. Fuel Consumption

	2004	2005	2006	2007	2008	2009	2010
High Speed Diesel Oil (in '000 tonnes)	37,074	39,651	40,191	42,896	47,669	51,710	55,699
Motor Spirit (in '000 tonnes)	7,897	8,251	8,647	9,285	10,332	11,258	12,731
High Speed Diesel Oil (in million litres)	38,557	41,237	41,799	44,612	49,576	53,778	57,927
Motor Spirit (in million litres)	8,213	8,581	8,993	9,656	10,745	11,708	13,240
Growth Rates (per cent)							
High Speed Diesel Oil		6.95	1.36	6.73	11.13	8.48	7.71
Motor Spirit		4.48	4.80	7.38	11.28	8.96	13.08

Source: Basic Statistics on Indian Petroleum & Natural Gas, MoPNG (http://petroleum.nic.in/petstat.pdf [accessed 12 August 2013]).

Annex B

3. Cess Calculations

a. Green Surcharge on Petrol (Pan India)

YEAR	GROWTH IN MOTOR SPIRIT CONSUMPTION (PER CENT)	CONSUMPTION OF MOTOR SPIRIT (IN LITRES)	GREEN SURCHARGE ON MOTOR SPIRIT (IN RS BILLION) @ RS 2/LITRE	CUMULATIVE GREEN CESS ON PETROL (IN RS BILLION)
2012	8.330	15,538	31	31
2013	8.330	16,832	34	65
2014	8.130	18,200	36	101
2015	8.130	19,680	39	141
2016	7.930	21,241	42	183
2017	7.930	22,925	46	229
2018	7.730	24,697	49	278
2019	7.730	26,606	53	331
2020	7.530	28,610	57	389
2021	7.530	30,764	62	450
2022	7.330	33,019	66	516
2023	7.330	35,439	71	587
2024	7.130	37,966	76	663
2025	7.130	40,673	81	744
2026	6.930	43,492	87	831
2027	6.930	46,506	93	924
2028	6.730	49,635	99	1,024
2029	6.732	52,976	106	1,130
2030	6.530	56,435	113	1,242
2031	6.530	60,121	120	1,363
2032	6.330	63,926	128	1,491

Annex B

3. Cess Calculations

b. Green Cess on Existing Vehicles (Pan India)

YEAR	VEHICULAR GROWTH ASSUMED (PER CENT)	RATIO OF CARS/ JEEPS/TAXIS	RATIO OF TWO WHEELERS	TOTAL VEHICLES ('000)	CARS/JEEPS/ TAXIS ('000)	TWO WHEELERS ('000)
2012	9.60	13.03	71.81	151,336	19,724	108,678
2013	9.60	13.03	71.81	165,863	21,617	119,111
2014	9.40	13.23	71.31	181,454	24,012	129,400
2015	9.40	13.23	71.31	198,510	26,269	141,563
2016	9.20	13.43	70.81	216,772	29,119	153,503
2017	9.20	13.43	70.81	236,715	31,798	167,624
2018	9.00	13.63	70.31	258,019	35,176	181,420
2019	9.00	13.63	70.31	281,239	38,342	197,747
2020	8.80	13.83	69.81	305,988	42,328	213,619
2021	8.80	13.83	69.81	332,914	46,053	232,416
2022	8.60	14.03	69.81	361,543	50,736	250,596
2023	8.60	14.03	69.81	392,635	55,099	272,146
2024	8.40	14.23	68.81	425,615	60,579	292,878
2025	8.40	14.23	68.81	461,365	65,667	317,478
2026	8.20	14.43	68.31	499,196	72,050	341,015
2027	8.20	14.43	68.31	540,129	77,958	368,977
2028	8.00	14.63	67.81	583,337	85,361	395,577
2029	8.00	14.63	67.81	630,003	92,189	427,222
2030	7.80	14.83	67.31	679,141	100,738	457,149
2031	7.80	14.83	67.31	732,112	108,596	492,805
2032	7.60	15.03	66.81	787,750	118,424	526,318

Annex B

3. Cess Calculations

c. Assumptions regarding Life of Vehicle and Its Insured Values

LIFE OF A VEHICLE	NEW & UP TO 1 Y OLD	2 Y OLD	3 Y OLD	4 Y OLD	5 Y OLD	6 Y OLD	7 Y OLD	8 Y OLD	9 Y OLD	10 Y OLD	MORE THAN 10 Y OLD
Value of Vehicle (per cent)	100	95	90	85	80	75	70	65	60	55	50
Percentage of Vehicles (per cent)	8.10	8.10	8.10	8.10	8.10	8.10	8.10	8.10	8.10	8.10	19.0
Weighted Average Insured Value of Vehicles	72 per cent										
Leakage in Insurance	50 per cent										

Note: *Y – Year.

Annex B

3. Cess Calculations

d. Calculation of Net Insured Values of Vehicles (Category Wise and Total)

YEAR	BELOW RS 300,000 (AVERAGE RS 250,000)	RS 3-700,000 (AVERAGE RS 500,000)	RS 700,000-1,200,000 (AVERAGE RS 950,000)	RS 1.2-2 MILLION (AVERAGE RS 1.6 MILLION)	ABOVE RS 2 MILLION (AVERAGE RS 3 MILLION)	TOTAL INSURED VALUE OF CAR (RS BILLION)	TOTAL INSURED VALUE OF TWO WHEELERS (RS BILLION)	NET INSURED VALUE OF CAR EXCLUDING LEAKAGE (IN RS BILLION)	NET INSURED VALUE OF TWO WHEELERS EXCLUDING LEAKAGE (IN RS BILLION)
2012	71,277	320,747	270,853	228,086	213,831	11,048	3,927	5,524	1,964
2013	78,119	351,537	296,854	249,982	234,358	12,109	4,304	6,054	2,152
2014	86,774	390,482	329,741	277,676	260,322	13,450	4,676	6,725	2,338
2015	94,930	427,187	360,735	303,777	284,791	14,714	5,116	7,357	2,558
2016	105,230	473,537	399,875	336,737	315,691	16,311	5,547	8,155	2,774
2017	114,911	517,101	436,663	367,716	344,734	17,811	6,058	8,906	3,029
2018	127,118	572,030	483,048	406,777	381,353	19,703	6,556	9,852	3,278
2019	138,558	623,511	526,520	443,386	415,674	21,476	7,146	10,738	3,573
2020	166,422	748,901	632,405	532,552	499,267	25,795	7,720	12,898	4,199
2021	166,422	748,901	632,405	532,552	499,267	25,795	8,399	12,898	4,199
2022	183,347	825,063	696,720	586,711	550,042	28,419	9,056	14,209	4,528
2023	199,115	896,016	756,636	637,167	597,344	30,863	9,835	15,431	4,917
2024	218,916	985,121	831,880	700,531	656,747	33,932	10,584	16,966	5,292
2025	237,304	1,067,868	901,756	759,373	711,912	36,782	11,473	18,391	5,736
2026	260,370	1,171,666	989,407	833,185	781,111	40,357	12,323	20,179	6,162
2027	281,720	1,267,739	1,070,536	901,504	845,160	43,667	13,334	21,833	6,667
2028	308,473	1,388,127	1,172,196	987,113	925,418	47,813	14,295	23,907	7,148
2029	333,150	1,499,173	1,265,969	1,066,079	999,449	51,638	15,439	25,819	7,719
2030	364,043	1,638,193	1,383,363	1,164,937	1,092,128	56,427	16,520	28,213	8,260
2031	392,437	1,765,967	1,491,261	1,255,799	1,177,311	60,828	17,809	30,414	8,904
2032	427,955	1,925,796	1,626,227	1,369,455	1,283,864	66,333	19,020	33,166	9,510

Note: Net Insured Value = Total Insured Value *(1--percentage Leakage).

Annex B

3. Cess Calculations

e. Calculation of Green Cess @4 Per cent of Net Insured Value of Vehicles

YEAR	CARS (IN RS BILLION)	TWO WHEELERS (IN RS BILLION)	TOTAL GREEN CESS (IN RS BILLION)	CUMULATIVE GREEN CESS (IN RS BILLION)
2012	221	79	300	300
2013	242	86	328	628
2014	269	94	363	990
2015	294	102	397	1,387
2016	326	111	437	1,824
2017	356	121	477	2,301
2018	394	131	525	2,827
2019	430	143	572	3,399
2020	474	154	629	4,028
2021	516	168	684	4,712
2022	568	181	749	5,461
2023	617	197	814	6,275
2024	679	212	890	7,165
2025	736	229	965	8,130
2026	807	246	1,054	9,184
2027	873	267	1,140	10,324
2028	956	286	1,242	11,566
2029	1,033	309	1,342	12,908
2030	1,129	330	1,459	14,367
2031	1,217	356	1,573	15,939
2032	1,327	380	1,707	17,646

Annex B

4.Urban Transport Tax on New Registration (Pan India)

a. Calculation of New Vehicle Registration (in '000)

YEAR	CARS ASSUMING 1 PER CENT SCRAP	BELOW RS 300,000 (AVERAGE RS 250,000)	RS 3-700,000 (AVERAGE RS 500,000)	RS 700,000-1,200,000 (AVERAGE RS 950,000)	RS 1.2-2 MILLION (AVERAGE RS 1.6 MILLION)	ABOVE RS 2 MILLION (AVERAGE RS 3 MILLION)	TWO WHEELERS ASSUMING 2 PER CENT SCRAP
2012	1,908	382	859	382	191	95	11,502
2013	2,091	418	941	418	209	105	12,606
2014	2,611	522	1,175	522	261	131	12,671
2015	2,497	499	1,124	499	250	125	14,751
2016	3,113	623	1,401	623	311	156	14,771
2017	2,970	594	1,337	594	297	149	17,192

YEAR	CARS ASSUMING 1 PER CENT SCRAP	BELOW RS 300,000 (AVERAGE RS 250,000)	RS 3-700,000 (AVERAGE RS 500,000)	RS 700,000-1,200,000 (AVERAGE RS 950,000)	RS 1.2-2 MILLION (AVERAGE RS 1.6 MILLION)	ABOVE RS 2 MILLION (AVERAGE RS 3 MILLION)	TWO WHEELERS ASSUMING 2 PER CENT SCRAP
2018	3,696	739	1,663	739	370	185	17,148
2019	3,518	704	1,583	704	352	176	19,956
2020	4,369	874	1,966	874	437	218	19,826
2021	4,148	830	1,867	830	415	207	23,070
2022	5,144	1,029	2,315	1,029	514	257	22,828
2023	4,871	974	2,192	974	487	244	26,562
2024	6,030	1,206	2,714	1,206	603	302	26,174
2025	5,694	1,139	2,562	1,139	569	285	30,458
2026	7,040	1,408	3,168	1,408	704	352	29,886
2027	6,628	1,326	2,983	1,326	663	331	34,783
2028	8,183	1,637	3,682	1,637	818	409	33,980
2029	7,682	1,536	3,457	1,536	768	384	39,557
2030	9,471	1,894	4,262	1,894	947	474	38,471
2031	8,865	1,773	3,989	1,773	887	443	44,799
2032	10,914	2,183	4,911	2,183	1,091	546	43,369

Annex B

4.Urban Transport Tax on New Registration (Pan India)

b. Calculation of Category Wise Newly-Registered Petrol & Diesel Cars (70 per cent Petrol and 30 per cent Diesel Cars) (in '000)

YEAR	PETROL CARS	BELOW 0.3 MN	0.3-0.7 MN	0.7-1.2 MN	1.2-2 MN	ABOVE 2 MN	DIESEL CARS	BELOW 0.3 MN	0.3-0.7 MN	0.7-1.2 MN	1.2-2 MN	ABOVE 2 MN
2012	1,336	267	601	267	134	67	573	115	258	115	57	28
2013	1,465	293	659	293	146	74	626	125	282	125	63	31
2014	1,828	365	823	365	183	92	783	157	352	157	78	39
2015	1,748	349	787	349	175	88	749	150	337	150	75	37
2016	2,180	436	981	436	218	109	934	187	420	187	93	47
2017	2,080	416	936	416	208	104	891	178	401	178	89	45
2018	2,587	517	1,164	517	259	130	1,109	222	499	222	111	55
2019	2,463	493	1,108	493	246	123	1,056	211	475	211	106	53
2020	3,059	612	1,376	612	306	153	1,310	262	590	262	131	65
2021	2,905	581	1,307	581	291	145	1,244	249	560	249	124	62
2022	3,601	720	1,621	720	360	180	1,543	309	694	309	154	77
2023	3,410	682	1,534	682	341	171	1,461	292	658	292	146	73
2024	4,221	844	1,900	844	422	211	1,810	362	814	362	181	91

YEAR	PETROL CARS	BELOW 0.3 MN	0.3-0.7 MN	0.7-1.2 MN	1.2-2 MN	ABOVE 2 MN	DIESEL CARS	BELOW 0.3 MN	0.3-0.7 MN	0.7-1.2 MN	1.2-2 MN	ABOVE 2 MN
2025	3,985	797	1,793	797	398	200	1,709	342	769	342	171	85
2026	4,929	986	2,218	986	493	246	2,111	422	950	422	211	106
2027	4,640	928	2,088	928	464	232	1,989	398	895	398	199	99
2028	5,728	1,146	2,577	1,146	573	286	2,455	491	1,105	491	245	123
2029	5,377	1,075	2,420	1,075	538	269	2,304	461	1,037	461	230	115
2030	6,630	1,326	2,983	1,326	663	332	2,841	568	1,279	568	284	142
2031	6,205	1,241	2,792	1,241	621	310	2,660	532	1,197	532	266	133
2032	7,640	1,528	3,438	1,528	764	382	3,274	655	1,473	655	327	164

Annex B

4.Urban Transport Tax on New Registration (Pan India)

c. Urban Transport Tax Rates and Estimated Collections

YEAR	UT TAX RATE ON PETROL CARS (PER CENT)	UT TAX RATE ON DIESEL CARS (PER CENT)	UT TAX RATE ON TWO WHEELERS (PER CENT)	COLLECTIONS FROM CARS (IN RS BILLION)	COLLECTIONS FROM TWO WHEELERS (IN RS BILLION)	TOTAL URBAN TRANSPORT CESS (IN RS BILLION)	CUMULATIVE URBAN TRANSPORT CESS (IN RS BILLION)
2012	7.5	20	7.5	166	43	209	209
2013	7.5	20	7.5	182	47	229	439
2014	7.5	20	7.5	228	48	275	714
2015	7.5	20	7.5	218	55	273	987
2016	7.5	20	7.5	272	55	327	1,314
2017	7.5	20	7.5	259	64	324	1,637
2018	7.5	20	7.5	322	64	384	2,024
2019	7.5	20	7.5	307	75	382	2,406
2020	7.5	20	7.5	381	74	455	2,861
2021	7.5	20	7.5	361	87	448	3,309
2022	7.5	20	7.5	448	86	534	3,843
2023	7.5	20	7.5	425	100	524	4,367
2024	7.5	20	7.5	526	98	624	4,991
2025	7.5	20	7.5	496	114	611	5,602
2026	7.5	20	7.5	614	112	726	6,328
2027	7.5	20	7.5	578	130	708	7,036
2028	7.5	20	7.5	713	127	841	7,877
2029	7.5	20	7.5	670	148	818	8,695
2030	7.5	20	7.5	826	144	970	9,665
2031	7.5	20	7.5	773	168	974	10,606
2032	7.5	20	7.5	952	163	1,114	11,720

Annex B

5. Summary of Accruals to National Urban Transport Fund (In Rs Billion)

						NATIONAL URBAN TRANSPORT FUND (NUTF)				
YEAR	GREEN SURCHARGE ON PETROL	GREEN CESS ON EXISTING VEHICLES (PAN INDIA)	URBAN TRANSPORT TAX ON NEW REGISTRATION (PAN INDIA)	TOTAL ACCRUALS TO UTF (PAN INDIA)	TOTAL CUMULATIVE ACCRUALS TO UTF (INDIA)	GREEN SURCHARGE ON PETROL (100 PER CENT IN URBAN SETTLEMENTS)	GREEN CESS ON EXISTING VEHICLES (60 PER CENT IN URBAN SETTLEMENTS)	URBAN TRANSPORT TAX ON NEW REGISTRATION (90 PER CENT IN URBAN SETTLEMENTS)	TOTAL ACCRUALS TO UTF	TOTAL CUMULATIVE ACCRUALS TO UTF
2012	31	300	209	509	509	31	180	188	399	**399**
2013	34	328	229	558	1,067	34	197	207	437	**836**
2014	36	363	275	638	1,704	36	218	248	502	**1,338**
2015	39	397	273	670	2,374	39	238	246	523	**1,861**
2016	42	437	327	764	3,138	42	262	294	599	**2,460**
2017	46	477	324	801	3,939	46	286	291	624	**3,083**
2018	49	525	387	912	4,851	49	315	348	712	**3,796**
2019	53	572	382	954	5,805	53	343	344	740	**4,536**
2020	57	629	455	1,084	6,888	57	377	409	844	**5,380**
2021	62	684	448	1,132	8,020	62	410	403	875	**6,255**
2022	66	749	534	1,283	9,304	66	450	481	996	**7,251**
2023	71	814	524	1,338	10,642	71	488	472	1,031	**8,282**
2024	76	890	624	1,515	12,157	76	534	562	1,172	**9,454**
2025	81	965	611	1,576	13,732	81	579	550	1,210	**10,664**
2026	87	1,054	726	1,780	15,512	87	632	653	1,372	**12,037**
2027	93	1,140	708	1,848	17,360	93	684	637	1,414	**13,451**
2028	99	1,242	841	2,083	19,443	99	745	757	1,601	**15,053**
2029	106	1,342	818	2,159	21,602	106	805	736	1,647	**16,700**
2030	113	1,459	970	2,429	24,031	113	875	873	1,861	**18,561**
2031	120	1,573	941	2,514	26,545	120	944	847	1,911	**20,472**
2032	128	1,707	1,114	2,821	29,366	128	1,024	1,003	2,155	**22,626**

Annex C

Rolling Programme Upto 2030

Calculation as Per Service-Level Bench Mark Guidelines

DESCRIPTION	2015	2020	2025	2030
LEVEL OF SERVICE	**4**	**3**	**2**	**1**
PUBLIC TRANSPORT				
Rail Transit, Bus Rapid Transit on Exclusive Row as Per Cent of Total Road Cum Rail Length	<10	10-20	20-30	>=30
No. of Buses/1000 Population	<0.2	0.2-0.4	0.4-0.6	>= 0.6
IPT (Intermediate public transport) In All Cities	Organise	Upgrade		
NMT (NON-MOTORISED TRANSPORT) AND ACCESS				
Footpaths/Road Length as Percentage	< 25	25-50	50-75	>= 75
Street Lighting (Lux Level)	<4	4-6	6-8	>= 8
Bicycle Lanes; Network Length as Percentage of Length of Road Network	<15	25-15	50-25	>= 50
Parking Facilities for NMT as Percentage of Major Terminals	<25	25-50	50-75	>= 75
TRAFFIC MANAGEMENT: TRAVEL SPEED (KMPH)				
Personal Vehicles	<15	15-25	25-30	>= 30
Public Transport	<10	10-15	15-20	>= 20
ROADS AND LINKED INFRASTRUCTURE				
Percentage of Area Under Roads	<10	10-12	12-15	>=15
Parking Spaces Paid as Percentage of Total	<25	25-50	50-75	>= 75
TERMINALS				
Intermodal	Plan	Implement		
Bus	Plan	Implement		
Truck	Plan	Implement		
ITS (INTELLIGENT TRANSPORT SYSTEMS)				
Surveillance; CCTV Provided as Per Cent of Needed	<25	25-50	50-75	>= 75
PIS (Passenger Information System) As Per Cent Of Needed	<25	25-50	50-75	>= 75
GPS/GRPS as Per Cent of Total No. of PT Vehicles	<25	25-50	50-75	>= 75
Signal Synchronisation as Per Cent of Needed	<25	25-50	50-75	>= 75
Modes In Integrated Ticketing as Percentage of Total Modes	<25	25-50	50-75	>= 75
TDM (TRANSPORT DEMAND MANAGEMENT)				
INTEGRATED LAND USE TRANSPORT PLAN				
Persons Per Hectare	<125	125-150	150-175	> = 175

DESCRIPTION	2015	2020	2025	2030
LEVEL OF SERVICE	**4**	**3**	**2**	**1**
Mixed Land Use On Major Transit Corridors (Percentage Area Under Non-Residential Use	<5	5-15	15-30	<=30
Intensity Of Development City Wide	<1	1.0-1.5	1.5-2.0	<=2.0
Intensity of Development Along Transit Corridor- Ratio of FSI on Transit Corridor To City FSI	<1-5	1.5-2.0	2.0-3.0	<=3.0
SAFETY				
Fatality Rate Per Million Population	>0.6 Persons	0.4-0.6 Persons	0.2-0.4 Persons	<=0.2 Persons
Fatality Rate For NMT as Per Cent of Total	>60	40-60	20-40	<=20
Security	Ongoing			
Safety Audit	Ongoing			
INSTITUTIONAL FRAMEWORK				
Legislation	Enact			
ENVIRONMENT				
Energy Efficiency	Implement			
Low Carbon Path	Implement			
Pollution	14-16	10-13	6-9	<=5
GHG (Greenhouse Gases) Emissions	Implement			
Capacity Building (As Percentage of Present Planning)				
Training	60 per cent	40 per cent	Ongoing	Ongoing
Education	60 per cent	40 per cent	Ongoing	Ongoing
R&D	60 per cent	40 per cent	Ongoing	Ongoing
Database	60 per cent	40 per cent	Ongoing	Ongoing
INVESTMENT NEED FINANCIAL SUSTAINABILITY OF BUS TRANSPORT				
Extent of Non Fare Revenue as Percentage of Total Revenue	<=10	10-20	20-40	>40
Staff Per Bus Ratio	<10	8-10	5.5-8	<=5.5
Operating Ratio	>=1.5	1-0-1.5	0.7-1.0	<0.7
Investment (Scenario 2)	**Rs 2 Trillion**	**Rs 4 Trillion**	**Rs 5 Trillion**	**Rs 6 Trillion**

Note: FSI: Floor Space Index; GPS: Global Positioning System; GPRS: General Packet Radio Service; PT: Private.

ANNEX D: URBAN TRANSPORT PLANNING IN SELECT INDIAN METROS

BANGALORE

Bangalore's urban transport system is a joint product of a number of agencies. The Municipal Corporation (Bruhat Bangalore Mahanagara Palike–BBMP), Bangalore Metrorail Corporation (a joint venture between national and state government departments), two agencies accountable to the state government (Bangalore Development Authority (BDA) and the Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC), and South Western zone of the national Indian Railways contribute to the physical network. The Bangalore International Airport Limited (BIAL), a joint venture between the Ministry of Civil Aviation, Karnataka Industrial Investment and Development Corporation (a state agency), and private promoters, developed the city's airport. The Bangalore Metropolitan Transport Corporation (BMTC), Bangalore Metrorail Corporation (BMRC) supply services on this network, competing

with private cars, taxis, rickshaws, and other means of transport. Traffic laws, environmental regulations determined by the national and state Pollution Control Boards (PCB), 'road furniture' according to guidelines established by the Indian Roads Congress (IRC), and licenses issued by the Regional Transport Offices (RTO) influence the operating environment for transport services and vehicle owners.

The state has setup the Bangalore Metropolitan Land Transport Authority (BMLTA) through an executive order, which is primarily a high-powered committee involving most of the senior bureaucracy and two experts. This is anchored by the Directorate of Urban Land Transport, a state-level agency under the Urban Development Department that was technically setup also through an executive order one day prior to setting up of BMLTA. The DULT is supposed to be the coordinating agency for most aspects concerning urban transport in all cities of Karnataka.

Bangalore is also home to several prominent citizen initiatives to provide citizens with more information about transport options and thus (probably) influencing ridership, usage, and public pressure for transport investment and service provision. Mapunity's Transport Information System[62], for example, helps consumers plan multimodal trips, creating an observable demand for further integration of ticketing, physical connections, and other parts of the system[63] for moving people.

The city and metropolitan region's transport system is effectively determined by decisions taken at the state level, with limited institutionalised input from city elected or civic leaders. The Directorate of Urban Land Transport (DULT) under the Urban Development Department is institutionally positioned as a coordinating body for most of the system. It, and especially its parent Organisation (the State Urban Development Department–UDD) have some levers with which to execute this role: the UDD role in allocation of state funding as well as direction of national funds from programmes like JNNURM, convening of meetings, and oversight of departments' functioning.

Decision-making about land use and transport infrastructure across modes intersect also intersect in the KUIDFC, particularly in projects such as the proposed cluster cities development around Bangalore. KUIDFC had commissioned the preparation of Comprehensive Traffic and Transportation Plan (CTTP) for Bangalore in 2007, a report that considerably influenced transport infrastructure development projects taken up by BBMP, BDA, BMRCL, BMTC, KSRTC and Traffic Police including the road widening projects by BBMP, next phases of Metro lines including High Speed Rail to Airport, Monorail/light rail corridors, construction of numerous underpasses and flyovers by BBMP and BDA, and TTMCs by BMTC. Although the KUIDFC is not integrated as a subordinate agency of UDD[63] (or its sub-agencies DULT and BMLTA), a sub-committee under BMLTA was constituted to ensure timely implementation of the projects identified under CTTP. However, during late 2008, owing to a jurisdictional issue, BMLTA directed BMRDA to prepare a revised CTTP for Bangalore Metropolitan Region (comprising about 8,000 sq. km) that should take the CTTP prepared by KUIDFC into account. As it stands, the revised CTTP has been prepared for Bangalore Metropolitan Region.

There are many regular, repeated circumstances in which the various agencies must interact in Bangalore and other evolving cities—decisions about land use, for example, or planning points of interchange and intermodal connection services, ensuring that new developments are adequately connected to the rest of the city, or assessing the impact of new developments and transport infrastructure on air quality via anticipated traffic—but there are few institutionalised channels through which this can take place.

Horizontal coordination between the various agencies takes place on a project basis and generally by specific MOU. Informal coordination amongst different agencies can work well. It worked well just before the inauguration of the new International Airport at Devanahalli, for example, when the State Government constituted a High Level Task Force to Airport Connectivity chaired under an officer of Additional Chief Secretary to the Government with members from heads of various line departments including BBMP, BDA, NHAI, BIAL, Traffic Police, PWD, BMRDA, and others during January-June 2008. In this case, all agencies met almost once a fortnight to take stock of various aspects to ensure there was better connectivity to the new international airport from city centre. It also happens at lower levels: the Bangalore Metrorail Corporation and the Bangalore Metropolitan Transport Corporation, for example, signed an MoU for Common Day Metro-Bus transit passes in February 2011, and BMTC introduced a metro feeder bus service in October 2011, when the first line of the Metro was inaugurated.

Nevertheless, coordination by MOU does not resolve all of the challenges, particularly coordination problems that extend across state and national governments. The BMRCL and Indian Railways have sparred over land use for points where the two rail networks converge. The Metro's North-South Corridor is stalled because the South West Railways is asking for additional compensation for Railways land to

62. http://www.btis.in (accessed 15 January 2014).
63. The South Western Railway reports directly to national railways, complicating efforts to take advantage of rail infrastructure and rail lands for the public transport network. Although there are a number of cooperative agreements between BIAL and state/national agencies, disputes between BIAL and other agencies sometimes require the intervention of the Chief Secretary to resolve.

be used by Metro .There have been extended delays over transfer of land to Metro by KSRTC and vice-versa for construction of Central Station at Majestic by Metro and Intermodal Bus Terminal at Peenya by KSRTC respectively. The matter had appeared in at least two meetings of the BMLTA and has been finally resolved. In the current state of affairs, the State Government has resorted to SPVs to ensure various projects proposed under CTTP[65].

The Bangalore Metropolitan Land Transport Agency (BMLTA), Bangalore's answer to the national mandate to establish Metropolitan Transport Authorities to coordinate urban transport planning and investment, is currently a convening body consisting of the heads of all agencies relevant for transport infrastructure, land use planning, and transport services and chaired by the Commissioner of DULT. It met regularly in the first three years after establishment to discuss coordination, but this frequency has reduced in 2012. It does not have any formal powers to influence investment or expenditure. At the time of writing, the DULT had commissioned a consultant report on the statutory aspects of empowering the body and was reportedly considering a new Bill that would strengthen the BMLTA.

CHENNAI[66]

Responsibility for managing the various components of transportation in Chennai falls under various agencies and departments of central, state and city government. The suburban train, the operations of Mass Rapid Transit System (MRTS) and the ownership of the rolling stock comes under the Indian Railways. The rest of MRTS including air-rights—the right to build, operate and commercialise areas above the metro if necessary—is owned by Chennai Metropolitan Development Authority (CMDA).

Land use and transportation planning is under the purview of CMDA, an agency under the Housing and Urban Development Department of the Government of Tamil Nadu (GoTN). Certain key roads in the city are the responsibility of Highways Department (HD). Legally, only Metropolitan Transport Corporation (MTC) under the Department of Transport of GoTN is allowed to operate stage carriages—buses, share autos and the like – for public purposes. Private parties are allowed only usage of 'tourist' vehicles—auto, taxis, maxicabs—which offer point to point journeys to ferry passengers. The regulation of all of these vehicles is the responsibility of the Commissionerate of Transport under the Home Department and its Regional Transport Offices (RTOs). Chennai Metro Rail Limited (CMRL) was created by GoTN as a Special Purpose Vehicle (SPV) to build and manage the upcoming metro rail system. CMRL is partly funded by the Central Government and GoTN.

The Corporation of Chennai (CoC) manages many of the bus routes and residential roads, parking and other road infrastructure. The Mayor of Chennai is elected by popular vote and the head of the city bureaucracy—the Commissioner and his team—is appointed by GoTN and reports to the Department of Municipal Administration and Water Supply (MAWS). Traffic is managed by Chennai Traffic Police, which also reports to the Home Department.

Some civil society organisations including the Institute for Transportation and Development Policy (ITDP), Embarq, Chennai City Connect (CCC), Transparent Chennai, SUSTAIN and various passenger associations have been engaging with government agencies to advise and improve planning and transportation infrastructure and services.

GoTN has formed the Chennai Unified Metropolitan Transport Authority (CUMTA), headed by the Minister for Transport as Chair, Chief Secretary (CS) as Vice-Chair and all relevant departments and agencies as members. The bill was modeled on the Hyderabad and Mumbai MTAs and gives the UMTA the authority to 'recommends' and 'advise' city and state governments on transport as well as the civil powers to initiate a suit.

While awaiting notification of the bill, the state government has also appointed a 14-member executive committee various working groups on Intermodal Integration (IMI) headed by the MD of CMRL; Finance headed by Secretary of Finance; Non-motorised Transport headed by the Commissioner of CoC. These working groups have senior engineering and planning staff from CMDA, HD, CoC, CTP, MTC, MRTS and other relevant departments. Civil society organisations and experts from CCC, ITDP, Anna University are members of these working groups. The CUMTA Executive Committee, chaired by the CS, and the working groups have the authority to engage experts and relevant organisations as they see fit.

CUMTA has been meeting and discussing complex projects that require a fair degree of cooperation among the members. Most of the projects and policy initiatives are in the early stages. For example the policy on parking management mentioned here is a new initiative. While area planning of CMRL stations is an ongoing project, area planning for MRTS was initiated and is being monitored in the IMI working group. Similarly Common Ticketing is being coordinated and monitored by the IMI working group and involves staff from CMRL and MTC.

CMRL initiated area planning and generation of related projects for various agencies. It has created

64. http://articles.timesofindia.indiatimes.com/2012-04-18/Bengaluru/31361004_1_railway-land-swr-metro-workers (accessed 2 May 2012).
65. The Bengaluru Airport Rail Link Limited, another SPV under the Infrastructure Development Department was set to study the feasibility for high speed rail to airport, monorail/light rail as proposed in CTTP and then take on its construction similar to the relationship between BMRCL and the Metro. In a more recent move, the state government has established Hubli-Dharwad BRTS Company Limited (registered during first week of May 2012) for taking up the BRTS between Hubli-Dharwad in northern Karnataka.
66. This text box was contributed by Raj Cherubal, Director-Projects, Chennai City Connect.

projects for Corporation of Chennai (CoC), HD, MTC, and the CMDA. This project could have profound impact in not only planning orderly and accessible Metro Rail stations by providing safe pedestrian crossing around stations, proper footpaths; pick up and drop off area for private and para-transit; proper bus stops for easy and safe interchange; feeder service with a radius of a few kilometres to avoid use of private vehicles to access Metro Rail; safe public space around stations with vending, public amenities like public toilets, etc.

Joint studies were done by CMRL and other agencies and budgets are being prepared by the agencies for implementation. CoC and HD have also taken up re-designing of roads with modern planning and designs due to this process. CMDA is preparing similar areas plans for the MRTS.

CUMTA is playing a vital role in coordination among these agencies. Since CUMTA does not yet have its own secretariat and planning staff much of this is done by its member agencies. Also, for example, since CMRL is an older and already functional agency and has a strong interest in implementing a vibrant area plan, CMRL officials have taken the initiatives in CUMTA working group to coordinate plans with other agencies. As mentioned earlier, regarding some new issues like city-wide parking management and common ticketing policy and technical specifications CUMTA is helping coordinate among the various agencies. The exact nature and responsibility of planning is expected to evolve as CUMTA is staffed with managerial and engineering personnel.

Important transport hubs like the airport and its vicinities are being reconsidered from IMI perspective—integration of various modes; providing due space and design for public transportation; physical and IT integration; evolving a common plan and physical design across various agencies. This reconsideration is being initiated by agencies like CMRL and organisations like CCC and ITDP.

Currently agencies including the Airport Authority of India (AAI), which owns and operates the airport, do not consider the impact of other modes of transportation on the airport. No specific provision is made to integrate the suburban train, future Metro Rail, buses, para-transit, etc. with the airport to make public transport friendlier for airport passengers. Using the same IMI principles and opportunity, vicinity of the airport is being relooked and redesigned by AAI. But this process gets complicated since various public spaces belong to different agencies. For example, while the airport is owned and operated by AAI, the road in front of the airport belongs to the HD, suburban station to Indian Railways, metro stations to CMRL and so on. Issues of budgets for improvements and integration, payment for competent consultants and so on become a matter of protracted discussions. Ideally, CUMTA should initiate and fund the studies and prepare common plans, while its member agencies raise funds to improve their respective infrastructure and services. Since CUMTA does not yet have funds and staff of its own these activities are being initiated by the Department of Transportation, CMRL, ITDP, CCC and others on their own initiative.

CUMTA is preparing initiatives to establish its secretariat, employ professional staff and has already begun to develop various policies for adoption. It developed a parking policy based on market based pricing, with SPV to manage city parking, for example, which the Corporation of Chennai has agreed to implement via a SPV with Chennai Traffic Police (CTP) and others as co-owners. This model is based on cities like Budapest where they have implemented highly effective parking management systems.

CUMTA has also engaged organisations like ITDP to advise and help implement benchmarks, standards, processes and other tools to make transportation in Chennai more sustainable and modern. CUMTA is also exploring formal and informal tie-ups with international sister organisations who have considerable expertise and experience in managing urban, citywide transport systems.

The CoC via the NMT working group is studying creation of semi or fully pedestrianised areas in important locations in the city. Modelled along Time Squares (NY) and other successful efforts, this could not only create vibrant and safe public spaces but also improve shopping, cultural and leisure experience of visitors.

As part of their efforts to improve pedestrian facilities on roads, CoC and HD have initiated re-design studies of all major roads—which add up to hundreds of kilometre of roads in the city. Here some fundamental decision such as rethinking of carriage way size are being made. Additionally facilities for easy access to all citizens, including disabled, elderly, are being incorporated into the design. The city is now rethinking the standards being used currently along with beginning to undertake more serious coordination with other agencies to ensure trouble free pedestrian flow and smoother traffic flow.

City agencies including CUMTA has enlisted various organisations like Chennai City Connect, Transparent Chennai, SUSTAIN, Care Earth and so on to help in these discussions and rethink. Additionally, MTC and other organisations have initiated studies and pilots to make the system more public transport and citizens friendly. For example, MTC is studying its routes and existing infrastructure and processes to optimise its routes; increase frequency; improve fuel efficiency; improve communication with passengers and so on.

While considerable progress has been made by the city, considerable hurdles still remain and needs to be dealt with. One of the many hurdles is that planning in many areas, like road improvement for dealing with congestion, is dealt by HD and CoC with very little input from MTC and other public transport agencies.

This means that while the GoTN has set ambitious and progressive goals to shift 70 per cent of motorised trips in Chennai to public transport by 2026, agencies like HD and CoC still see flyovers, road widening and elevated roads as solutions to easing congestion. This would be counter to plans in an advanced city, with superior planning and coordination capabilities, where emphasis would be on increasing the public transportation infrastructure and services while at the same time restricting ownership and usage of private vehicles. Such complex plans requires sophisticated coordination of vision, goals, policy, plans, designs, standards and so on among various agencies—which is what CUMTA is expected to do when fully functional.

Many more governance initiatives, tools and processes need to be adopted. There is still a huge dearth of IT and communication systems to engage public participation; ensuring adherence to proper standards and designs; transparent contracting and monitoring; active maintenance and upgrade. All these will require substantial work by CUMTA and all its agencies.

MUMBAI[67]

Mumbai's transport system is overseen by a combination of municipal/metropolitan authorities, state agencies, and national government entities. The road system is planned and developed by Municipal Corporation of Greater Mumbai (MCGM), the Mumbai Metropolitan Development Authority (MMRDA), and the Maharashtra State Road Development Corporation (MSRDC). Local and neighbourhood roads tend to be the responsibility of the Municipal Corporation, while the MMRDA and MSRDC invest in the larger urban arteries such as the proposed elevated coast road from Sewri to Worli (MMRDA) and the Mumbai Trans Harbor Link (MSRDC). Sidewalks, footpaths and skyways are similarly shared across the corporation and metropolitan agencies, with MCGM responsible for much of the legacy network while MMRDA has developed the system of skywalks more recently.

Several national highways developed by the National Highways Authority of India also run through the city and connect it to other urban areas in its economic catchment area (e.g., Pune and Nashik). Construction of roads in coastal areas also come under the purview of the Government of India Ministry of Environment and Forests' national regulations on coastal zones.

The MCGM, also known as the Brihanmumbai Municipal Corporation (BMC) also has primary responsibility for streetlights, clearing encroachments, and maintaining utilities under roads. It is also responsible for traffic management, in keeping with national guidelines for road standards and traffic furniture. An independent Traffic Management Unit was set up under the MCGM in 1999 as part of an effort to strengthen overall urban transport planning. It has the authority to coordinate traffic signals and routing, but its ability to coordinate investments in the road system and public bus services and, even more broadly, investments in alternatives to road transport are not clear.

The bus system comprises three municipal-level services: the largest, the Brihanmumbai Electric Supply & Transport Undertaking (BEST), an autonomous agency formed when the BEST Company was 'municipalised' under the MCGM, operates buses through the metropolitan area including Navi Mumbai. The Navi Mumbai Municipal Transport (NMMT) also operates buses within Navi Mumbai as well as on routes connecting Navi Mumbai and Mumbai. The Thane Municipal Transport (TMT) operates its buses from Thane to outlying areas.

The suburban rail system is owned by Indian Railways and operated jointly by two zones (Western and Central). The Mumbai Railway Vikas Corporation Ltd (MRVC), a joint venture of Ministry of Railways and the Government of Maharashtra, was also formed in 1999 as part of the Mumbai Urban Transport Project for implementation of rail related projects to reduce congestion.

The MMRDA, chaired by the Urban Development Minister of Maharashtra, is the planning and nodal agency for Mumbai Metro project, although some aspects of development such as dispute resolution or cancellation of PPP contracts are under the purview of the Maharashtra State Government. The Metro is being developed in part as public-private partnership—the Mumbai Metro Transport Private Ltd (MMTPL), though more recent expansions may be under the engineering-procurement-construction (EPC) route. The metro will be operated by Mumbai Metro One Pvt Ltd (MMOPL), a joint venture company formed by Reliance Infrastructure, Veolia Transport and the Mumbai Metropolitan Region Development Authority (MMRDA).

Mumbai also has a number of NGOs and international non-profits working on transport-related issues that work with the government and citizen groups to provide expertise for particular projects, advocate

67. Rishi Aggarwal, Observer Research Foundation, contributed significantly to this text box.

integration in neighbourhoods and across modes, develop passenger information tools, and otherwise contribute to Mumbai's transport planning. The World Bank has also provided technical assistance on several projects and integrated transport plans.

In principle, the MMRDA has been the central point for coordination of Mumbai's transport strategy for the last decade. The 2002 Mumbai Urban Transport Project (MUTP) was led by MMRDA with support from the World Bank. The Comprehensive Transport Strategy (CTS) developed under this project envisioned multi-modal coordination for the Mumbai region, so the UMTA was created by Executive Order in 2008 to be the nodal agency for coordination. It operates as a department of the MMRDA and relies on the Development Authority as its administrative and technical Secretariat. As of January 2013, a law was being drafted to establish the UMTA as a separate agency with its own staff.

There UMTA does not appear to have the powers to coordinate with other regional development agencies involved in transport. It is a state-level agency, while the BMC and other bus operators report to the Municipal Corporations. The Additional Chief, UMTA of MMRDA (K. Vijaylakshmi) described some of the challenges in detail at a November 2011 public meeting[68]: The metro- and mono-rail projects have been planned keeping in mind links to the suburban railways, but the project has grown significantly. Plans for a multi-modal corridor from Alibag to Virar, have also been generated. However, implementation of the BRTS for the Western and Eastern Express Highways had been deadlocked due to problems with inter-agency coordination: 'MMRDA has already completed the Detailed Engineering Report (DER), but as the BRTS is under the jurisdiction of MSRDC, BEST and BMC, MMRDA is unable to work on it', she said[69]. Traffic management, a part of the overall transport strategy, is meant to be undertaken by the BMC and other Municipal Corporations. There are also challenges in coordination with other state agencies such as the RDC and the state-national joint venture MVRC concerned with suburban rail.

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68. Observer Research Foundation (2012).
69. Ibid.

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6. TRANSPORT DEVELOPMENT IN THE NORTH EAST

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6. TRANSPORT DEVELOPMENT IN THE NORTH EAST

It is now well acknowledged that the economic and human potential of India's North East region (NER) is severely constrained due to its transport infrastructure deficiency. The Central and state governments are now jointly focused to build infrastructure in the region.

INTRODUCTION

Certain key initiatives of the government, such as the 'Look East Policy' and the North East Industrial and Investment Promotion Policy (NEIIPP), 2007, and the NER Vision 2020 released in 2008, are efforts in the right direction but these will have to be shored up by concerted efforts. Despite Plan investments in the past, infrastructure development in the North East has been poor, which has also been noted by the NER Vision document as the single biggest constraint to accelerated growth. The region is characterised by grossly underdeveloped transport linkages that have sequestered and isolated the region not only from the rest of the country and the world, but also within itself.

NTDPC is placing a special focus on transportation in the North East in view of its unique problems of isolation from the rest of the country, which arose as a consequence of the Partition in 1947. Prior to Independence, the North East was organically connected with the rest of India through what is now Bangladesh, and to the East to Burma (now Myanmar). Even then, the state of both road and rail infrastructure left much to be desired, but the situation was much better than it is now, with the land connection with the rest of India only through the slender 27-km wide Siliguri 'chicken's neck' corridor. With the closing of borders, access to Chittagong port also got severed, cutting the region off from sea routes.

In effect, the market and centres of productivity in the North East got separated by a political dividing line, which has had severe repercussions on the livelihood of people in the whole region.

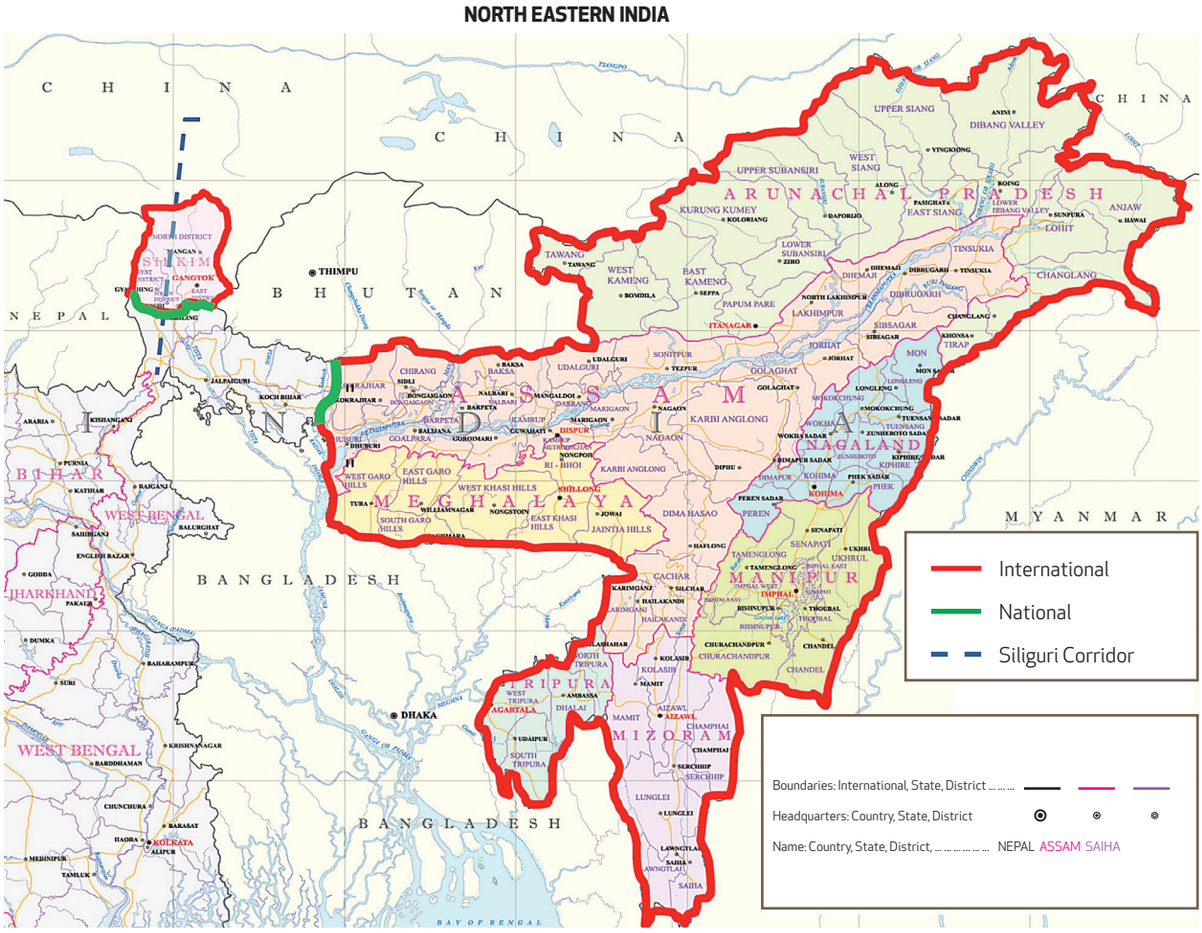
Today, the entire boundary of NER (96 per cent) is an international border shared with China and Bhutan in the north, Myanmar in the east, Bangladesh in the south and west, and Nepal to the west of Sikkim. The geopolitical distancing of the region from its main markets and trade gateways led to economic insulation and caused immense structural damage to the NER economy.

Figure 6.1 and Table 6.1 show the international boundary that the NER shares with neighbouring countries.

Historically, undivided Bengal and the NER were an integrated market with active roads, railway tracks and waterways crisscrossing the region. Global trade was conducted through the sea route, a network of inland waterways, and land transportation through road and railways. In fact, the network between Dibrugarh and Chittagong was one of the earliest railway projects in India (commenced in 1884) implemented by the British (Figures 6.2 and 6.3).

Some of the more important commodities were tea and timber. The tea industry in Assam depended on Chittagong port to export its produce and import raw materials such as coal used as fuel to dry tea leaves. As the tea industry grew, these rivers became important

Figure 6.1
The North East



Source: NTDPC (Base Map: Ministry of Development of NER).

carriers of trade. With Partition, the industry was severely hit as Chittagong became a part of East Pakistan. Railway links with places presently in Bangladesh upto Akhaura, Belonia, Mahisashan were also snapped. The lines connecting Siliguri in North Bengal to Kolkata and Assam to Chittagong were severed. The whole Assam Railway was cut off from the rest of the Indian system. These lines carried almost all freight traffic from these regions.

By 1950, India reconnected Assam to the rest of the country's rail network by building a more than 200 km metre-gauge rail link through the Siliguri corridor. However, the tea chests from Assam's gardens were now required to be carried over a much longer distance to reach Kolkata port. Any possible option of exporting tea via nearby Chittagong was completely eliminated after India's 1965 war with Pakistan.

The North East, which has been innately rich in natural resources, was doing well economically till Partition. In fact, on the eve of In dependence, per capita income of the state of Assam was higher than the country's average. This remained so even during the 1950s and 1960s, perhaps since India and Pakistan initially agreed to allow cross-border traffic that kept transportation routes alive. The trend started showing a reversal in the 1980s as an after effect of the 1965 Indo-Pak war that completely snapped the links, and the variance has only grown deeper thereafter.

It is for all these reasons that NTDPC decided to commission a special Working Group on the North East as part of its overall strategy for transport development in the country. Moreover, given the terrain of the North East, and the special role of inland waterways, it is essential that a more organised strategic, long term intermodal view be taken for developing transport in the region. Recent political developments leading to the opening of Myanmar, and renewed discussions with Bangladesh, also suggest that a long-term strategic view be taken to intensify international transport linkages from the region. Volume II, Chapter 13 on Promoting International Transport Connectivity between India and the South and South East Asia Regions further emphasises the importance of opening these intra-regional transport connections.

THE NER TODAY: DISTANT AND REMOTE

The NER today is relatively disconnected with the progress made by the country in the last several

Table 6.1
State-wise Length of International Border of NER
[in Km]

STATE	BANGLADESH	BHUTAN	CHINA	MYANMAR	NEPAL	TOTAL
Arunachal Pradesh	0	217	1,080	520	0	**1,817**
Assam	263	267	0	0	0	**530**
Manipur	0	0	0	398	0	**398**
Meghalaya	443	0	0	0	0	**443**
Mizoram	318	0	0	510	0	**828**
Nagaland	0	0	0	215	0	**215**
Sikkim	0	32	220	0	97.80	**350**
Tripura	856	0	0	0	0	**856**
Total	**1,880**	**516**	**1,300**	**1,643**	**98**	**5,437**

Source: Ministry of Development of NER (MDoNER).

decades. The region's economy is generally characterised by low per capita income, limited industrialisation, inadequate infrastructure facilities, geographical isolation and communication bottlenecks, lack of private and foreign direct investment and a high unemployment rate among the relatively better educated people. However, the literacy rate in the region at 68.5 per cent, with a female literacy rate at 61.5 per cent, is higher than the country's average of 64.8 per cent and 53.7 per cent, respectively[1].

Income levels in the region are now lower than the national average by over 30 per cent. A quick comparison between the NER states and India (see Figure 6.2) in terms of compounded annual growth rate of Gross State Domestic Product (GSDP) during 2004-05 to 2010-11, shows that while India grew at greater than 8 per cent, NER grew far less rapidly.

While the economy of the region is a matter of overall concern, its sectoral composition may also need to be examined carefully. As in the rest of India, there has been a decrease in the contribution of the primary sector and its subsectors in NER, which has largely been compensated by an increase in the tertiary sector. The contribution of the secondary sector has remained more or less constant. The region exhibits a trend of transformation where primary is not replaced by the secondary but by the tertiary (see Figure 6.3). Understandably, the region has to depend more on the tertiary (or services) sector due to lack of industrialisation/ manufacturing. One of the important reasons for limited industrialisation is the region's acutely constrained transport linkages which in turn negatively impact market access and trade.

In fact, even for the tertiary sector to continue playing the important role that it plays today, strengthening infrastructure will be vital, as tourism, which is an integral sub-sector, is largely driven by the quality of infrastructure. The infrastructure deficit is today one of the biggest constraints to the economic growth of the region. Poor density of road in most states in the NER (Figure 6.4) and scant rail transportation within the region has not only hampered mobility but also hindered the development of markets. The traditional transportation routes through inland waterways have become virtually non-functional after Partition and although the agreement with Bangladesh allows the transportation of goods, these routes have become inactive. The region is also poorly linked by air, and sea routes have been blocked.

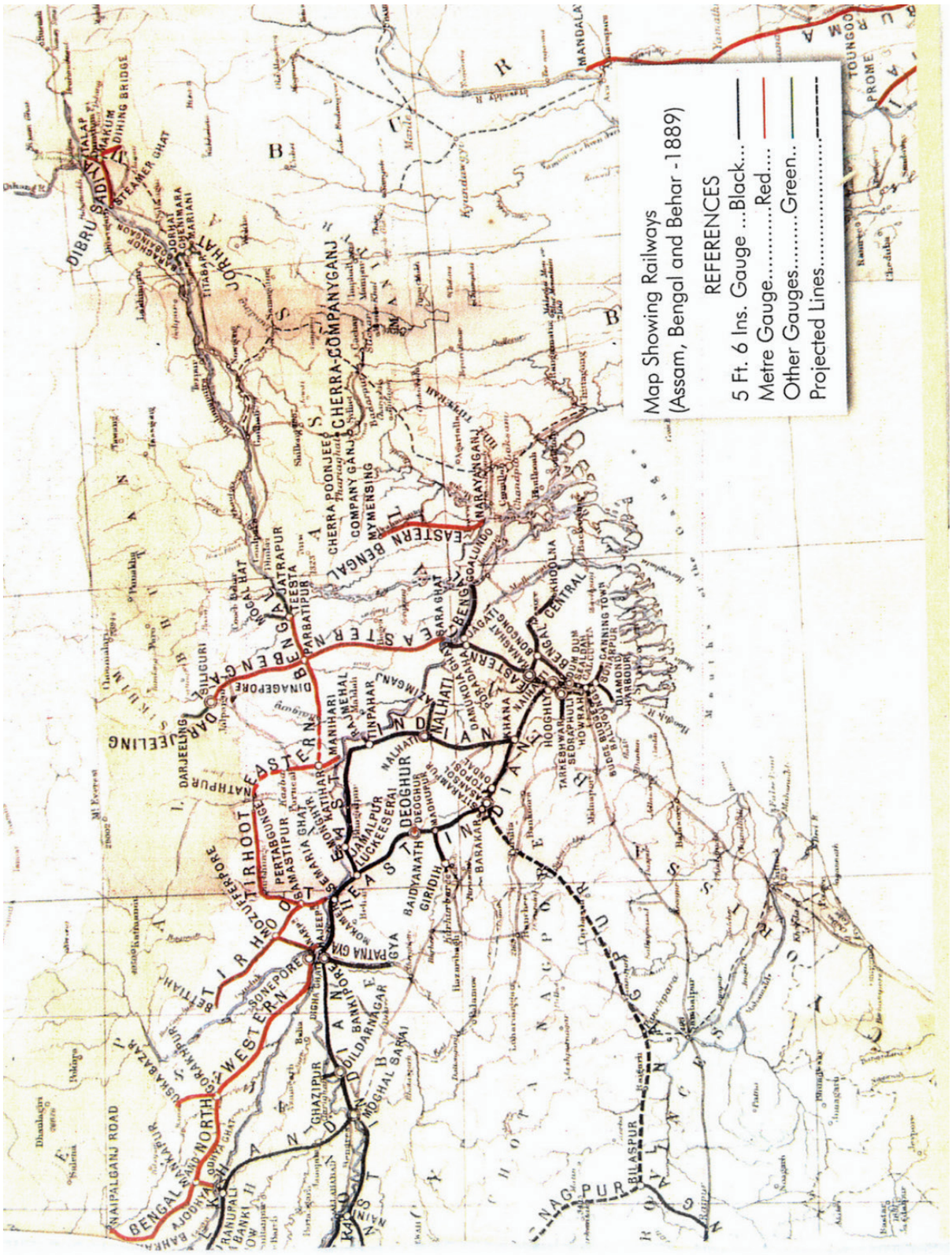
Improving intra-regional transport links will promote links with the rest of India, enabling movement of people and commodities. It will establish national reassurance that would help break mental barriers and encourage people from rest of India to travel and invest.

The development strategy for the NER will have to be built specifically around the primary and service sector. Inherent potential for horticulture, floriculture and plantation crops needs to be exploited, while facilitating tourism in the hilly areas can unlock further potential. Undoubtedly, transport infrastructure for faster and efficient evacuation of primary goods such as tea, jute, bamboo, minerals, oil etc is urgently required. Providing this will give the people a sense of participation in the Indian growth story.

Whereas a series of measures and infrastructure projects have been initiated to improve transport linkages with the NER and to plug it back into the mainland India, the problems of poor governance and limited institutional capacity remain a grave concern. The uneasy relationship with most of the neighbouring countries has also not helped the cause of development of the region. With a large part of the boundary forming difficult international borders, private investment has shied away. Further, the

1. Census of India (2011).

Figure 6.2
India Railways Map 1889: Assam, Bengal, Bihar

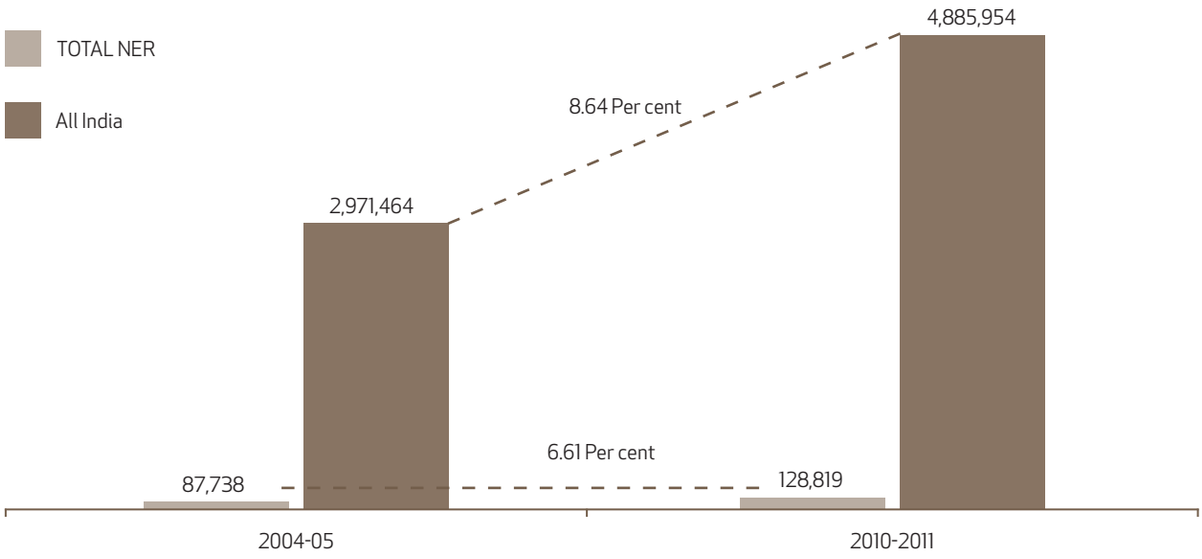


Source: Ministry of Railways.
Taken from a book, *Indian Railways—The final frontier*, published by Northeast Frontier Railways in 2002.

Figure 6.3
India Railways Map 1912: Assam, Bengal, Bihar

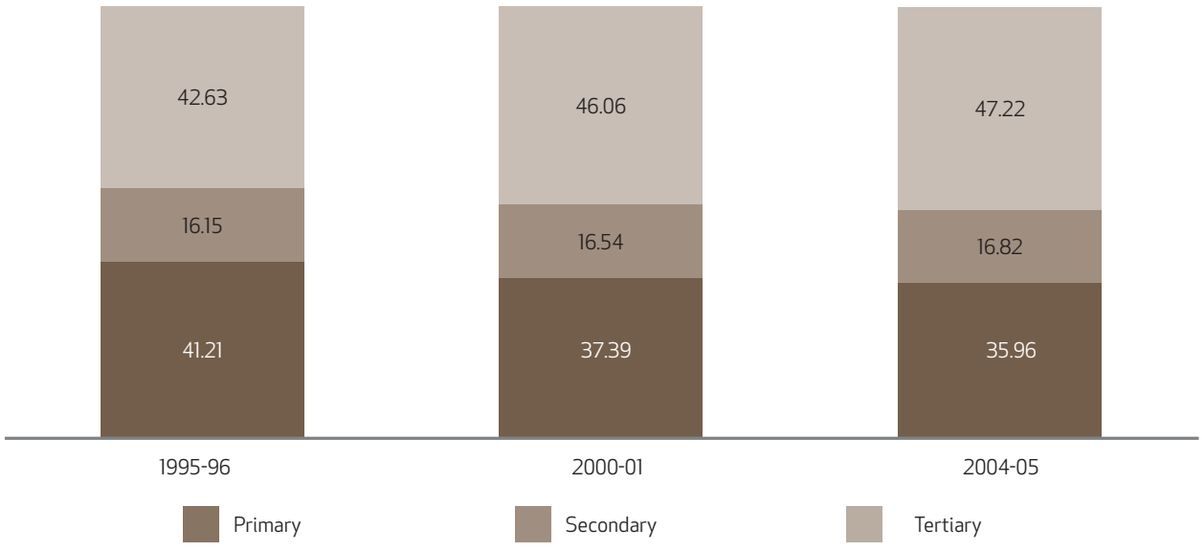
Source: Ministry of Railways.
Taken from a book, *Indian Railways—The final frontier*, published by Northeast Frontier Railways in 2002.

Figure 6.4
Comparative Economic Growth (GSDP): NER and India (2005-11)



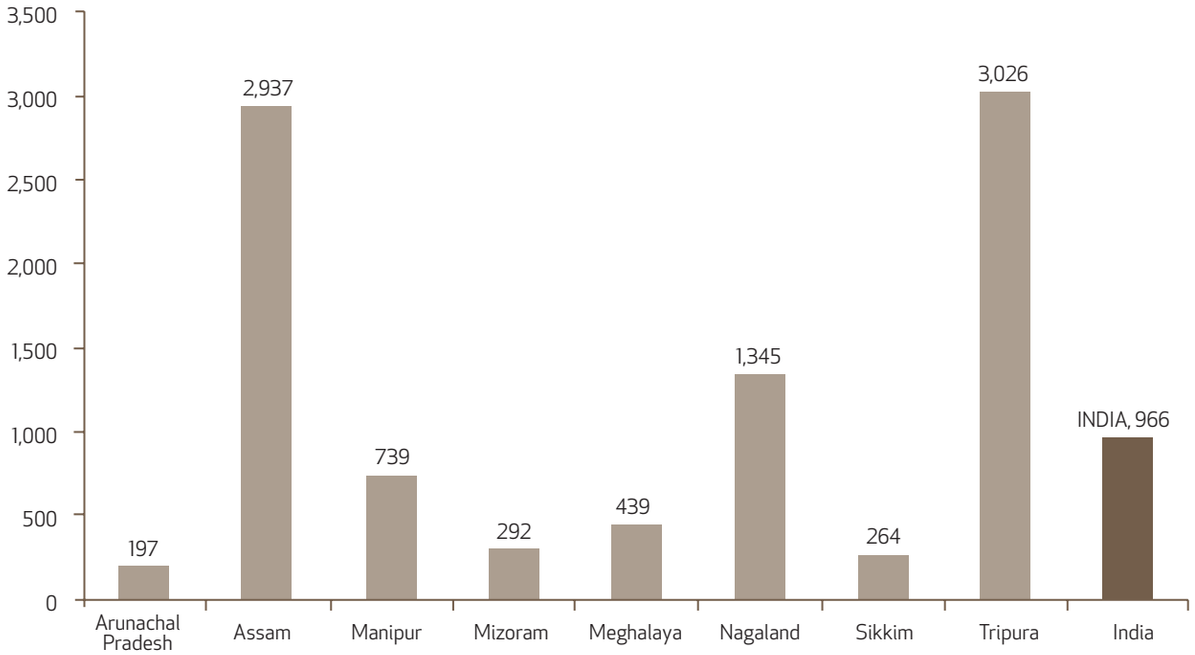
Source: Ministry of Development of NER (MDoNER).

Figure 6.5
Structural Change in the NER Economy: Sectoral Composition of GSDP
{Per cent]



Source: NER Vision 2020.

Figure 6.6
NER vs National Road Density, 2008
(Route Km/'000 Sq. Km)



Source: PwC report of Jan. 2013, 'India's North-East Diversifying Growth Opportunities (data provided by TRW, Ministry of Road Transport & Highways).
* Excludes roads constructed under JRY and PMGSY.

quest for ethnic and regional identity led to numerous insurgencies. Needless to say, the long historic turmoil and the consequent socio-economic repercussions have had a deep impact on the psychology of the people of NER.

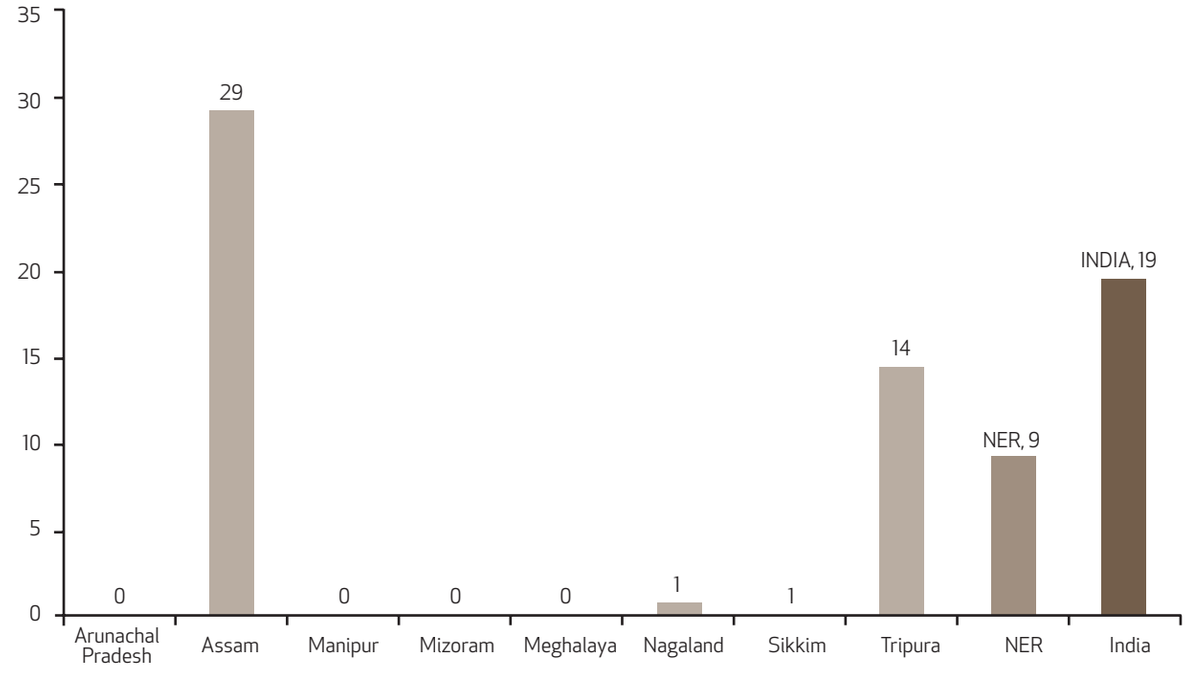
THE IMPORTANCE OF NER

The world is looking to engage with the emerging economic hotspot, the East, and it is in North East India that South-East Asia begins. Most urgent and strategic interventions are required for the NER to play the arrowhead role for India. Transport infrastructure will be vital to strengthen integration within the region, and with the rest of the country, and also for India's increased integration with the South East in the future. Improving transport connectivity shall have to be the foremost priority for social and economic mobility and market integration. Whereas inter-regional, intra-regional and regional connectivity to mainland India is necessary, critical to improving connectivity are issues of diplomacy and an improvement in border infrastructure and trade facilitation with neighbouring countries.

The NER needs to be integrated back to the national mainstream to prepare it for the strategic role it is expected to play going forward and the region has the potential for generating quick economic returns. Improving connectivity is the most important measure for the resurgence of the NER. Transport links shall help development of markets, reduce exploitation by middlemen, and in the process improve livelihoods of people in remote areas by enabling them to market their products at higher prices, while also promoting awareness and harmony among states. The economy of the region is still primarily agrarian with the industrial sector having mainly grown around tea, petroleum [crude], natural gas, mining and steel fabrication, but not quite close to its full potential. Due to inadequate industrial growth, the vast resource base available remains unexploited and the pressure for employment is on the service sector. Transport links can help ease out the undesirable pressure by promoting more balanced growth.

The contribution of NTDPC becomes all the more relevant as the NER presents natural characteristics that make it imperative for more organised intersectoral planning for transportation in the region. It is remote from the rest of India; several areas feature difficult hilly terrain; it also has many rivers, which can permit significant inland water transport options, but also contribute to difficulties in engineering transport infrastructure; it has a long border with neighbouring countries which increases the importance of transport infrastructure from a strategic and security viewpoint; and it consists of

Figure 6.7
State-wise Rail Density in the NER, 2009
(Route Km/'000 Sq Km)



Source: PwC report of Jan. 2013, 'India's North-East Diversifying Growth Opportunities (Rajya Sabha unstarred Question No. 1467, dated 06.08.2010).

eight states, each of which has its own requirements and priorities.

THE LOOK EAST POLICY

The broad strategy should be to promote ties of the NER with its immediate neighbours in the short term, while looking beyond its borders to tap into the benefits of India's burgeoning trade with the ASEAN bloc in the longer run. Myanmar, now a member of ASEAN, has become a crucial link between India and ASEAN countries. Political leaders from Bangladesh, USA, South Korea and Britain have already made their forays into Myanmar. India, despite having a geographic advantage, has been rather languid in its approach and certain initiatives have only begun to show recently. The North East, specifically Manipur, and the border town of Moreh in particular, can be the centre of a thriving and integrated economic space linking two dynamic regions with a network of highways, railways, pipelines, and transmission lines crisscrossing the region. Moreh has traditionally been the trading hub with Myanmar and presents vast potential to become a major export centre from India for the South-East Asian region. Another big project already under way is designed to turn the Kaladan River into a shipping route, linking Mizoram to Myanmar's port of Sittwe, which India is helping develop. Expediting the same while systematically creating economic opportunities by bringing together industry and people in well-planned localised areas, with adequate enabling infrastructure, is the need of the hour.

Bangladesh, again, has to be an integral part of any transport strategy for the NER. Ingress to Chittagong port and opening up of the inland water route could lead to economic resurgence of the region. In fact, Tripura in the NER is just about 75 km from the Chittagong and could therefore become an important gateway for India to East Asian countries. Such unblocking of trade routes would be in mutual interest and boost confidence on either side. The existing high tariffs on Bangladesh imports and the lack of border trade infrastructure that has limited trade to the informal variety could also then potentially convert to formal border trade between the NER and Bangladesh. At the same time, Bangladesh could have access to Indian markets by enabling free trade in the land routes, which would mitigate its unfavourable balance of trade with India considerably.

Similarly, India needs to leverage on the ambitious Trilateral Highway Project which is an example of triangular road diplomacy between India, Myanmar and Thailand; inter-linking the Indian Ocean with the South China Sea. While the Asian Highway is being built along planned routes to cover a wide spectrum of road network in the NER, much more needs to be done by the Indian government to make the road functional. The Asian Highway needs to be integrated with other critical projects that are

envisaged to be completed as part of the Look East Policy such as the Kaladan Multimodal Transit Project and Trans-Asian Railways. *It is with this backdrop, to unlock NER's economic and human potential and make it an integral partner in India's economic development that provision of integrated and robust transport infrastructure within, to and from NER becomes very significant. This coupled with the strategic implications and the need to reduce physical and mental distances, a separate discussion on transportation issues and strategy for the NER becomes indispensible.*

OVERARCHING TRANSPORTATION ISSUES FOR THE NER

Most of the area in the region is hilly and undulating with low population densities except the plains of Assam, parts of Tripura and valley areas of Manipur. Rail connectivity in such terrain is not only time-consuming but would need huge investments. It is road connectivity which would play a dominant role in fulfilling the transportation needs of the public. Air and inland water transport will play a role for a limited segment of people and goods. Before analysing the four transportation sectors, some common issues cutting across different sectors are discussed here.

NORTH EAST IS A COMPACT REGION

Transport planning has to be done at three levels–intra-regional, with the rest of India and connectivity with the international neighbours and beyond for South Asia, South East Asia and China.

MULTI-MODAL TRANSPORT PLANNING

Regional solutions for intra-regional movement of goods and passengers, connectivity with the rest of India and international connectivity have to be planned in an integrated manner. At present, there is hardly any inter-sectoral planning amongst the four transport infrastructure sectors–road, civil aviation, rail and inland waterways. Even at the beginning of the 12th Plan, such an approach has not been undertaken.

INSTITUTIONAL SUPPORT

Institutional support for multimodal planning of transport and to give implementation and technical support, particularly to the road sector, is necessary after discussions with key stakeholders.

CROSSING THE BRAHMAPUTRA

The 890-km length of Brahmaputra from Dhubri to Sadia has at present only three bridges across it to connect areas on its either side. Two more are under construction. The three existing ones are the Saraighat road-cum-rail bridge at Guwahati; the Tezpur-Kolia Bormora Setu, connecting Sonitpur with Nagaon district; and the Jogighopa-Naranarayana rail-cum-road Setu. The two bridges under construction are the Bogibeel rail-cum-road bridge; and the Dhola-Sadia road bridge, both of which will facilitate connectivity between Assam and Arunachal Pradesh. These five bridges are grossly inadequate both from a security standpoint as well as to serve general commutation.

CONNECTIVITY BETWEEN STATE CAPITALS AND THE REST OF INDIA

Various state capitals are at present connected only by one road (rail connectivity for five of them has yet not become operational) which often leads to bottlenecks, both man-made and natural. The land connectivity of the NER with the rest of India is through a 27-km-wide corridor (21 km at its narrowest) often referred to as the Chicken's Neck. This poses serious bottleneck to capacity creation in the region.

INFRASTRUCTURE FOR INFRASTRUCTURE

Investments in infrastructure in the NER has increased exponentially since the 10th Plan and is likely to continue in the 12th Plan. But all construction agencies are beset with problems of accessing construction material, poor quality of roads and unavailability of rail links. A well-thought-out strategy to sort out the problem is imperative.

USE OF APPROPRIATE TECHNOLOGY TECHNOLOGY

building of quality infrastructure has undergone tremendous change across the globe. Better standards of road building to match those in the neighbouring Malay Peninsula which receives equal or even higher volume of rainfall need to be introduced while also exploring/ developing innovative construction techniques.

MAINTENANCE OF TRANSPORT ASSETS

Heavy and incessant rainfall over six to eight months, and lack of generation of resources by state governments cause poor maintenance of assets. Expansion in the road network would further require greater share of states' resources for maintenance.

PUBLIC INITIATIVES FOR THE NER

Public investment in the transport sector has to be seen within the overall perspective of the Union Government with respect to the NER. The North Eastern states receive special consideration in terms of allocation of Plan funds and other facilitating interventions:

SPECIAL CATEGORY STATES

Recognising the special requirements of the region and the need for significant levels of government investment, the North Eastern states have been categorised as Special Category states and Central Plan assistance to these states is provided on liberal terms. For the NER, the per capita level of Central assistance is amongst the highest in the country.

Table 6.2
Flow of Plan Funds to NER: 11th Plan Period
(Rs billion)

(Annual Plan / Revised Estimates)

SOURCE OF FUNDING	2007-08	2008-09	2009-10	2010-11	2011-12	TOTAL
From Planning Commission (State Sector approved outlays of NE States including ACA/ SPA)	113	147	177	210	250	897 (49.3)
From NEC	6	6	6	7	7	32 (1.78)
From Ministry of DoNER (NLCPR Scheme)	6	6	7	8	8	35 (1.95)
Central Ministries / Departments	129	148	162	198	217	855 (46.98)
Total	**254**	**309**	**352**	**423**	**482**	**1818**

Source: Ministry of Development of NER (MDoNER).
Figures in () are Percentage.

10 PER CENT MANDATORY EARMARKING OF FUNDS FOR NER

In order to mobilise financial resources, a policy decision was taken in 1996 to earmark at least 10 per cent of the Plan Budget(s) of the Central ministries/ departments for development of the North Eastern states. Now, 52 ministries/departments earmark 10 per cent of their Gross Budgetary Support (GBS) for the NER.

NON-LAPSABLE CENTRAL POOL OF RESOURCES

The Non-Lapsable Central Pool of Resources (NLCPR) created in 1997–98 (operationalised in 1998–99) is the accrual of the unspent balance of the mandatory 10 per cent budgetary allocation of the ministries/departments. The broad objectives of the NLCPR Scheme is to ensure speedy development of infrastructure by way of filling the existing infrastructural gaps (economic and social) in the region by making funds available from the pool.

LIBERAL PLAN FUNDING NORMS

NER States have a weak financial base and limited scope to raise additional resources due to their small size, remoteness, terrain and internal fund raising constraints. They are, therefore, unable to contribute the states' share as per the norms of the Centrally Sponsored Plan Schemes of the ministries/ departments of the Union Government. Hence, funding norms of Centrally Sponsored Schemes have been progressively liberalised for the North Eastern states. The states' contribution to Centrally Sponsored Schemes now range generally between 10 and 20 per cent, whereas for other states it is between 20 and 50 per cent.

LIBERAL NORMS FOR EXTERNALLY AIDED PROJECTS

Being special category states, the loan burden from externally aided projects is shared by the Central Government and Special Category States in the ratio of 90:10.

SETTING UP OF MINISTRY OF DONER

The Department of Development of North Eastern Region (DoNER) was set up in 2001 to coordinate and give impetus to the Centre's development efforts pertaining to socio-economic development of the region. It was converted into a Ministry in 2004.

The North Eastern Council, Shillong, set up in 1971, is under the administrative control of the Ministry of DONER.

SPECIAL PACKAGES FOR NER

The Central Government has also been announcing special packages for socio-economic development of the NER from time to time.

TAX CONCESSION IN NER

Including Direct Tax The Income Tax Act has special concessional provisions for NER.

Apart from these special provisions, heavy public investment is being made in the NER for infrastructure. Table 6.2 provides a snapshot of investments

made in the NER by the Union Government in the 11th Plan period.

Overall, a steady flow of funds and a facilitating infrastructure of policies and schemes have been created for the NER by the Union Government. While these efforts may certainly be praiseworthy and helpful, a broad review of specific transport infrastructure challenges that the region presents is necessary to appreciate the need for still greater and incisive interventions. Detailed sectoral discussion is taken up in the subsequent section.

ROADS

Roadways are the backbone of transport and communication in the NER, primarily due to terrain and sparse distribution of population. In fact, water and road transport have always been the primary modes to move people and freight. Rail and air are rather recent phenomena.

Initially, there were just unmetalled mud roads while the only wheeled means of transport was the bullock cart. People covered distances mostly on foot. Rivers like the Brahmaputra, the Barak, the Gomati, the Haora and the Manu were navigable by boats. Around the 16th century, King Nar Narayana of Koch Bihar got an embanked road constructed from the capital in Koch Bihar to Narayanpur near Lakimpur in Assam which was a distance of nearly 350 miles. Later, reasonably extensive economic infrastructure was built up during the Ahom rule in the forms of embankments around the Brahmaputra and its tributaries. The embanked road built on the south bank of river Brahmaputra linking upper and lower Assam facilitated movement of troops, people and transportation of goods. It also protected rice fields from floods. Unfortunately, many of such vital public works were damaged, and even destroyed during the Burmese invasion in the early 19th century.

Around 1833, an important road was constructed linking Imphal, capital of Manipur, with Silchar in British India. The construction was a joint venture of the British and Manipuri government. The road became the vital channel of flow of goods and movement of people and livestock between Cachar (in Assam) and Manipur. In 1868, the department of Public Works was established. A road board was constituted in 1926-27. By 1929, the length of metallic roads went up to 565 miles while kaccha (earth) roads measured more than 4,000 miles. By 1937-38, the length of metallic roads increased to more than 700 miles while the total road length went beyond 5,000 miles. The construction and maintenance of roads achieved great significance during the Second World War, following the advance of Japanese forces near Assam.

However, a majority of important road links which had become the lifelines for the region were suddenly rendered inactive with Partition in 1947. During the last 60 years of Indian independence, while roads have been built in the region, road transport connectivity is still wanting. The inadequate pace of road development in the NER, exacerbated with even lesser focus on planned development, has been an area of concern for the government. In 2005, a mega road programme, titled Special Accelerated Road Development Programme in North East (SARDP-NE) was initiated. The main objective is to link the state capitals and district headquarters in the NER with double lane National Highways (NH) or State Roads to the existing NH network. The programme thus includes improvement, upgradation or construction of National Highways and State Roads. In order to expedite the process of sanctioning of projects, a fast track procedure through a high powered committee under the chairmanship of Secretary, Road Transport and Highways, has been set up with special powers.

Some of the key projects/schemes initiated for planned development of roads across the NER are discussed below.

MAJOR PROJECTS/SCHEMES UNDERWAY

The political leadership and public have long recognised an increasing need to build adequate and quality roads connecting the NER internally and to mainland India. However, the overall road density of the region still remains below national average.

SPECIAL ACCELERATED ROAD DEVELOPMENT PROGRAMME FOR NORTH EAST (SARDP-NE)

This programme envisages providing road connectivity to all the district headquarters in the NER by minimum two-lane highway standards apart from providing road connectivity to backward and remote areas, areas of strategic importance and neighbouring countries. The programme is planned in two phases, including the Arunachal Package covering about 10,141 km.

This is by far the most ambitious road development programme for the NER. NHAI, state PWDs and the Border Roads Organisation (BRO) are the implementing agencies. The objectives are as follows:

- Upgrade National Highways connecting state capitals to two/four-lane
- To provide connectivity of all 88 district headquarter towns of the NER by at least two-lane road
- Provide road connectivity to backward and remote areas of the NER
- Improve roads of strategic importance in the border area
- Improve connectivity to neighbouring countries

Table 6.3
SARDP-NE

PHASE A	ARUNACHAL PRADESH PACKAGE	PHASE B	TOTAL
4,099 km	2,319 KM	3,723 KM	**10,141 Km** • National Highways 4,798 Km (47 per cent) • State Roads 5,343 Km (53 per cent)

Source: Ministry of Development of NER (MDoNER).

Table 6.4
Progress of SARDP-NE, February 2013

ITEM	PHASE A	ARUNACHAL PACKAGE	TOTAL
Total Length	4,099 km	2,319 km	6,418 km
Works Sanctioned/ Awarded	3,771 km	1,332 km	5,103 km
Works Under Tendering/ Approval	388 km	79 km	467 km
Works Under Tendering/ Approval	388 km	79 km	467 km
Roads Completed	1,062 km	40km	**1,102 km**
Target for Completion	March 2015 (for ongoing works)	June 2016 (for awarded length)	

Source: MDoNER.

The lengths to be constructed /upgraded and their coverage in phases have repeatedly undergone changes due to intermittent request from state governments and other quarters. Table 6.3 and 6.4 show the components and the progress of SARDP-NE as of February 2013.

The development status as per the most recent update is,

- Detailed Project Reports (DPR) are under preparation for about 13 per cent of the proposed roads for Phase A and the Arunachal Package.
- About 10 per cent (1,102km) of the total length has been completed
- Phase B is approved only for DPR preparation and not investment.
- In 2012-13, 300 km expected to be constructed and 1,980 km awarded.

Overall progress has been quite slow, with largely pre-construction activities being undertaken as of now. Given the pace, SARDP-NE is expected to be completed not earlier than 2020. Figures 6.6 and 6.7 show roads under SARDP-NE for Arunachal Pradesh and the East West Corridor respectively.

EAST WEST CORRIDOR

Apart from SARDP-NE, the NHAI is implementing the four-laning of 672 km of the East West Corridor from Srirampur (Assam/West Bengal border) to Silchar in Assam, and the two-laning with paved shoulders from Jowai to Rattecherra (104 km) in Meghalaya under NHDP-III. The corridor is estimated to be completed by December 2014.

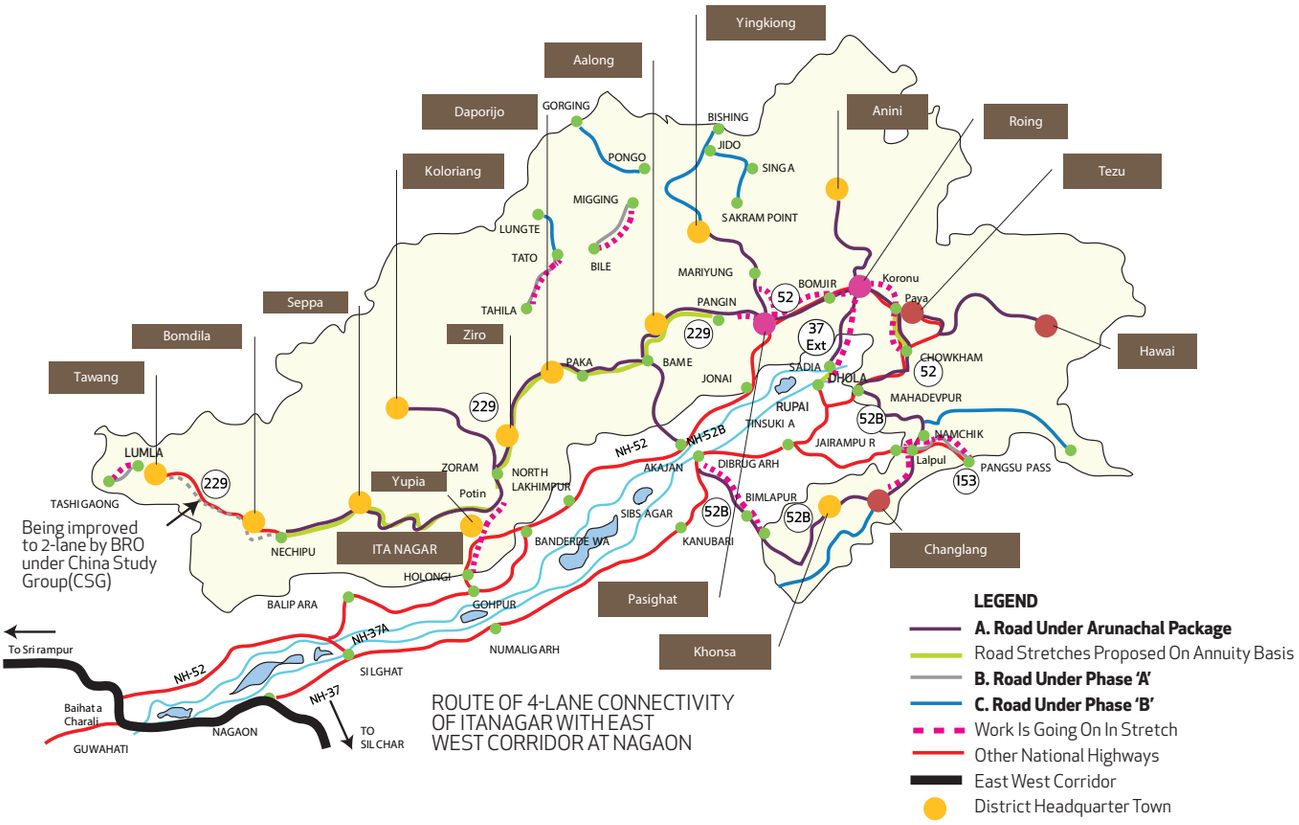
PRADHAN MANTRI GRAM SADAK YOJANA (PMGSY)

PMGSY, a flagship programme of the government being implemented and monitored by the Ministry of Rural Development. takes care of rural connectivity and has specific provisions to take care of the sparse population and hilly terrain of the NER and border blocks. For the in-between roads, Major District Roads (MDR), Other District Roads (ODR), inter-state roads and other urban roads, there are funding windows through different ministries.

Table 6.5 presents the progress as of February 2013. By February 2013, 11,996 habitations out of the total 17,486 eligible have reportedly been sanctioned, while 9,511 (54 per cent) of the habitations have been

Figure 6.8

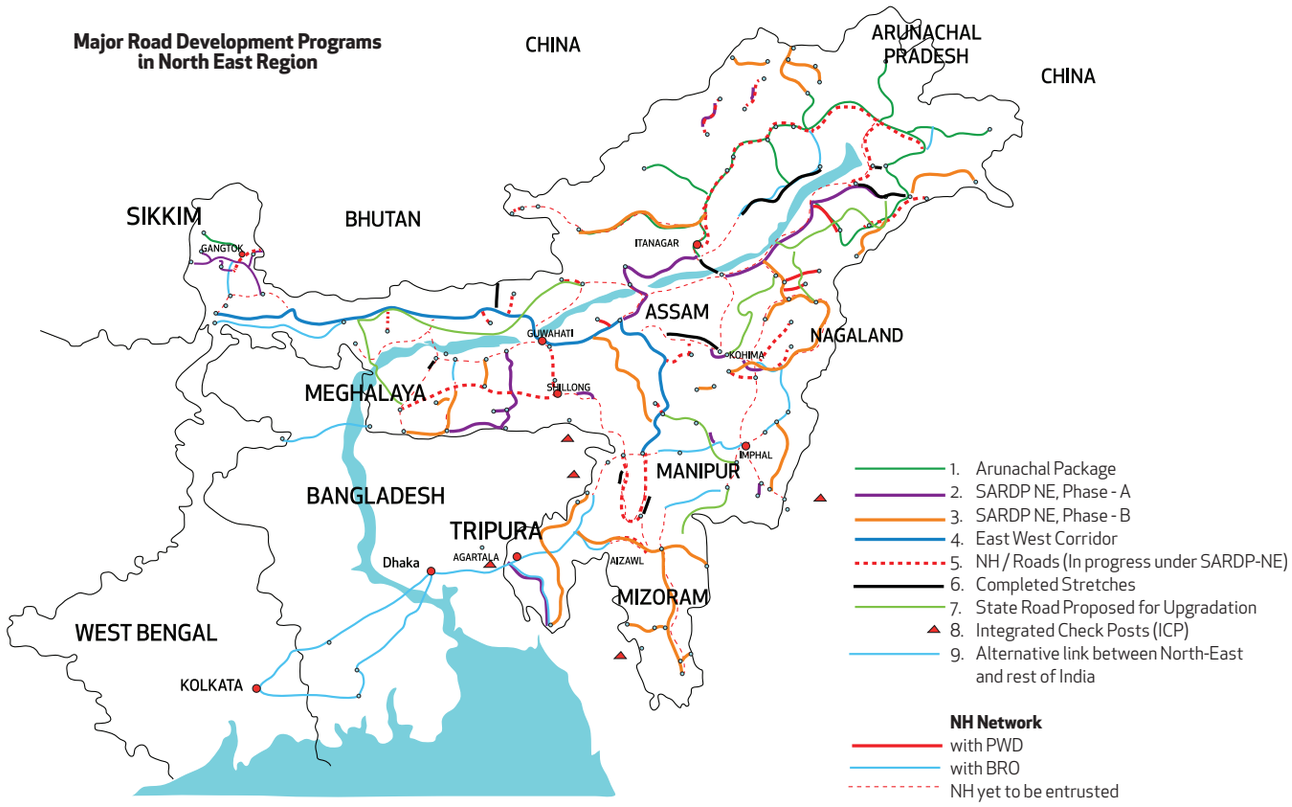
Roads Covered for Improvement in Arunachal Pradesh under SARDP-NE



Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Figure 6.9

East West Corridor: Existing Roads Being Upgraded to 2-Lane or 4-Lane



Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Table 6.5
Pradhan Mantri Gram Sadak Yojana in the North East, February 2013

	ELIGIBLE	DPRs CLEARED	CONNECTED
No. of Habitations	17,486	11,996	9,511 (54 per cent)
		SANCTIONED (UPTO FEB 2013)	**COMPLETED (UPTO FEB 2013)**
No. of Road Works		9,401	6,679 (71 per cent)
Length of Road Works (in km)		39,674 Km	31,236 Km (79 per cent)

Source: MDoNER.

connected. PMGSY is expected to connect all the remaining eligible habitations by 2020.

DEVELOPMENT STATUS

The road network per capita is significantly higher in the NER relative to the rest of the country, given the hilly terrain and the low density of population. However, a more accurate indicator of the ease of movement of passenger and freight traffic, the road length per unit area, is higher only in Assam, Nagaland and Tripura, and not in the other hill states. It is again easy to conclude that road infrastructure is still relatively deficient in the NER states.

NATIONAL HIGHWAYS

While overall road density (km/100 sq km) of the region may be lower than the national average, the length of National Highways in the NER for a given area as well as population, is much better than rest of India (Table 6.6).

The progress and latest available status for some of the major programmes for NH development is placed in Table 6.7.

STATE HIGHWAYS, INTER-STATE ROADS, MDRS & ODRS

These are financed from a wide variety of projects and schemes of different ministries/ departments and the states' Plan funds. Many of these roads are not new alignments but existing roads that have deteriorated, requiring necessary maintenance and upgradation. As availability of funds for maintenance is considerably poor, maintenance being a non-Plan activity, existing roads are improved under Plan funds. This issue has been discussed later in the chapter.

STRATEGIC AND BORDER ROADS BY BRO AND OTHER AGENCIES

The Government of India has also embarked on an ambitious plan to construct strategic roads in border areas on the Bangladesh, Bhutan, China and Myanmar border in the About 9,302 km of roads are being constructed for strategic reasons by Department of Border Management.

This will greatly add to the stock of roads in the NER and serve the needs of the local population in addition to strategic needs. For obvious reasons, the details are not discussed here. However, it is recommended that the present organisational shortcomings afflicting the Border Roads Organisation which plays a very major role in the NER should be addressed by the Government at the earliest.

Overall, while major road programmes are being undertaken in the NER, the pace is a concern. The completion of these, particularly SARDP-NE and the East West Corridor, will significantly improve the quality of road connectivity. At the same time, PMG SY implementation needs a significant push.

KEY ISSUES

While substantial investments for roads have flowed into the region, issues such as road network planning, maintenance, creation of human capital, augmenting machinery, and process improvement have not received required attention. The emphasis has largely been on sanctioning new roads, neglecting maintenance of the existing ones, an undesirable situation further exacerbated by the languid approach often leading to serious time and cost overruns.

The need to establish a connection with the rest of India following Partition, the Chinese aggression, economic development, and trans-border connectivity are some of the main drivers which have been impelling the Central Government to construct roads in the region since Independence. However, impediments such as terrain and climatic conditions, insurgency, and mismanagement of resources have been key constraints.

Table 6.6
National Highways: The North East and All-India

TOTAL NH LENGTH	76,818 KM	
IN NE STATES	9,525 KM (12.40 PER CENT)	
	ALL INDIA	NE REGION
Km / 1000 sq.km	23	39
Km / Million population	75	600

Source: Ministry of Development of NER (MDoNER).

Table 6.7
National Highway Development Programme (NHDP)-I,& III

PROGRAMME	STRETCH	LENGTH	STATUS
NHDP-II (NHAI)	East-West Corridor (only in Assam, from Shrirampur to Silchar)	670 Km	Completion likely by March, 2014 after many missed deadlines
NHDP-III (NHAI)	Jowai (Meghalaya)/Ratachhera (Assam Border)	102 Km	Work awarded in March, 2012

Source: Ministry of Development of NER (MDoNER).

RECOMMENDATIONS

Road connectivity has to be essentially planned at four levels:

a. Connectivity within each state
b. Intra-regional connectivity
c. Connectivity to rest of India
d. Connectivity to neighbouring countries

The section attempts to make recommendations with that broad objective while drawing on the existing gaps and prevalent issues in the NER.

INFRASTRUCTURE

A. Strategic

- With the expectation of continuing containerisation in the country, it is advisable to upgrade all district headquarters in the plains areas to become container transport-compatible. In addition, all points of international access in Arunachal Pradesh (Pangsau Pass), Manipur (Tamu-Moreh), Mizoram, (new point at Zorinpui), Agartala (Sabroom and Akhaura) and Meghalaya (Dawki and Mahendraganj) should also become container-compatible.
- Four-lane access to all state capitals in the North East needs to be ensured.
- Development of an alternative highway alignment linking West Bengal and Bangladesh through the Hili-Mahendraganj Corridor and the Kolkata-Bashirhat–Khulna Corridor needs to be undertaken.
- Development of modern highways using tunneling and bridging techniques to connect Gangtok with Siliguri and Imphal with Kohima and Silchar so as to reduce transit time and minimise environment damage.

B. State Connectivity

i. Upgradation of Standards for State Highway and District Headquarter Link Roads

The standard of roads being built to link the district headquarters under the SARDP-NE should be gradually raised so that the container load can be carried in the plains districts of Assam and also to important transit points like Dimapur in Nagaland and Itanagar in Arunachal Pradesh. For these main state highways, standards similar to National Highways should be prescribed, viz. the formation width of 12 mt with carriageway of 10 mt. and radius of curvature of 12 mt to facilitate movement of large containers.

ii. Connectivity between State Capitals and the NHDP

As a first step, each of the state capitals needs to be linked to the expanding highway network being developed under the NHDP. At present, only Guwahati is linked to the East West Phase-II of the NHDP, and Kohima is

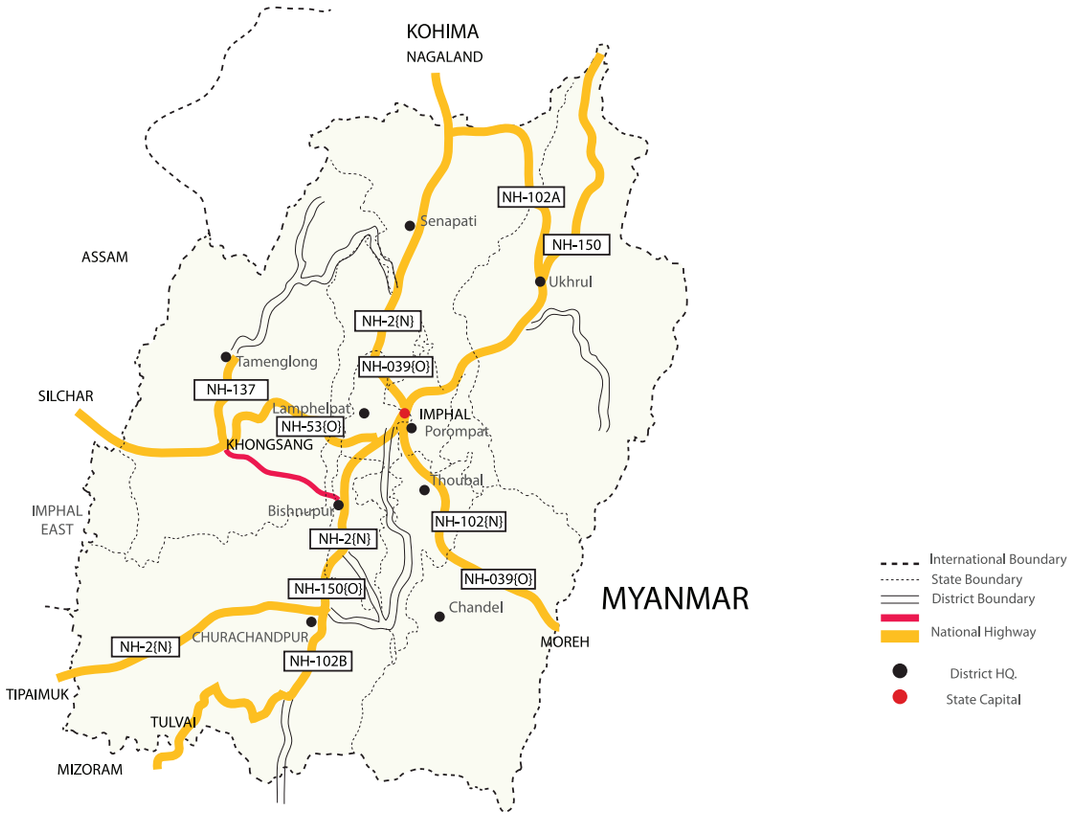
being linked by four-lane highway too. It will be built from Daboka, on the East West Highway as a spur to Dimapur and then upto Kohima. Shillong will have four-laning access only from Barapani while district headquarter Jowai in Meghalaya will have a full four-lane highway linking it to the main National Highway. Similarly, the three southern states of the North East will have problems of last-mile connectivity. The closest four-lane highway for Imphal will be in Aizawl, Kohima and Siliguri. For Mizoram, it is through the proposed four-laning of the Siliguri-Kolasib highway which has not yet been sanctioned. There is no planning for any four-laning in the ghat sections of Mizoram. Similarly, Agartala will have a four-lane highway upto Silchar/ Karimganj and thereafter traffic will run on a two-lane highway. Itanagar is being connected by a four-lane spur.

iii. Connectivity to and from the States

Manipur

At the moment, Manipur deserves the highest priority for four-laning since it is a major security area and it has the worst road connectivity on account of frequent blockages on the approaches to the National Highway. Four-laning is necessary to ensure that goods can reach cheaply, quickly and safely and the exorbitant flight tariffs being charged come down to a reasonable level. In view of the special problems of Manipur, we suggest that four-laning be done in two phases; firstly the Kohima-Imphal route () which plies through districts inhabited by Naga tribes and secondly the Silchar-Imphal route. The Silchar-Imphal route involves crossing of six bridges and five valleys and low-altitude hill ridges. In view of the strategic importance of Imphal, we recommend that the MoRTH construct a four-lane highway using the method of tunneling through the ridges and building bridges across the valley. Similarly, a tunnel through the main Kohima peak would ensure spur access from the Dimapur-Kohima highway to the Manipur Valley. The highway from Imphal upto the border at Moreh-Tamualso needs to be four-laned since this is part of the Asian Highway No 1 proposed by UNESCAP and ADB and to which India is a signatory. The Tamu-Moreh border will be the main entry point for all roadborne traffic entering India from the ASEAN countries and we should aim that the goal of the Asian Highway No 1 needs to be an international standard (see Figure 6.10).

Figure 6.10
Road Map of Manipur: Select National Highways



Source: MoRTH.

Nagaland
While at the present moment international trade through Nagaland might be negligible, but bearing the latent potential in mind, the MoRTH should prepare project reports for any future border crossing which the Nagaland Government may wish to pursue.

Mizoram
For Mizoram, four-laning upto Aizwal is both commercially and politically necessary. It is also recommended that four-laning of the highway upto the Indo-Myanmar border at Zorinpui (see Figure 6.11) is necessary to have seamless linkages to the Kaladan Multimodal Project. This will provide a secondary access to India from the Myanmar side and will enable better utilisation of our existing investment in Kaladan. Mizoram should be considered as being a gateway state along with Manipur as far as international trade is concerned.

Tripura
The third gateway state for the North East could be Tripura which rests upon the success that we can achieve in our negotiations with Bangladesh on access to Chittagong. Four-laning is needed right from Sabroom on the southern tip of Tripura to the main East West Highway in Silchar. Such a strategic link could enable the North East to avail of entry points in Myanmar and Bangladesh depending on prevailing political relations.

Sikkim
Sikkim suffers from relative geographical isolation. We recommend that the main highway from Siliguri to Gangtok be reconstructed on a new alignment using modern method of tunneling and bridging of valleys in contrast to the trans-alignment with hill hugging routes. We should aim to reduce the transit time between Gangtok and Siliguri to about three hours by road. A road built using tunnels and bridges will provide all-weather access

Table 6.8 is a listing of roads essential for inter-state connectivity in the NER.

C. NER-India linkage

i. Importance of Proposed NH 31D (Salsalabari-Ghoshpukur near Siliguri)

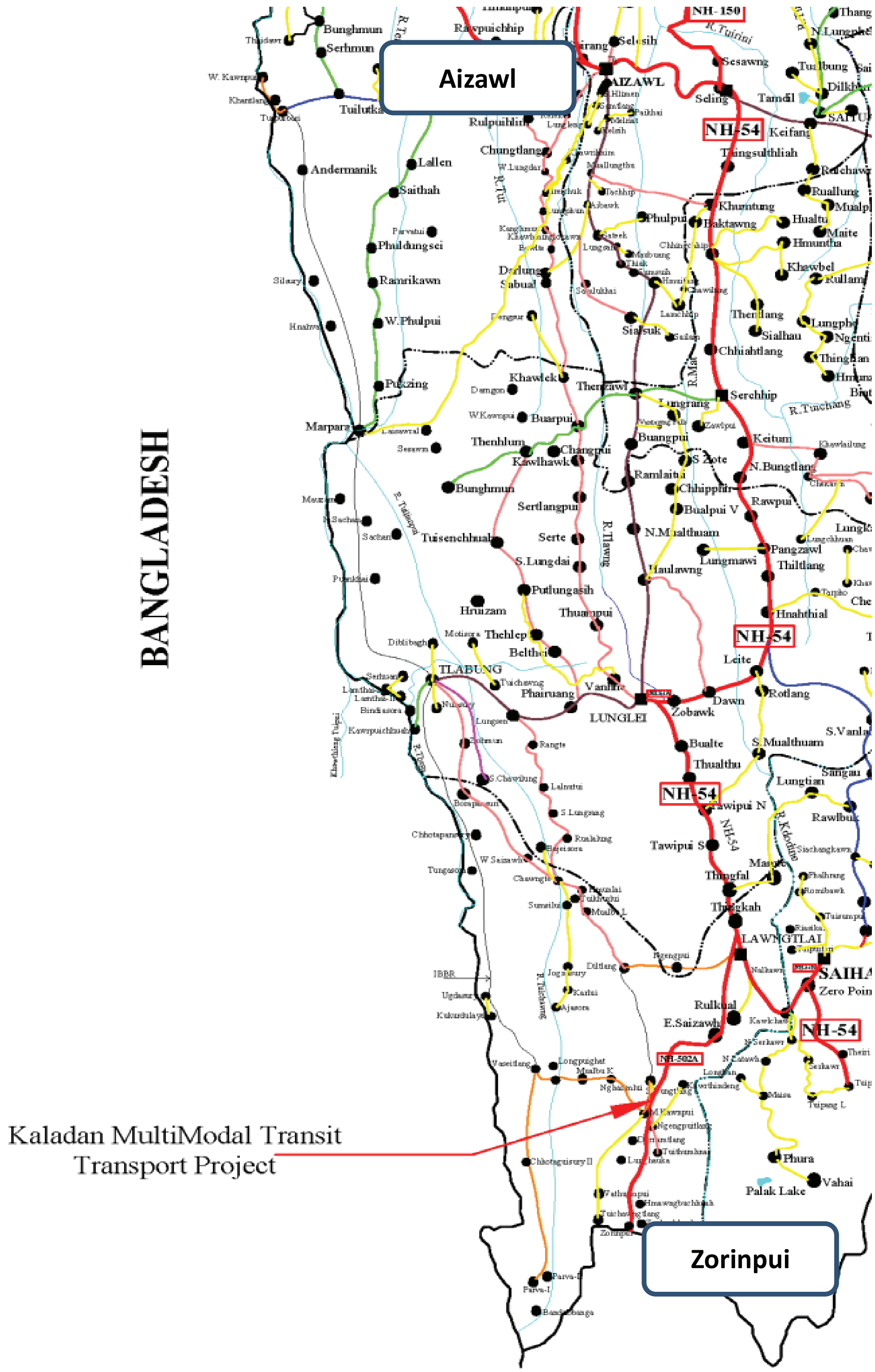
A discussion on the road network in the North East inevitably requires attention to the delays in constructing National Highway 31D. This alignment is from Salsalabari to Ghoshpukur (near Siliguri) on the Assam-West Bengal border. For a length of 163 km, the new alignment is on the southern side of the North Bengal Corridor. In view of the anticipated growth of trade in the North East, it is possible that this strategic highway will have to be six-laned in the near future. As it stands now, it is understood that strong support of the government of West Bengal shall be required for acquiring the land in North Bengal. Since this is a project of national importance which links the entire North East with the rest of the National Highway network, special effort has to be made at the political level to ensure that this vital link is created and maintained.

ii. Alternative link between North East and Rest of India

At the same time, development of alternative routes from the North East to West Bengal should be encouraged so that the NER cannot be isolated during any future hostility or adverse weather conditions. Asian Highway No 1 enters Bangladesh from Dawki on the Meghalaya-Bangladesh border. However, the closest approach from Meghalaya to West Bengal is on the alignment Mahendraganj to Hili which is slightly over 100 km. It is possible that the Bangladesh government might permit India to access this route by linking it to the job of connecting Sylhet with Rangpur in Bangladesh. Such an action will be possible only with a major bridge over Padma (probably Sirajganj) and Brahmaputra. This bridge could simultaneously be used for development of Hili to Mahendraganj route to Meghalaya. The development of the project report for this is strongly recommended.

The third possible route would be through southern Bangladesh from Dhaka to Kolkata. The present trans-border arrangement is a long NH35 through the Benapole-Petrapole border crossing connecting Jessore with Kolkata. However, there have been requests from Bangladesh Chambers of Commerce for a connection from Khulna to Kolkata on the South Eastern side of Kolkata through the India-Bangladesh border near Bashirhat. Such a connection would also enable industry and commerce to benefit from an alternative port in Mongla, Bangladesh, which lies the south of Khulna. This would help to boost trade in the Greater Kolkata area. Bangladesh might also be persuaded to extend Agartala-Dhaka-Kolkata connectivity through Jessore or Khulna if India undertook major highway construction in the southern part of Bangladesh.

Figure 6.11
Aizawl–Zorinpui [on Mizoram-Myanmar Border at the Tip of Kaladan Project]



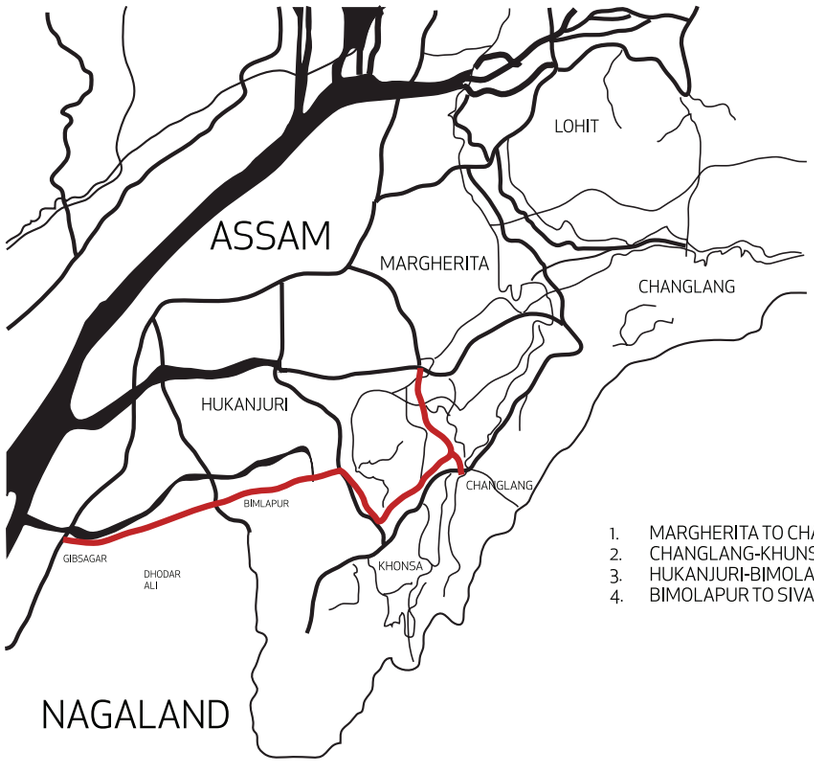
Source: MoRTH.

Table 6.8
Roads Essential to Provide Inter-state Connectivity and Connectivity to Backward and Border Areas

STATE ROAD PROPOSED FOR UPGRADATION	STATE	LENGTH (KM)
Margherita-Changlang-Khonsa-Hukanjuri-Sibsagar (see Figure 6.12)	Arunachal Pradesh and Assam	130
Rowta (NH-52)-Udalgiri-Tamulpur-Jala-Goverdhana-Kajolgaon (NH-31)-Srirampur	Assam	406
Chumukedima-Shedhumi-Niuland-Ralan-Sanis-Bhandari- (Merapani) – Longtho-Longehem-Tuli (foothill road)	Nagaland and Assam	250
Tenglong to Sesenpur, via Khongsang and Rengpang	Manipur	133
Churachandpur-Singhat-Sinzawl-Tuivai Road-Mizoram border, via Ngopa (see Figure 6.3)	Manipur and Mizoram	340
	Total length	**1,804**

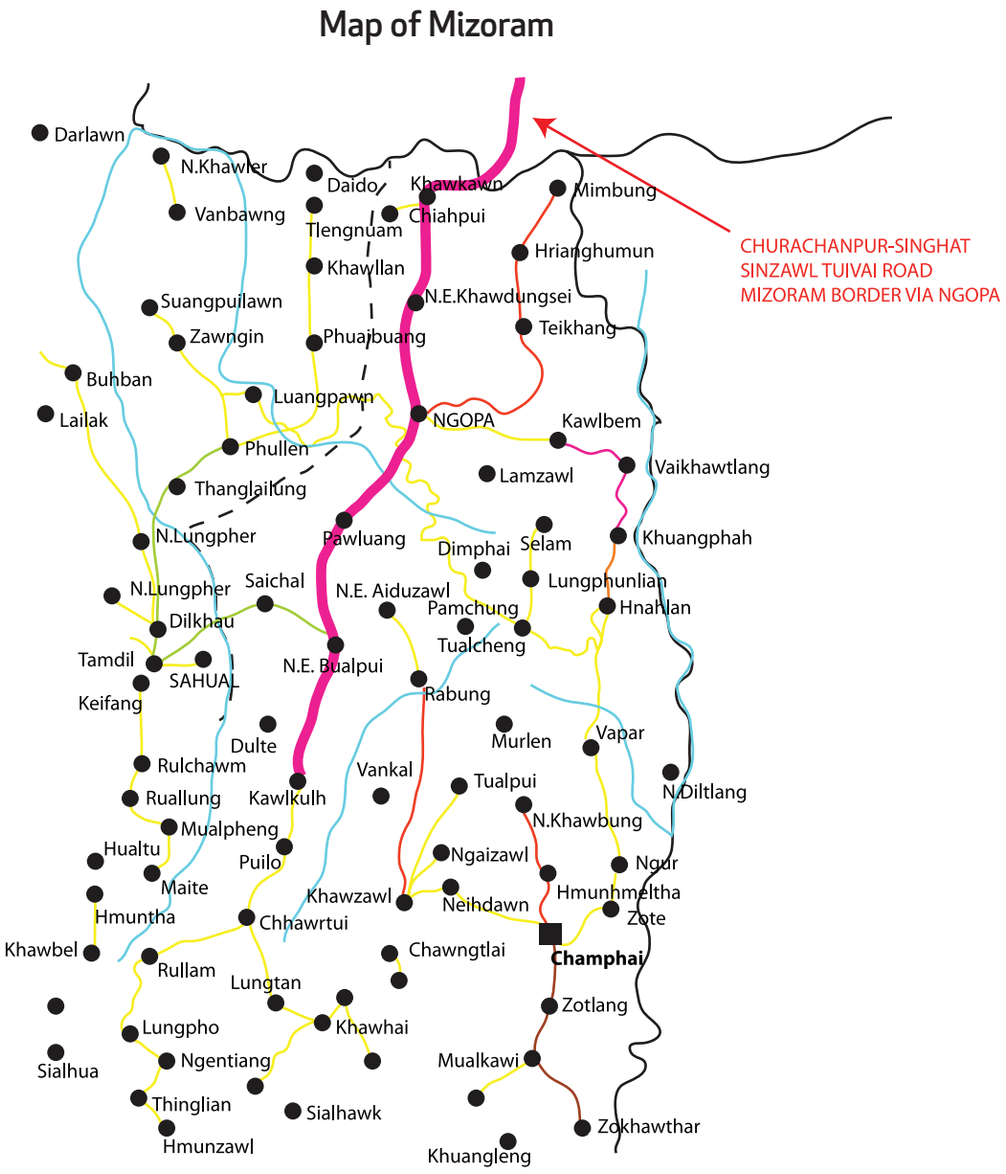
Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Figure 6.12
Margherita to Sivasagar



Source: MoRTH.

Figure 6.13
Churachanpur to Mizoram Border via Ngopa



Source: MoRTH.

D. Roads for Diverse Objectives

Development of roadwork for the following purposes needs more attention than is being given:

i. For evacuation of agricultural and horticulture products and other natural resources. The economic development of the NER will come from the growth in the agriculture sector (particularly horticulture, floriculture, bamboo), services sector and the natural resources of hydropower, tea, oil, limestone and coal. Evacuation of these products from their source of origin/ manufacture/ cultivation has to be planned by road or rail and inland waterways (air for highly perishable flowers).

ii. For evacuation of commodities, the development of the railway sector and inland waterways is critical. As there is intense pressure for road development to connect human habitations that are sparsely distributed in the region, agriculture link roads to evacuate agro-products to the nearest market does not get the required importance.

iii. It is recommended that serious thought be given to developing network of agriculture link roads to the nearest mandi/ market for movement of agriculture/ horticulture produce. Area under horticulture has increased in the NER due to the interventions made under the Horticulture Mission of the Minis-

try of Agriculture. Production of cereals has also increased in recent times in the plains areas of Assam. For the creation of a robust market economy, a network of roads to carry agriculture produce is essential. As road projects are generally selected on the basis of pressure from different sections, agriculture link roads do not have any constituency and hence are not pushed.

E. New Technology: Bridges, Tunnels, Geo-textiles, Bio-engineering

i. **Bridges** are numerous in the North East. There is a large requirement for semi-permanent timber bridges to be converted to brick and mortar or iron and steel bridges. Technology for laying bridges quickly and at a low cost has to be promoted. Technology of Bailey bridges has improved recently; this should be used for North East. For interior areas, suspension bridges should be promoted. These are low-cost and can be installed quickly. Steel girder bridges can also be promoted. They are also earthquake resistant.

ii. **Tunneling:** Emphasis is needed on tunneling to reduce the length of roads. In snow-covered areas, tunneling should be used to reduce the length of the road exposed to the elements. Tunneling will also result in generation of gravel of which there is a shortage in North East. More tunneling will reduce cost and distances, and be environment-friendly.

iii. **Two-lane roads:** In place of four-lane roads, preference may be given for construction of two-lane roads suitably located on either side of the hill slopes. This is preferable because in hilly areas, two-lane roads will involve less earth-cutting and these two roads could be used separately for two directions.

iv. **New Materials:** The terrain and topography of the North East lends itself to increased use of new material such as geo-textiles and innovative methods to use local material such as bamboo through bio-engineering. The Ministry of Textiles is trying to promote the use of geo-textiles in the NER. The state governments and MoRTH should take up visible pilot projects to promote the use of new materials such as geo-textiles. The World Bank road project in Mizoram has effectively displayed use of bio-engineering using bamboo to prevent landslides. These efforts can be expanded in other areas as well. Further, use of appropriate technology for the construction in heavy rainfall area needs to be introduced in the field. The introduction of new technology could involve additional cost than traditional methods therefore decision on financing such technologies needs to be taken at appropriate level.

v. **Suspension Bridges:** Under PMGSY, there is no provision for rope bridges/ suspension bridges that are suitable for a region with scattered rivulets. We strongly recommend that rope bridges and Bailey bridges be included in PMGSY guidelines for the NER.

F. Maintenance

Maintenance is a major bugbear in the NER. It is cost-intensive due to heavy rainfall and nature of terrain, and availability of non-Plan funds is never sufficient for maintenance. The general tendency is to build – neglect – rebuild in the garb of expansion. Unfortunately, the cost of poor maintenance is borne by the user and the people, reflected in the high rates of accidents and the low user life of vehicles in the NER. Due to poor conditions of roads, buses and trucks are rendered unusable after four years, whereas in the rest of the country, heavy vehicles and trucks can be used for at least 10 years. In short, while maintenance cost of vehicles is high, commercial lives are much shorter. Multi-axle vehicles cannot ply beyond Guwahati due to inadequate road capacity. While these conundrums exist, growth in the number of commercial vehicles in the North East has been much (about 50 per cent) higher than other parts of India even with the current slowdown. Thus, maintenance and improvement of roads acquires immense importance. The following is recommended to address the issue:

i. Use higher quality standards for construction of roads, so that maintenance needs are lower.

ii. Much higher allocation for maintenance and professional management of maintenance.

iii. A policy decision to cover maintenance expenditure under the plan needs to be taken.

iv. Maintenance by contractors for first five years after the construction should be inbuilt into the road contracts. Subsequently, the state government should prepare a master plan for maintenance, based on which funds shall be allocated and released by the agencies for blocks of five years. Overall accountability should be with the PWD for general maintenance and they have to be equipped financially and operationally to do so.

v. Promote concept of Performance Based Maintenance Contracts for three to five years. Start with roads receiving WB/ ADB or GOI assistance under SARDP-NE programmes.

vi. Establishment and management of a dedicated Road Maintenance Fund.

The rainy season in the North East ranges from six to eight months. Engineering and project management strategies have to be created around the difficulties that Nature presents.

INSTITUTIONAL STRENGTHENING

A. New organisational structure

In the hierarchy of roads, National Highways are at the top and PMGSY is at bottom of the pyramid. There are village roads, forest roads, roads in small towns which are the responsibility of the panchayats/ local bodies/ forest department / nagarpalikas etc. In between are a slew of state highways, MDRs, ODRs which form the backbone of the transportation sector. Many of the MDRs are also inter-state and inter-district roads. These are funded by various agencies of the Central Government under different schemes, untied funds and also Special Plan Assistance (SPA)/ Additional Central Assistance (ACA) from the Planning Commission. The implementing agencies are NHAI, BRO and state PWDs and local bodies.

BRO is beset with several organisational issues and its performance on critical roads draws the displeasure of state governments at times. BRO works in the most difficult conditions and has very little autonomy. As BRO is entrusted with many important roads other than strategic GS roads, issues afflicting BRO should be addressed to enable the organisation to perform its role.

There is an urgent need to strengthen the capacity of the state construction agencies. At the same time, the quality of roads in the NER and their timely implementation cannot be allowed to suffer while the capacities of state PWDs and other agencies are built. Roads are the backbone of this region. The whole process of building them right from the stage of conceptualisation to preparation of DPR till maintenance needs overhaul.

In order to address the constraints, a new institutional structure for the road sector for the NER is recommended, which would provide technical support and guidance to the state governments without impinging on the autonomy of the states.

Two models that appear appropriate for such an institution to draw on are:

a. Pradhan Mantri Gram Sadak Yojana (PMGSY)

   The PMGSY implementation model is working well in creating good quality roads in rural and interior areas. Another body to assist the state governments in the road sector (apart from the PMGSY roads) covering state highways, MDRs, ODRs, inter-state roads, etc, with technical and managerial inputs should be set up whose structure could be drawn on lines of the PMGSY arrangements. The advantage of the PMGSY model is that of clear demarcation of roads under the Centre and state, together with strict standards of DPR preparation, bid documents, bidding transparency and robust MIS.

b. Joint Assistance to Support Projects in European Regions (JASPERS) in the European Union.

   JASPERS provides technical expertise to the 12 Central and Eastern EU Member States: Greece, Croatia, Serbia, Montenegro and former Yugoslav Republic of Macedonia, for any stage of the project cycle from the early stages of project conception through to the final application for EU funding. The assistance is provided free of charge and is geared towards accelerating the absorption of the available funds. A JASPERS-like organisation should be made available for providing technical assistance to the NE States. It will work in close cooperation with the states to produce accomplished project proposals which will meet parameters required for funding by different sources. Manned by technical experts, it will provide assistance for any stage of the project cycle from the early stages of conception through to implementation and maintenance.

   Such institutional structure may be established under the administrative control of Ministry of DONER. This model, combined with the GIS database that has also been proposed, has the potential of vastly improving the way roads are conceptualised, designed, plans prepared, bid evaluated and awarded and finally maintained. This organisation can be christened as NER Road Development Authority (NERRDA).

B. Capacity building

Investments in roads are increasing but there has been no corresponding assessment of the capacities of the PWD, BRO or other agencies to cope with the increasing burden. It is of urgent importance to build capacity of state PWDs, central agencies and contractors.

Training

- **Capacity building of Road Building Organisations** State PWDs possess a wealth of good engineers having local knowledge base. However, their exposure to good national/international practices is weak. DONER, with support from MoRTH and Indian Academy of Highway Engineers, has taken some initiatives to provide training to staff at various levels and in various aspects of planning, design, project management, maintenance,

dispute resolution, quality assurance. These initiatives need to be strengthened considerably and training programmes be designed to upgrade existing capacity over the next 10 years.

- **Central Research Institutions:** Institutions such as Central Road Research Institute (CRRI) under CSIR and Indian Academy of Highway Engineers should take more interest in the NER and evolve technology and management solutions for the region. They should design a programme for regular interaction with the State PWDs.

  Further, the CRRI and CSIR should set up a dedicated road research and development institute in the North East to deal with NER-specific technology issues.
- **Contractors' Associations:** Supporting the contractors' associations in establishment of an academy of construction on the lines of National Academy of Constructions (NAC), Hyderabad, in the NER, for delivery of training to construction workers and equipment operators. Linkage with ITIs and polytechnics should prove helpful for geographic spread in the region.
- **Engineering Colleges:** The capacity of engineering colleges in the region to train civil engineers needs to be be enhanced. Besides the IIT at Guwahati, there are two state engineering colleges in Assam (Guwahati and Jorhat), and National Institutes of Technology in Agartala, Silchar and Dimapur. There is also NERIST in Itanagar. In the interest of the region, an assessment of the number of civil engineers that the region needs should be done, and consequent action taken to ensure a quality supply of engineers.
- **Training & capacity building at** levels below Junior Engineers. Start courses on road technology in polytechnics which will create a steady supply of trained manpower.
- **Project development and Bid Process Management**
  - Preparation of DPRs (often project costs have to be enhanced as DPRs are not prepared properly). Ideally, preparation of quality DPRs can mitigate problems in implementation. If DPRs are made correctly and pre-construction activities duly completed, the project completion time will be certainly reduced.
- There is a need for improvement and stand ardisation of:
  - Bid documents
  - Evaluation of bids
  - Drawing up of contracts
  - Implementation, supervision
  - Quality control (lack of laboratories for quality control)
  - Transparency

Lack of equipment Presently it appears that there is no major dearth of equipment for bigger road contracts for NHAI or SARDP-NE roads. Big contractors are attracted towards the NER to the large contracts being awarded now on EPC basis by NHAI and MoRTH for SARDP-NE and East West Corridor. However, for the lower order roads, even state highways and PMGSY packages, local contractors still do not have adequate equipment available. Big contractors coming from outside into the NER are generally not interested in the smaller packages even if the few roads are bundled together in a single package.

A proposal for an Equipment Bank had been mooted few years ago by North Eastern Development Finance Corporation Ltd (under Ministry of DONER), Guwahati. The proposal could not go far due to lack of land. We suggest that state governments, NEDFi or any other agency (including private players) set up Equipment Banks at different locations in the NER.

Air connectivity can fill in to a significant extent the need for intra-state connectivity and the region's linkage to the mainland.

C. Strengthen Project Management

The rainy season ranges from six to eight months. Project management strategies have to be created around the difficulties that Nature presents. The high incidence of rain in the region is a fact of life, and engineering and project management solutions need to be developed to cope with this problem.

A vicious circle of delays and non-completion of projects is created in the following way:

i. Due to large amounts being invested in the road sector, the number of projects being sanctioned by different central agencies and state governments is increasing.
ii. Owing to the internal weaknesses, projects are not completed in time. Utilisation certificates are not submitted in time. On the other hand, funding agencies sanction new projects more as a means to absorb their allocations rather than on pure merit. States are also happy to get new sanctions which appease various interests which espouse one road or the other. Ultimately, the bunch of incomplete projects gets inflated with large committed liabilities. Construction of roads is sometimes treated as a means of distributive justice and not as projects that need to be professionally managed. There is little effort to develop contracting capacities. In certain cases, construction of a 30-km road has taken as long as six years, with work having been divided in 25-30 parcels.

Table 6.9
Traffic Trends in the NER

	AIRCRAFT MOVEMENTS		PASSENGERS		FREIGHT (IN TONNES)	
YEAR	NO.	PER CENT CHANGE	NO. (IN MILLION)	PER CENT CHANGE	NO.	PER CENT CHANGE
2004-05	33,019	4.5	1.45	10.8	10,304	13.4
2005-06	34,036	3.1	1.62	12.0	11,006	6.8
2006-07	42,069	23.6	2.27	40.2	9,836	-10.6
2007-08	55,471	31.9	2.86	25.9	11,260	14.5
2008-09	58,843	6.1	2.98	4.1	13,346	18.5
2009-10	62,307	5.9	3.63	21.8	18,947	42.0
2010-11	67,393	8.2	4.51	26.5	24,087	27.1
2011-12 (Provisional)	70,576	4.7	5.45	18.6	23,748	-1.41

Source: DGCA's presentation for PSC, 18.4.12.

Therefore, annual capacity of state governments and implementing agencies should be assessed and combined with strict monitoring such as testing laboratories. Quality control facilities are also, at present, quite poor.

D. Leveraging Information Technology

GIS Database

Creation of centralised database of road assets accessible to the public based on GIS or any other suitable technology is a must. This will prevent duplication of proposals for upgradation/ maintenance of same roads to different agencies, create transparency and help in proper monitoring. All state governments and agencies must participate in the centralised database system. It will involve massive data entry as data is available at Executive Engineer or SDO, PWD level. However, such a database combined with a GIS map will be of immense help in policy planning and monitoring. It can and should be even made open to the public as a stakeholder.

It is recommended that DONER, Department of Information Technology, and MoRTH consider this proposal in right earnest. It might require some time, funding and concerted effort, but the outcome shall be worthwhile.

E-governance in State PWDs

None of the state governments including Assam have embarked on serious use of e-governance, e-tendering, e-procurement and comprehensive computerisation of the PWD to improve their project management. A quick survey of the websites of the state PWDs shows that barring Arunachal Pradesh, Tripura and to some extent Manipur, none of the other states have a functioning up-to-date website. Use of e-governance will expand the purview of contractors taking up projects in the states. Several good models are already available which the NE States can use with their local modifications.

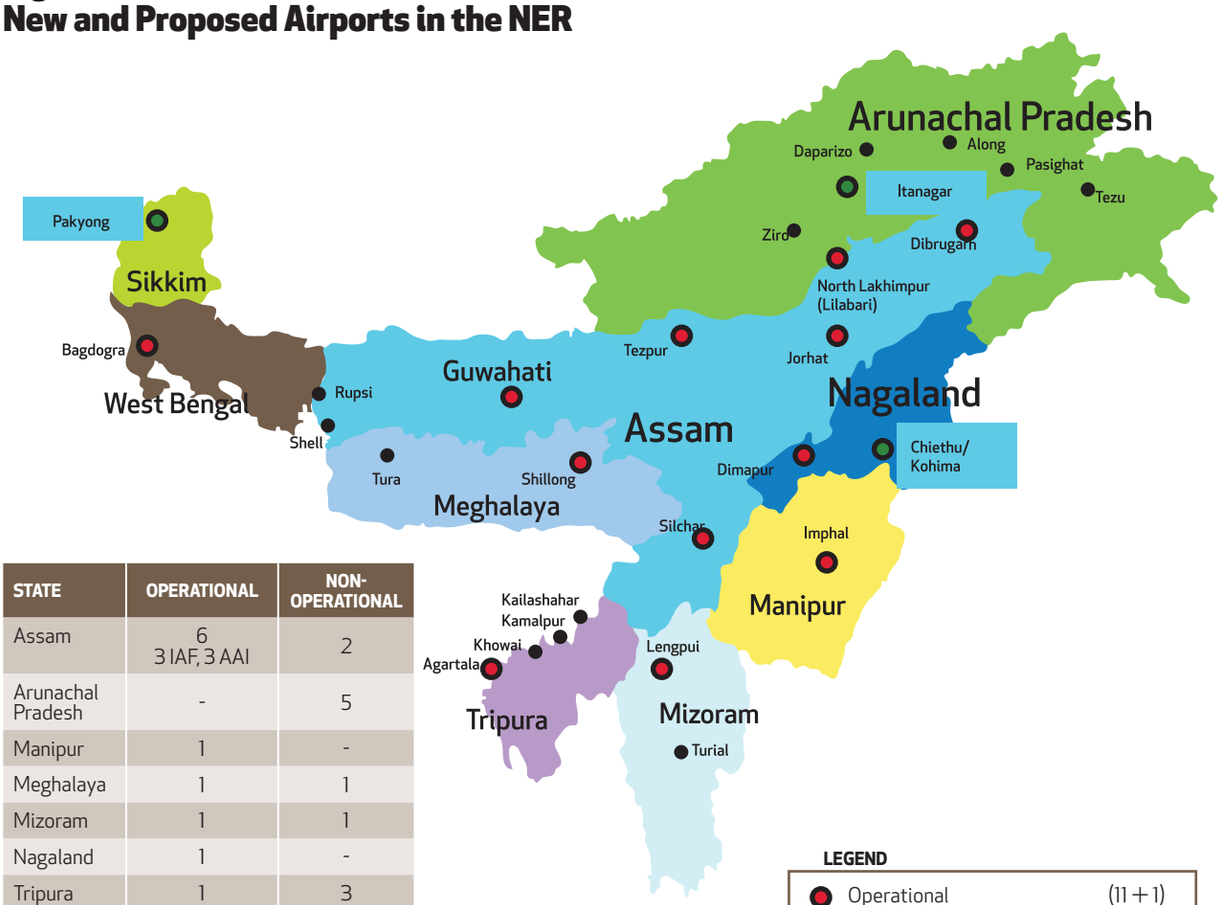
CIVIL AVIATION

Civil aviation plays a greater role in the NER than it does in other parts of the country due to inherent terrain and the physical spread. Civil aviation is more of a necessity than an option for transport needs of the NER given the topography which renders road and rail connectivity to be limited. Except Assam and Tripura, states do not have any rail connectivity. Even Tripura is too far for rail connectivity to be used for reaching the mainland. Inclusiveness of the NER with the rest of India is physically possible only through air services. Air connectivity can fill in to a significant extent the need for intra-state connectivity and the region's linkage to the mainland.

MAJOR DEVELOPMENT SCHEMES/POLICIES

The NER is dotted with airports. Some airfields are Second World War legacies reminding and reinforcing the strategic aspects of transport planning in the region. After Independence, the Ministry of Civil Aviation (MoCA) and North Eastern Council (NEC) have cooperated to develop a good infrastructure of airports. While more airports are being planned and

Figure 6.14
New and Proposed Airports in the NER



STATE	OPERATIONAL	NON-OPERATIONAL
Assam	6 3 IAF, 3 AAI	2
Arunachal Pradesh	-	5
Manipur	1	-
Meghalaya	1	1
Mizoram	1	1
Nagaland	1	-
Tripura	1	3
Sikkim	-	-
West Bengal	1	-
Total	**11+1**	**12**

Source: Ministry of DoNER.

developed, there are areas that still need infrastructure for air connectivity.

The NER currently has 12 operational airports and the same number of non-operational airports. Efforts are being made at various levels to improve air penetration in the region. North Eastern Council, Shillong, provided Viability Gap Funding to Alliance Air, a subsidiary of Air India, from 2002 to 2011 to operate ATR-42 aircrafts in the NER to increase intra-NER connectivity, particularly to those stations where commercial services are inadequate. At present, Tezpur, Dimapur and Leelabari only have services of Air India/ Alliance Air. The funding has now been discontinued by North Eastern Council. The NEC has, in August 2013, offered viability gap funding for renewing services to these airports, along with Barapani.

ROUTE DISPERSAL GUIDELINES OF DGCA

The Route Dispersal Guidelines have been an important policy initiative of the Ministry of Civil Aviation that has helped to increase the number of seats available in the North East. Table 6.9 shows the increase in air connectivity in the North East over the last decade after the civil aviation sector was liberalised.

SUPPORT FROM MINISTRY OF HOME AFFAIRS FOR HELICOPTER SERVICES

Ministry of Home Affairs provides assistance to NE state governments for helicopter services to facilitate transportation for general public in remote and hilly areas. It is presently given to all states except Assam and Manipur. The states have to follow a market-based price discovery system. Flying hours per annum are prescribed in the scheme. Not more than 20-25 per cent can be used by state governments for ministers and officials. The rest has to be essentially used for public transportation. MHA subsidises 75 per cent of the fare and the rest is paid by either the state government or the traveller.

Helicopter services will play an important role, especially for remote areas. These, however, are expensive. How they can be made viable is a crucial question.

c. New policy aimed at creating international and regional aviation hubs in the country[2]

The Government has recently cleared policy aimed at creating international and regional aviation hubs in the country. It has also approved the constitution of an Inter-Ministerial Committee under the leadership of Secretary, Civil Aviation, for suggesting various measures to overcome the bottlenecks in the development of aviation hubs at various airports In India.

The new policy not only focuses on developing global hubs in India but also on establishing domestic regional hubs to cater to the growing air traffic from non-metro destinations in remote areas, including the North East. The government is according high priority to provide air connectivity to remote, difficult and interior areas of the country, and focusing on building and modernising airports in Tier-II and Tier-III cities.

KEY ISSUES AND RECOMMENDATIONS

Air connectivity in the North Eastern States is hampered by difficult terrain and relatively low levels of economic development. Despite the important role that civil aviation can play in reducing the physical exclusion of the NER, certain issues have rendered its effectiveness to be limited. The key concerns have been with respect to:

- Need to for higher public investments for development and maintenance of airports
- Land acquisition
- Technological upgradation
- Lack of trained manpower
- Operational unviability of bigger aircrafts in some airports

As a function of one or more such issues, only 12 out of a total of 24 existing airports in the NER are operational.

Clearly, with more frequent flights in and out of this geographically difficult region, there may be considerable reduction in its physical exclusion. The development of existing airports and operationalisation of non-operational airports would not only make air links feasible between the state capitals but also with neighbouring countries. Multi-utility-based air services which enable the movement of high value cargo can also be instrumental in improving the economic vitality of the region. Likewise, perishable agro commodities can find markets within and outside the region based on their quick and reliable evacuation through air transport. Similarly, a new policy centred around small aircraft is required to implement a hub-and-spoke model.

Supporting an active civil aviation sector in the NER shall also open up the region internationally, especially to the neighbouring countries and the ASEAN. Guwahati airport should be developed as a potential major gateway to South East Asia, both for passenger and freight traffic. However, in order to achieve the objective of uninterrupted and reliable air services and to prevent accidents, there is a need to develop state-of-art weather and navigation information systems and human resources together with the actual physical airport infrastructure.

DEVELOPMENT OF AIRPORTS

For the people of Mizoram or Tripura, travel by road upto Kolkata takes around three days for a one-way journey. Hence, civil aviation services are used more as a necessity than an option, even by common people of the NER. The situation warrants planned public investment in civil aviation to increase its reach, to deploy latest technology as well as to keep it affordable. The road sector has a fully publicly funded special road programme for NER–Special Accelerated Road Development Programme for the North East (SARDP-NE). Similarly, the national projects of the Railways are covered under the Plan funded Non-Lapsable North East Railway Development Fund of the Ministry of Railways. Therefore, it is strongly recommended that a publicly funded programme for the complete development of the airport infrastructure in the region is prepared and implemented in the 12th Plan

COST OF LAND ACQUISITION FOR AIRPORTS

In the case of road and rail sector, the cost of land acquisition is included in the project cost which essentially means that the state governments do not have to bear the cost. In contrast, the Airports Authority of India (AAI) insists on getting land from the state governments free of cost which imposes undue burden on NE States and affects the development of airports. It is recommended that land acquisition cost for civil aviation infrastructure in the NER should be borne by the Union Government.

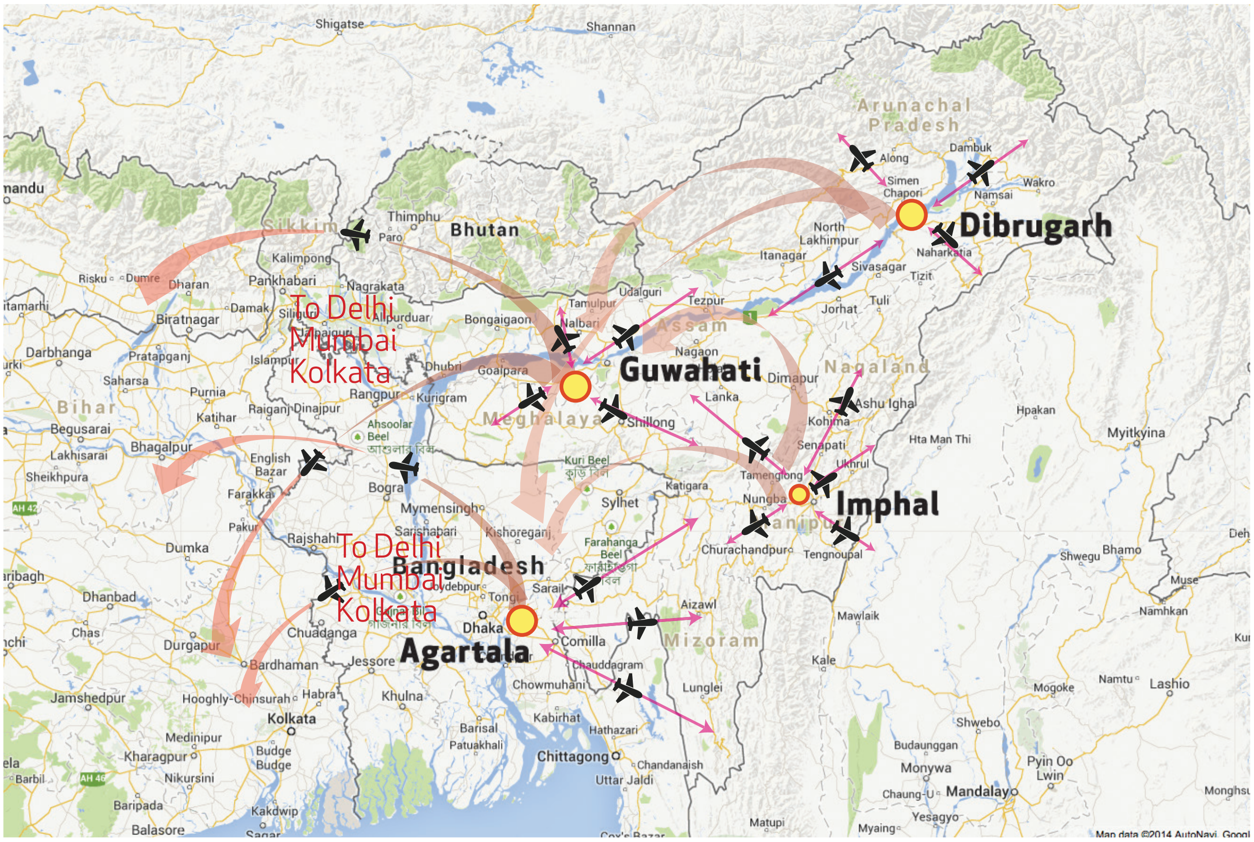
PERIPHERAL DEVELOPMENT OF FACILITIES

Unexploited export potential of the NER is in part due to non-availability of warehouses and cold-storage facilities at airports, provision of which will attract more businesses and more traffic by commercial airline operators. Transport infrastructure investment in the North East should thus include provision of infrastructure facilities for movement of goods.

2. http://www.thehindu.com/business/Industry/government-clears-new-aviation-policy-to-setup-aviation-hubs/article4702631, accessed 12 May 2013.

Figure 6.15
Indicative Schematic of the Hub and Spoke Model proposed

NORTH EASTERN INDIA



Source: Ministry of DoNER.

AIRPORT DEVELOPMENT BY AIRPORTS AUTHORITY OF INDIA

Construction is on of airports at Tezu (Arunachal Pradesh) and Pakyong (Gangtok) along with various Advanced Landing Grounds and civilian enclaves. Developmental works in the operational airports are also being undertaken. The North Eastern Council has been assisting the AAI in development of airports in the region. This includes expansion of runways to accommodate bigger crafts, provision of night landing and instrument landing system, improvement of passenger terminals, expansion of aprons and development of city side wherever land is available. Figure 6.8 shows the operational, non-operational and new airports in the NER. The details are available in Annex 6.1.

NIGHT LANDING AND INSTRUMENT LANDING SYSTEMS (ILS)

AAI has drawn up a plan for full-scale development of civilian airports in the region. AAI should be assisted to start night landing facilities and Instrument Landing Systems (ILS) wherever technically feasible as it will increase the window of operations for these airports. In the absence of ILS and night landing (presently night landing is operational in Guwahati, Agartala and Imphal), the airports are not optimally utilised. The IAF-owned airports of Tezpur, Silchar, Jorhat and Bagdogra will continue to support Sikkim till aircrafts are not be able to land in Pakyong. Moreover, Pakyong is not an all-weather airport. As Bagdogra airport operates as a civilian enclave, IAF should consider approving night landing with necessary security-related restrictions that it may find appropriate.

The advantage of early daybreak in the NER to start early morning flights is also not utilised as ATC hours are restricted due to non-availability of manpower. It is a chicken and egg situation as ATCs are not intensively manned as only a few flights land. Airlines can operate more flights if ATC hours are increased, and ILS and night landing facilities are made operational.

In the airports at Silchar, Tezpur and Bagdogra, IAF airports with civilian enclaves, the ATC is manned by the IAF. AAI should negotiate with IAF so that night landing facility for civilian aircrafts is allowed in these places with appropriate security restrictions.

HUB AND SPOKE MODEL FOR OPERATION AND USE OF SMALL AIRCRAFTS IN SPOKES

The position taken by operators and MoCA is that operations in the NER are commercially unvi-

NTDPC recommends that Guwahati Airport, which has received full international status in principle, be developed as a gateway to South East and East Asia, consistent with the overall Look East policy of the Government.

able and result in losses. The model presently operating is unsuitable as it does not account for the topography, sparse spread of population, tenuous physical links with the rest of India and huge distances. Given the specific features, a 'Hub and Spoke' model with Guwahati and also Agartala, Imphal and Dibrugarh as hubs and other destinations as spokes should be more appropriate (Figure 6.9). Small aircrafts stationed in Guwahati and other hubs could operate early morning (to take advantage of early daybreak in the region) and fly travellers back to Guwahati/ Agartala and shift into bigger aircrafts to travel further to Delhi, Kolkata, Mumbai, etc. The transit time should not be more than 30-40 min in the morning and also evening so that travellers are able to reach their destinations outside the region by 10:00-10:30 am and return the same day if possible. At least for Delhi and Kolkata, this model needs to be in place.

In order to get this model going, the following are required:

- Development of physical infrastructure for hubs. This is the easier part as it involves plan investment by AAI with funds from MoCA/ DONER/NEC. Creation *of airport hubs with hangars is strongly recommended for Guwahati, Agartala, Imphal and Dibrugarh*.
- To make the airlines to use the facilities of the hubs at Guwahati, Agartala Dibrugarh and Imphal is the difficult part, as there is not enough manpower. Further, locally trained manpower is not available. Trained and deployed people are unwilling to shift to Guwahati.
- For the hub and spoke model to be successful, small aircraft are needed. This requires change in policy and perhaps mindset to promote use of smaller aircrafts in the NER.

Air services within the region will be based on the multi-utilities such as passenger traffic, high value cargo, medical and other emergency services. It addresses the viability issues of air services by operating smaller carriers. Further, this will stimulate the development within the region by bringing together the critical mass required for growth in terms of networking of sparse population, transport of high value commodities like flowers, fruits, medicinal plants, organic products. As horticulture and floriculture grows in the NER, multiple use (passenger and cargo) of aircrafts will be useful in quick transportation of these perishable but high valued commodities to the markets outside the NER. Passenger in peak hours and cargo in non-peak hours can be combined in small-sized dual-use aircraft to carry both passengers and cargo from spokes to the hub. It will also address the viability issue of small aircraft.

PROMOTION OF HELICOPTER SERVICES

Helicopter services will play an important role, especially for remote areas. These, however, are expensive. How they can be made viable is a crucial question. We have discussed the scheme being operated by Ministry of Home Affairs for helicopter services. The hub and spoke model can be achieved by three-tier air services:

- Connectivity between regional hubs like Guwahati, Agartala, Imphal, etc, and metros like Delhi and Kolkata: big aircrafts
- Intra-regional connectivity between regional hubs and smaller airports and airfields within the region: small aircrafts
- And finally, helicopter services in remote districts to the smaller airports/ airfields/ regional hubs, which may be operated depending on the daily/ weekly needs.

Such three-tier system would fit into a 'Hub-and-Spoke' model to feed the big carriers to outside of the region and address the viability issues in a systematic manner.

CREATION OF LOCALLY TRAINED MANPOWER TO RUN CIVIL AVIATION INFRASTRUCTURE

Airport facilities in the region are being expanded. However, as there is general reluctance for employees to work in the NER, airports are not adequately manned. Even the IAF acknowledges that they are not able to operate a night landing facility in the civilian enclave for Silchar airport due to lack of manpower. Hence, it is recommended that local youth be trained in different sector of aviation, particularly in ground handling, navigation, logistics.

For creation of a base of adequately trained manpower who would be willing to serve the region, local training facilities have to be developed. Lilabari in Assam could be a potential location for establishing such a training facility. The bigger challenge lies in setting up the facilities (with public investment), developing accredited curriculum and training courses and operating the institute. A practical option would be to have a branch of the National Aviation Academy at Rae Bareily in Lilabari. Aircraft maintenance courses could be started in polytechnics in the region. The aviation academy will have to be owned and run by the Central Government as private agencies are unlikely to find Lilabari presently attractive nor are the state governments capable of running such institutions. Civil Aviation is in the Union List of the Constitution.

Government-funded training facilities in the NER for pilot or air hostess training are not required as

Box 6.1
Incorporating the Specific Requirements of NER in an Aviation Policy for the Region

One of primary reasons for lack of effective civil aviation services in the NER is the application of same policy instruments for the region as well as for the rest of the country. Policies will have to be tailor made, given the peculiar character of the region and the challenges it presents. MoCA has come out with a set of revised regulatory policy changes which is under active consideration.

Recently, the Ministry of Civil Aviation has prepared a report[2] on improving Regional Air Connectivity. Some of the major recommendations are as under:

a. Modify Route Dispersal Guidelines to assign more weightage to non-capital stations in the NER. Additional connectivity created should be distributed in the ratio of 40:60 between capital and non-capital stations.
b. Airlines should be asked to deploy additional capacity in future in Meghalaya and Nagaland, of course subject to market demand and adequate infrastructure.
c. Promote deployment of small aircrafts (See Annex 6.2).
d. Setting up Essential Air Services Fund to promote government intervention for connectivity to peripheral remote locations. Such schemes are prevalent in developed countries also–UK (North East England and Wales), USA (Essential Air Services Programme, Small Community Air Service Development Programme), European Union, Caribbean and Pacific countries. This is particularly relevant to the NER and we recommend that MoCA take a positive view.
e. As scheduled airlines in India desire to maintain homogenous fleet of aircrafts, the character of non-scheduled operators (NSOP) should be changed to allow them more flexibility as they operate smaller aircrafts (less than 40 seats). They should be allowed to publish their schedule and have joint operations with scheduled airlines. In this way, the hub and spoke model–small aircrafts at the spoke (NSOPs) can work together with scheduled operators at the hub. They can bring passengers in small aircrafts from smaller places to Guwahati or Agartala from where the passengers will be put in larger planes to connect them to the metros.
f. Facilitating the promotion of regional airlines.

The Ministry of Civil Aviation needs to take a quick and practical decision on the recommendations of the Rohit Nandan Committee.

Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Table 6.10
State-wise Distribution of Rail Network
[Km]

STATE	BROAD GAUGE	METRE GAUGE	NARROW GAUGE	TOTAL
Arunachal Pradesh	14.66	1.26	-	15.92
Assam	1,800.03	845.96	-	2,565.99
Tripura	-	195.40	-	195.40
Nagaland	11.13	1.72	-	12.85
Manipur	-	13.85	-	13.85
Mizoram	-	1.50	-	1.50
Meghalaya	-	-	-	-
Sikkim	-	-	-	-
Total NE Region as on 1.4.2012 (Starting of 12th Plan) in NE Region	**1,301**	**1,060**		**2,661**

Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

2. Rohit Nandan Committee Report (2012).

Table 6.11
New Railway Projects

PLAN HEAD	NEW LINE	GAUGE CONVERSION	DOUBLING	RAILWAY ELECTRIFICATION	TOTAL
Projects in progress	13	4	1	1	19
Total Cost (Rs billion)	226	75	2.5	8	311
Cumulative Expenditure up to March'12 (Rs billion)	51	53	0	3	107
Throw forward (in Rs Billion as on 1.04.2012)	125	29	0	5.3	204
Length of Ongoing Works (Km)	965	1,510	45	836	3,356

Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Table 6.12
Physical Achievement in New Railways Projects (km)

YEAR	NEW LINE	GAUGE CONVERSION	DOUBLING
2007-08	20	107	-
2008-09	113	170	-
2009-10	-	110	-
2010-11	58	110	**31**
2011-12	148	409	-
Total	**339**	**906**	**31**

Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

these are available in the private sector in adequate numbers outside the NER also.

UP-TO-DATE WEATHER INFORMATION

State-of-the-art weather information systems are required to prevent accidents and frequent cancellation and delays. As services are not reliable especially in routes that are in the interior, passengers find it safer to depend on roads. This leads to insufficient passenger load that affects commercial viability. As the weather is tricky, regular up-to-date information to the pilot can reduce the number of cancellations and enhance the trust of the public in the regularity and certainty of air services. The Department of Meteorology should develop a plan for effective collection of weather data and broadcasting it in real time to airline operators.

DEVELOPMENT OF GUWAHATI AS AN INTERNATIONAL AIRPORT

Guwahati Airport has now received full international status in principle, but there are no international flights operating from this airport except to Bhutan. NTDPC recommends that this airport be developed as a gateway to South East and East Asia, consistent with the overall Look East policy of the Government, and the increased strategic and business links with Myanmar, Thailand and other ASEAN countries. As the India-ASEAN Comprehensive Economic Cooperation Agreement gathers force, and other initiatives for increasing economic cooperation with neighbouring countries bear fruit, the development of Guwahati airport as the gateway to ASEAN would be very desirable.

The existence of an airport has been used in many places to generate economic activity. Schiphol Airport at Amsterdam is a case in point. It has enabled the development of the Dutch flower industry which supplies flowers to far-flung places. Furthermore, in the reverse direction, it enables the supply of flowers to Europe from Latin America by using the flower markets of the Netherlands.

Thus, the development of Guwahati airport as a full-fledged international airport will do much for the development of the region. This capacity can be further utilised by locating light industries such

Table 6.13
Gauge Conversion Status

PROJECT	STATE	KM.	REMARKS	TARGET DATE FOR COMPLETION
Lumding-Silchar-Jiribam & Badarpur-Kumarghat	Assam, Tripura, Manipur	483	National Project	December 2013
Rangia-Murkongselek alongwith linked fingers	Assam, Arunachal Pradesh	510	National Project	March 2014
Katakhal-Bhairabi	Assam, Mizoram	84		December 2014

Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Table 6.14
New Lines

NAME OF PROJECT	STATE	LENGTH (KM)	REMARKS	TARGET DATE
Bogibeel Rail cum Road Bridge	Assam	73	National Project	December 2015
New Maynaguri-Jogig-hopa	Assam, W.Bengal	245.68		March 2014
Murkongselek-Pasighat	Assam	30.61		March 2015
Tetelia-Byrnihat in lieu of Azra-Byrnihat	Meghalaya, Assam	21.5	National Project	March 2014
Dudhnoi-Mendipathar	Meghalaya, Assam	19.75		March 2013
Harmuti-Itanagar	Arunachal, Assam	33		Harmuti-Naharlagun: March 2012
Byrnihat – Shillong	Meghalaya	108	National Project	March 2017
Bhairabi- Sairang (Aizwal)	Mizoram	51.38	National Project	March 2014
Jiribam-Tupul (Imphal)	Manipur	98	National Project	Jiribam-Tupul: March 2014 Tupul-Imphal: March 2016
Dimapur-Zubza (Kohima)	Nagaland	88	National Project	March 2015
Agartala- Sabroom	Tripura	110	National Project	Agartala-Udaipur: December 2012 Udaipur-Sabroom: March 2014

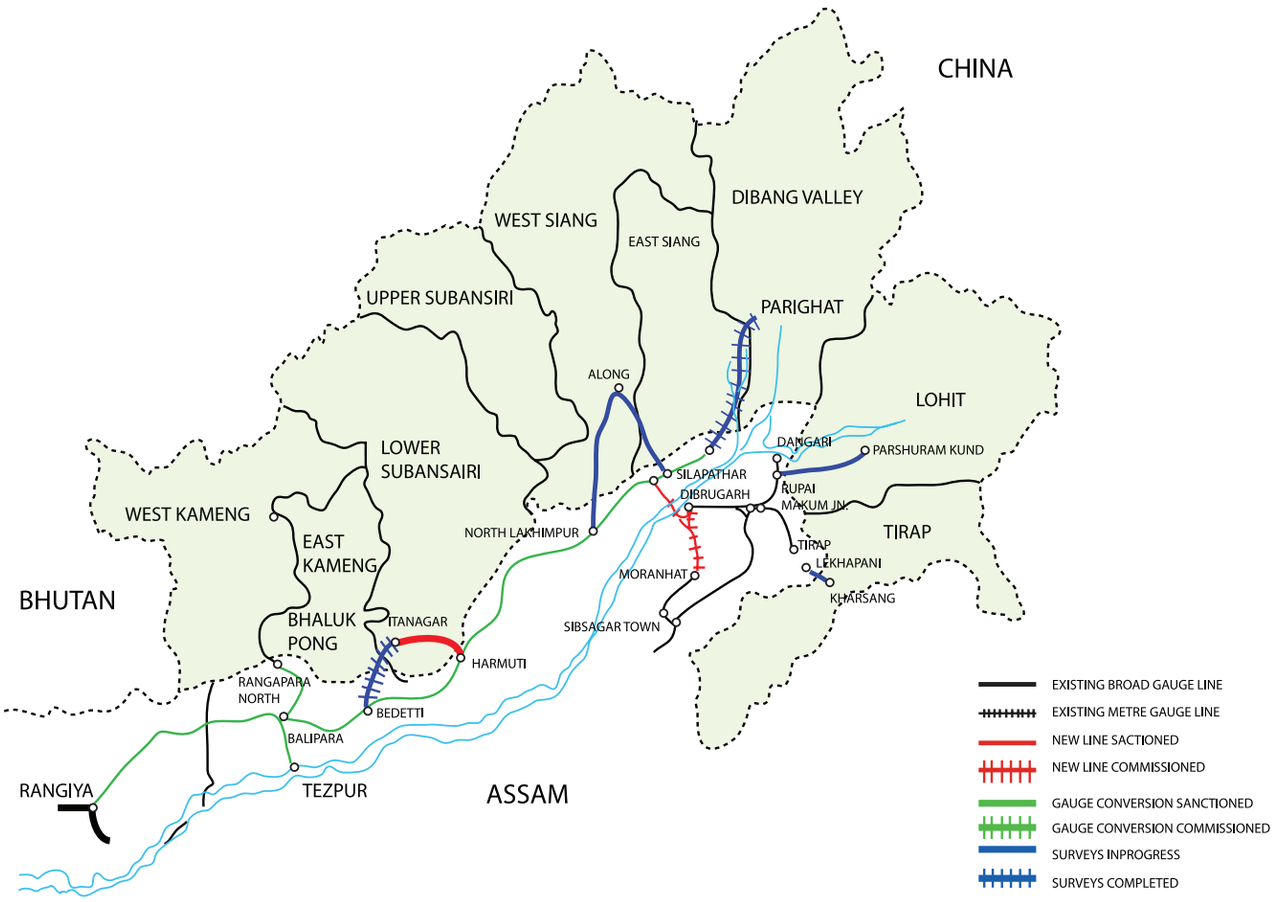
Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Table 6.15
Status of Connectivity to Capital Cities

STATE	CAPITAL	NAME OF PROJECT	REMARKS & TARGET DATE
Assam	Guwahati (Dispur)	--	Connected
Tripura	Agartala	Kumarghat-Agartala	Connected
Arunachal Pradesh	Itanagar	Harmuti-Itanagar	Harmuti-Naharlgun:Mar-2012
Manipur	Imphal	Jiribam-Tupul	Jiribam-Tupul:Mar-2014 Tupul-Imphal:Mar-2016
Nagaland	Kohima	Dimapur-Zubza	Mar- 2015 (T) Extn. to Kohima will be processed after detailed survey, Problem in LA.
Mizoram	Aizwal	Bhairabhi-Sairang	Mar-2014 Extn. to Aizwal will be examined during detailed survey
Meghalaya	Shillong	Azra-Byrnihat-Shillong	Tetelia-Byrnihat in lieu of Azra-Byrnihat - Mar-2014 Byrnihat-Shillong not fixed.
Sikkim	Gangtok	Sivok-Rangpo	Sivok-Rangpo – Mar-2015.

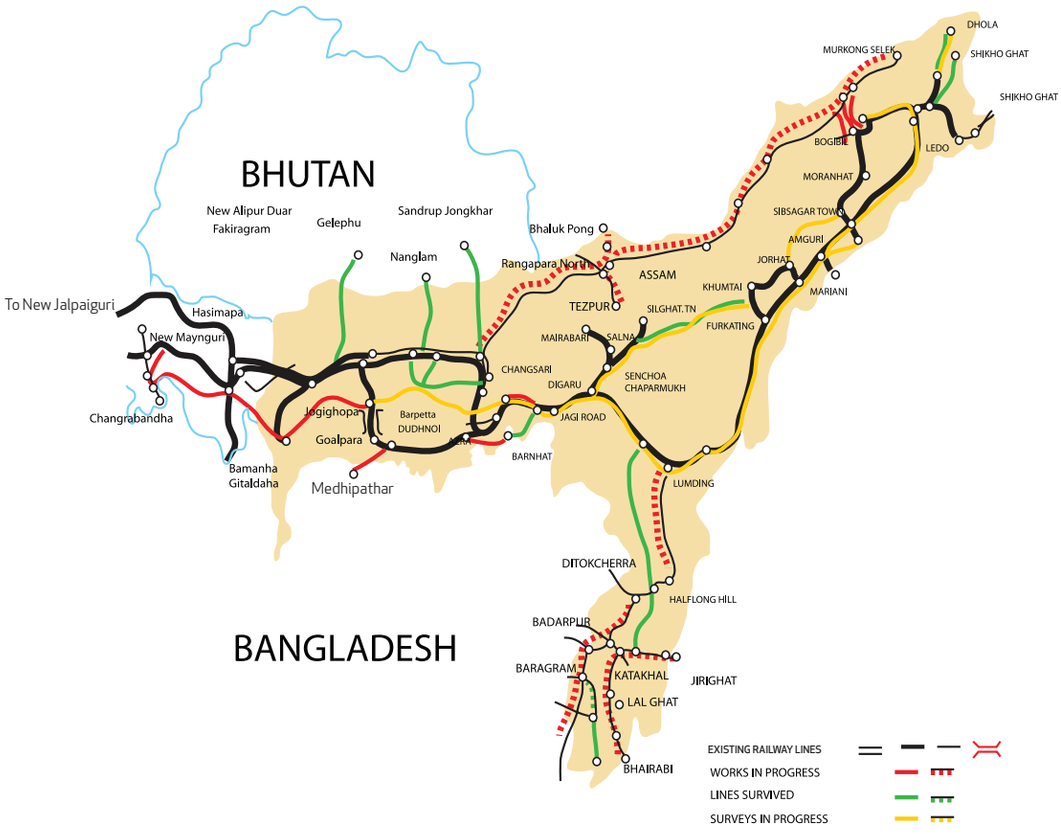
Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Figure 6.16
Railway Projects and Surveys in Arunachal Pradesh



Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Figure 6.17
Railway Projects in Assam and Bhutan

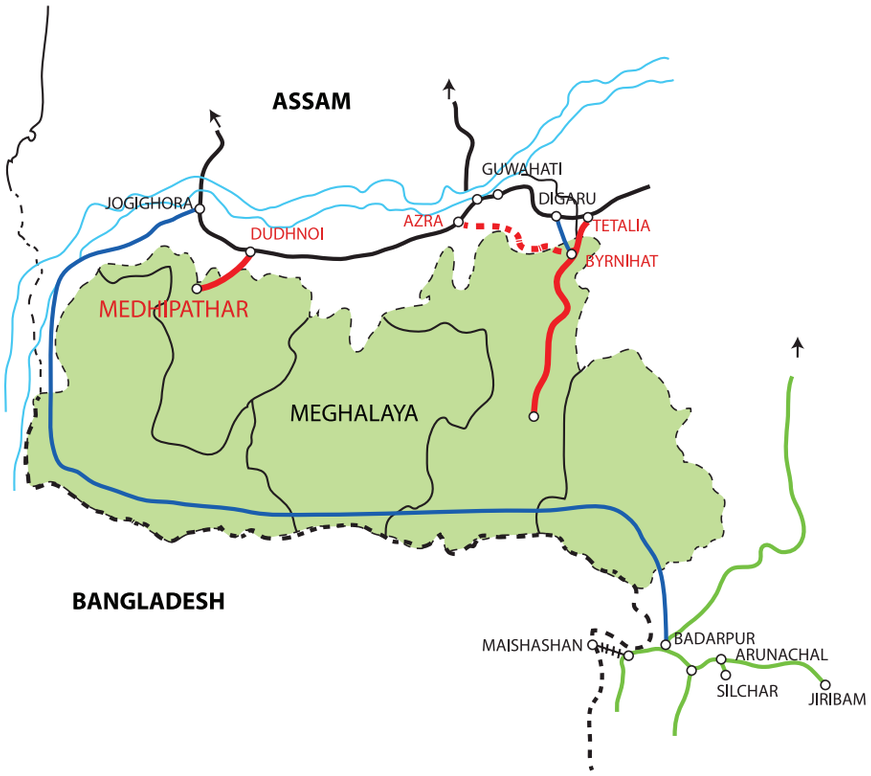


Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Figure 6.18
Railway Projects and Surveys in Manipur

Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Figure 6.19
Railway Projects and Surveys in Meghalaya

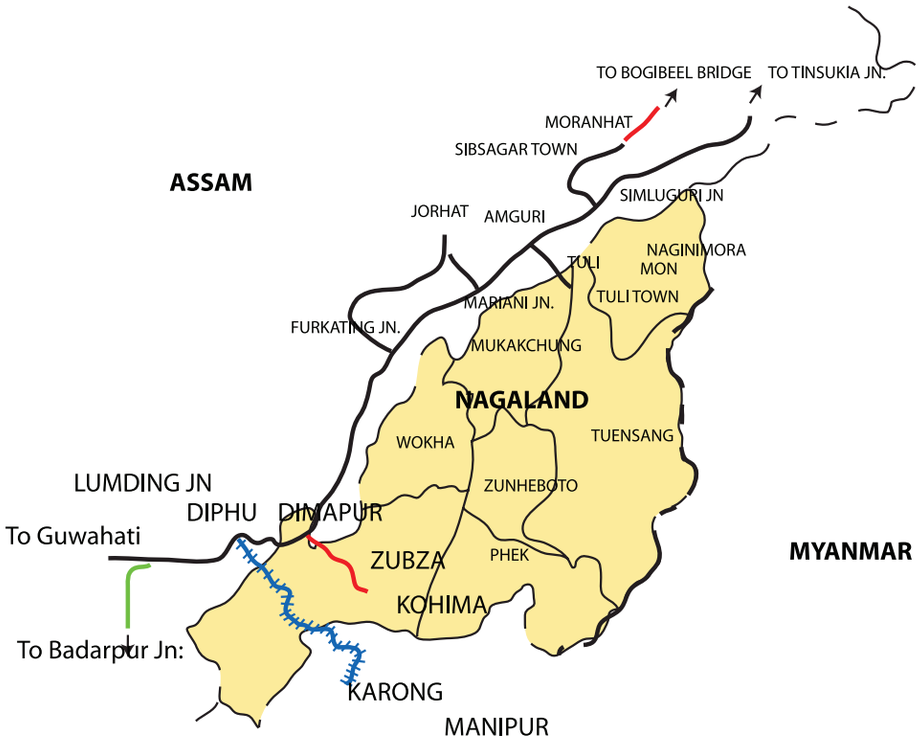


Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Figure 6.20
Railway Projects and Surveys in Mizoram

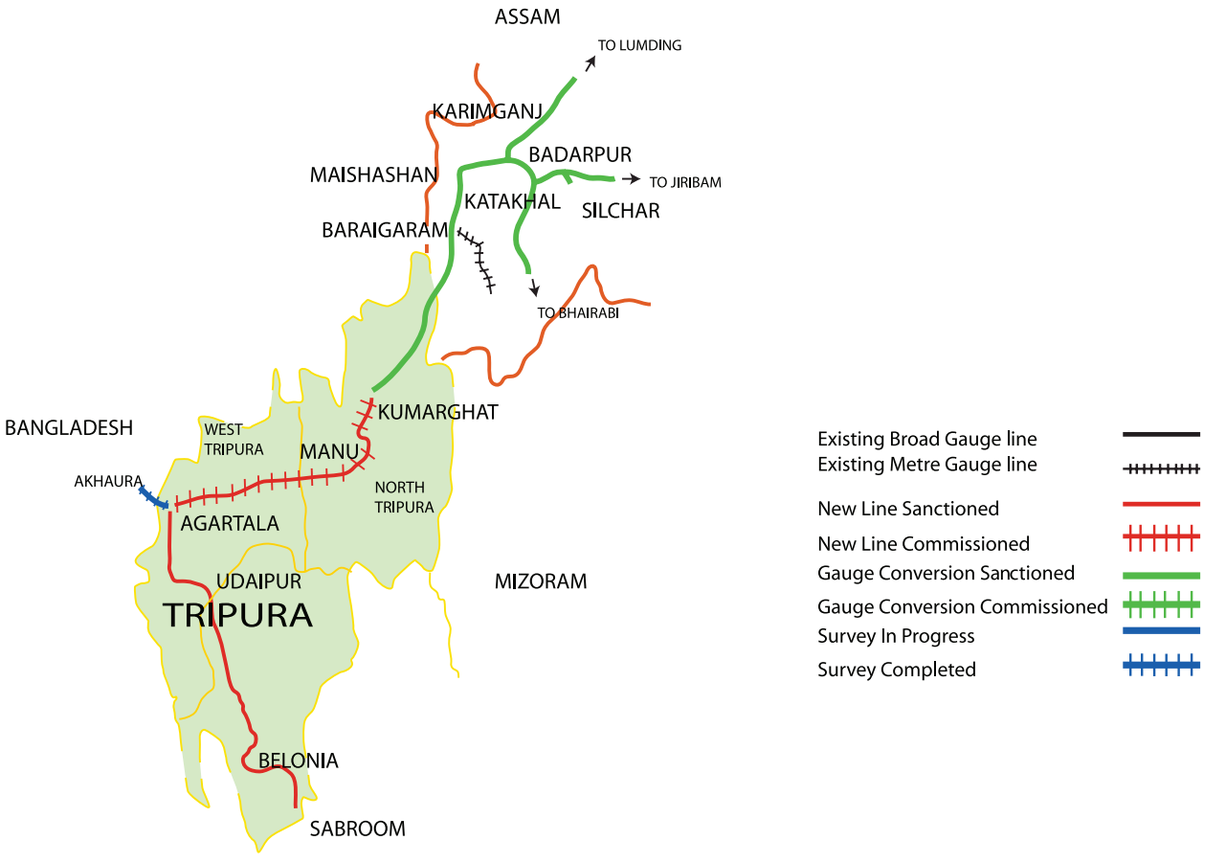
Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Figure 6.21
Railway Projects and Surveys in Nagaland



Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Figure 6.22
Railway Projects and Surveys in Tripura



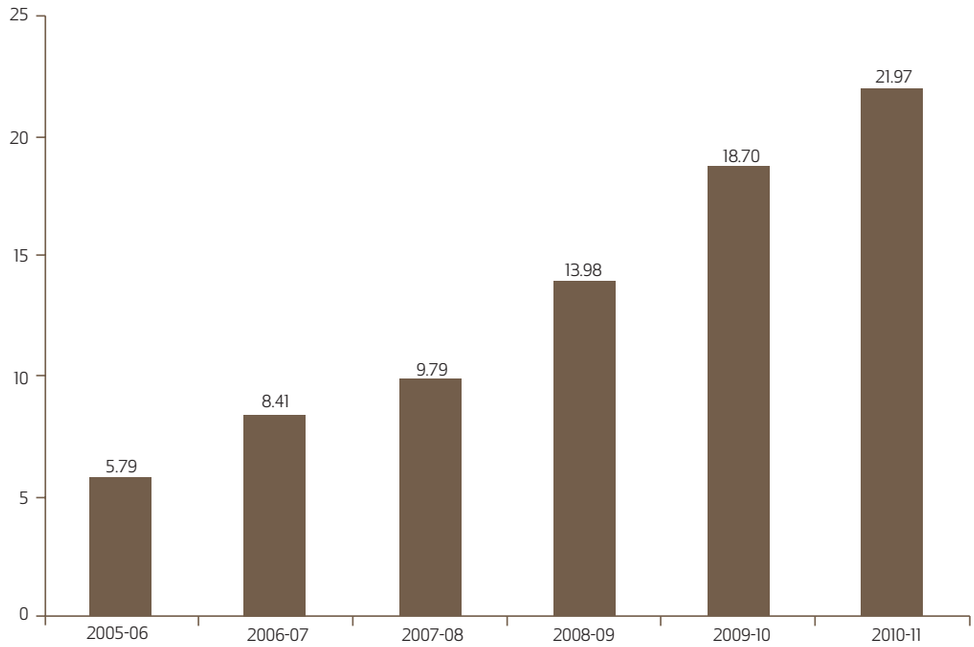
Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Figure 6.23
Railway Projects and Surveys in Sikkim

Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Figure 6.24
Railway Investments in the North East

[Rs Billion]



Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

It is hence proposed that Badarpur and Dhubri should be developed as multi-modal hubs in the NER, where all the four modes of transport –rail, road, air and waterways–converge. These hubs are also strategically well placed–both geographically and demographically.

as food processing, floriculture, sericulture and the like in its proximity, or striking distance. It would also greatly help the development of tourism in both directions.

RAILWAYS

It is surprising to note that the railways entered the remote areas of eastern Assam relatively earlier than the more accessible regions of British India. Assam Railway and Trading Company commissioned a 65-km metre gauge track from Dibrugarh to Margherita in 1881. Commercial interest of the East India Company in trading of tea and coal drove the technological upgradation in transportation. Discovery of petroleum catalysed the growth, and around 1947, just before Independence, the whole NER, which included the erstwhile East Bengal (now Bangladesh), was buzzing with robust railway connectivity to the mainland as well as with the deep port of Chittagong–the fulcrum of all international trade for the region.

The vivisection of 1947 hit rail connectivity to the NER in the belly, with not only Chittagong getting disconnected, but connectivity to the mainland lost. Immediately after 1947, the task of providing rail connectivity through the Siliguri corridor or the 'Chicken's neck' was taken up earnestly. By 1958, a new railway zone, Northeast Frontier Railway (NFR) with its headquarters at Malegaon, Guwahati, had been carved out of the North Eastern Railway. NF Railway has since become the lifeline of the NER, transporting essential goods like food grains, POL, coal, fertiliser, salt, cement, etc, all over.

Historically, the whole of the NER was served only by a metre gauge railway system with its attendant inadequacies of low speeds, low throughput etc. The 'Unigauge' policy of Indian Railways adopted in 1993 metamorphosed rail transport in the NER. The country's longest train run (Vivek Express) from Dibrugarh to Kanyakumari traverses a distance of 4,273 km across the length and breadth of the country. This has become possible only because Dibrugarh town has come on the broad gauge map of IR.

The rail network (as on 1 April 2012) in the NER comprises 2,661 km out of which 1,601 km (60 per cent) are on BG (all due to gauge conversion). After the gauge conversion projects on hand get completed by December 2014, only 20 km of metre gauge will remain as a rump, reminiscent of an era gone by.

ON-GOING PROJECTS

Upgradation of the rail network in the NER has received significant attention of the Ministry of Railways in the last 25 years. Capacity has been augmented manifold leading to introduction of a large number of long distance passenger carrying trains and removal/reduction of transhipment activities which hitherto has been the single biggest bottleneck in smooth movement of traffic.

Seventeen projects comprising new line/gauge conversion/doubling and railway electrification are in progress with a total throwforward of Rs 162 billion (as on 1.4.2012). The category-wise break up of projects is given in Table 6.11.

The physical achievement so far (as of 2011-12) in terms of new lines, gauge conversion and line doubling are tabulated in Table 6.12.
It can be seen that 57 per cent of gauge conversion has actually materialised in the five-year period from 2007 to 2012.

There is still a little more than 1,000 km of metre gauge track in the region necessitating transshipment at Rangiya for traffic going to destinations north of the Brahmaputra and at Lumding for destinations in the Cachar hills of Assam, Tripura, Manipur and Mizoram. Once this portion also gets converted to broad gauge, it will provide seamless transportation of people and material to every corner of the country. It is expected that these projects shall be completed by 2014. The details are in Table 6.13.
There are, at present, 11 new line projects on hand which shall add 882 km (33 per cent of the existing) of new routes to the rail network in the region upon completion. Table 6.14 gives the details.

As noted earlier, rail density in various states of the NER has been abysmally low. Except Assam and Tripura, no other state can boast of a rail link to its capital town. The Government of India has sanctioned rail projects which would put each of the state capitals in the NER on the railways map (Table 6.15). Refer to Figures 6.16 & 6.23 for ongoing projects in NER States.

INVESTMENTS

Due to difficult terrain, poor condition of law and order leading to insurgency in certain areas, the target realisations of projects have been quite tardy. However, in the last five years, the Ministry of Railways have put in arduous efforts to deliver on various

promises and utilises the funds allotted by the Planning Commission. As a result of the focused attention, the Railways' investment in te NER has steadily been going up and output has also shown significant improvements (Figure 6.10).

KEY ISSUES AND RECOMMENDATIONS

Indian Railways has been a change agent in the NER. The area has benefitted immensely from the 'unigauge' policy. By the end of 2014, when the guage conversion works get completed, India would be connected seamlessly by rail from its easternmost corner to the westernmost corner. Completion of the Bogibeel bridge would connect the North of Brahmaputra railway alignment with south of Brahmaputra rail line at the easternmost end, providing an alternate route to Tinsukhia, Tirap, Dimapur, etc. If the Railways succeed in bringing to reality its ambitious programme of taking rail to the capitals of every state in the region, it would be a significant achievement.

In order to provide focussed attention to asset creation in the NER, planning should be carried out in two phases.

PHASE I (UPTO 2020)

The Railways' shelf of projects is full to the brim for works upto 2020. Yet, projects in the NER have the ill repute of never getting delivered on time. If the gauge conversion projects get completed by 2014 as planned, concentrated effort on building new lines already sanctioned, can be easily launched. However, even if all these new lines works are completed by 2020, the connectivity by rail for every capital of the NE states will still remain a distant dream. Determined and planned efforts are imperative to achieve rail connectivity to all the capitals by 2020. To this end, following is considered inescapable:

COMPLETION OF SURVEYS AND SANCTIONS BY 2014

All the remaining alignments to each of the capital towns which are yet to be sanctioned either due to surveys not getting completed or sanctions not received must be taken up post-haste to ensure that works get completed by 2020. At present, only Guwahati and Agartala are connected by rail.

i. Arunachal Pradesh: Itanagar has to be joined to the Rangia-Murkongselek route (which is under gauge conversion) at Harmuti. It is a sanctioned work upto Naharlagun which will act as a terminal for Itanagar. The work is expected to be completed by 2014.
ii. Manipur: The track from Jiribam to Tupul will get commissioned by March 2014. The extension from Tupul to Imphal has been sanctioned at a cost of Rs.44.78 billion in 2013.
iii. Mizoram: Aizwal, the capital of Mizoram, is to be connected to Badarpur on existing alignment via Bhairabi. The work is being done in two parts. Bhairabi to Sarang is a sanctioned work. The extension from Sarang to Aizawl is awaiting completion of survey. The sanction and resource mobilisation will follow.
iv. Meghalaya: Shillong is to be linked to Tetelia on the existing rail route but at present only Tetelia to Byrnihat route is under construction. Byrnihat to Shillong portion has been sanctioned at cost of Rs.40.83 billion in 2012-13.
v. Nagaland: At present, work is sanctioned only from Dimapur to Zubza. It extension to Kohima is still getting surveyed.
vi. Sikkim: Sivok to Rangpo, already sanctioned, is expected to be completed by March 2015. But Rangpo to Gangtok is still being contemplated.The survey for extending the railway line not only upto Gangtok but beyond upto Nathu La, should be expedited.

To improve its image and visibility on project completion, Indian Railways should unfailingly build 150-200 km of new lines every year in the region.

It is apparent from the above picture that the target of connecting all state capitals by rail link cannot be adhered to unless the alignment and cost for connecting Shillong, Kohima, Imphal and Gangtok is speedily finalised and sanctions taken.

TECHNOLOGICAL UPGRADATION

Most of the railway projects have been sanctioned based on old surveys. At that time, IR was daunted by the task of drilling long tunnels especially in the Himalayas. But with the success being experienced in Jammu and Kashmir projects, as well as the fully operational Konkan Railway line, IR should have developed sufficient capacity by now to undertake long and sophisticated tunnel projects even in inhospitable terrain. There is hence an urgent need for technological upgradation as well as updation of all survey reports of the NER. The existing surveys have planned for stations at vertically distant locations. It may be possible to avoid this inconvenience by relying on introduction of more tunnels, not contemplated earlier for maintaining gradients as well as proximity to habitation.

The Committee envisages that once this connectivity is achieved; there will be eight Rajdhani Expresses– one from each state capital, running to the national capital by 2020.

Electrification upto Agartala

At present, electrification of BG line upto Guwahati has been sanctioned. In order to provide seamless connectivity within the region, electrification

The North East Region being riverine offers immense scope for development of inland waterway transport. This mode also has a natural fit with the bulk commodities that the NER imports from and exports to the rest of India.

of Guwahati-Lumding-Silchar-Agartala line should also be taken up and completed by 2020.

Augmentation of network capacity

The development of the rail network in the area is likely to increase the freight and passenger traffic and therefore augmentation of the network capacity will be needed. At present, the route from New Jalpaiguri to Lumding has double line in parts. With passenger and freight traffic likely to go up considerably in the future, the entire stretch from New Jalpaiguri to Guwahati will need to be doubled. The following routes are expected to be strengthened in due course.

- Doubling of New Jalpaiguri–New Alipurduar route
- Doubling of New Bongaigaon to Guwahati route Doubling of Guwahati to Lumding route: This route is the common portion which serves traffic going to Dibrugarh side and towards Silchar. To avoid congestion, this route needs to be doubled. A part of the route between Guwahati and Digaru has already been completed and commissioned.

PHASE II (2020-32)

The projects being undertaken in Phase I will provide excellent inter-regional and intra-regional connectivities. Yet, the following two actions will further catalyse trade, commerce, tourism in the region:

MULTI-MODAL HUBS

Badarpur and Dhubri are two locations which are eminently suitable for development as multi-modal hubs, particularly for the following reasons:

- Badarpur is a railway junction situated very close to Silchar. Indian Railways owns large tracts of land on which a suitable yard can be built to serve the needs of a multi-modal rail terminal handling containers of various sizes. The Barak river flows close by, where an Inland waterway port terminal can be planned. A National Highway passes through the town. Silchar (18 km away) has an operational airport.
- Dhubri is another such location. Located in close proximity to the Bangladesh border, it is situated on the banks of the mighty Brahmaputra where the Inland Waterway Authority is already in the process of developing an inland port. Dhubri is already on the railway map and NH-31 passes through the town. An airport at Rupsi (24 km away) is also coming up by 2020.

It is hence proposed that Badarpur and Dhubri should be developed as multi-modal hubs in the NER, where all the four modes of transport–rail, road, air and waterways–converge. These hubs are also strategically so well placed–both geographically and demographically that they may be amenable to be developed through PPP mode.

NEW LINE FROM DHUBRI TO SILCHAR VIA SHILLONG

It is suggested that a new line through Meghalaya connecting Dhubri to Silchar via Tura-Shillong should be surveyed and taken up as an alternate route for Badarpur-Silchar and beyond. This new alignment will link the entry point of Dhubri on the Indo-Bangladesh border to Meghalaya and southern Assam. It would create a link between the two proposed multi-modal hubs at Dhubri and Badarpur (near Silchar, 8 km). At Shillong, it will connect also with the new sanctioned line to Byrnihat (in Meghalaya on the Guwahati-Shillong road) providing another alternate connection.

TRANS-BORDER CONNECTIVITY

i. **New line between Imphal-Moreh-Mandalay**
   By 2020, the railway should arrive in Imphal. In Phase II, this alignment should be extended to Mandalay in Myanmar via Moreh-Tamu which is emerging as India's gateway on the land route to South East Asia. With the doors of democracy having opened in Myanmar, trade and commerce between India and Myanmar is bound to escalate. A helpful infrastructure will only galvanise this progress. Further, this is bound to give a fillip to the Look East Policy. However, it is suggested that this connectivity should be provided on broad gauge upto Mandalay to ensure seamless movement across borders.

ii. **New Rail Link from Sittwe (Myanmar)**
   India has invested heavily in developing Sittwe port in Myanmar in the Rakhine region. The transportation of goods via this port is at present planned by road and inland waterways. Kaladan Multi-modal Project has been undertaken to connect Sittwe port to India which includes development of waterways on Kaladan river and also a road connecting Sittwe port to Mizoram. However, it is felt that without proper rail connectivity, the potential of a major port cannot be exploited fully. It is hence suggested that the Indian government should plan for a rail link (BG) from Sittwe port to Aizwal in consultation with the Myanmar government.

This alignment can be taken up further north from Aizwal to Imphal to Kohima to Tirap on the existing rail route to Tinsukia. This rail link, if constructed, will generate many alternate rail routes for the whole region, thereby precluding any possibility of complete blockage of one state by a rogue group in a neighbouring state. If the Imphal-Moreh-Mandalay line also comes up, it will provide a handy connectivity to every state to take on international trade.

A direct rail link between Aizwal and Agartala will convert the whole alignment as a 'garland' on the neck of the NER adorning its bodypolitic.

iii. **Imphal as a new rail hub (National & International)**

Imphal can become a potential rail hub in future through possible project extensions in the following manner:

Present proposal: Jiribam-Tupul-Imphal (National Project)

- Eastward extension: Imphal–Moreh-Mandalay
- Northward extension: Imphal-Kohima-via Northern Nagaland-Tirap (Arunachal Pradesh)
- Southern extension: Line coming from Paletwa (on the Kaladan Multi-modal route)-Indo-Myanmar border—Lawngtlai-Aizawl Churachandpur-Imphal.

It is proposed that Imphal will become a hub for railway connectivity with Myanmar from two sides and also get Nagaland and Arunachal Pradesh.

INSTITUTIONAL CAPACITY BUILDING

There is a handful of sanctioned projects, many termed as 'National Projects' where the funding for the project is met to the extent of 75 per cent by the Central government and 25 per cent by the Ministry of Railways. This special funding arrangement is helping the timely completion of the railway projects. Yet, many projects are languishing purportedly for reasons like difficult terrain, poor condition of law and order bordering on insurgency in certain areas. Though railway administration has worked arduously to complete projects and utilise funds so generously available under National Projects scheme, yet the impression among the local populace is that of perpetual delays caused by willful neglect. In the last five years, the Railways' investment in the NER has steadily been going up and output has also shown considerable improvements.

150-200 KM OF NEW LINE ANNUALLY

To improve its image and visibility on project completion, Indian Railways should unfailingly build 150-200 km of new lines every year in this region. This would involve an expenditure of nearly Rs.35 billion annually. The institutional back up to sustain activity of this level shall have to be provided and strengthened by the Railways.

CLOSE MONITORING

There is a need to spend the allotted funds in a timely manner to cut down delays. Close monitoring of progress of works is essential at both Railway board and Zonal levels.

INLAND WATER TRANSPORT

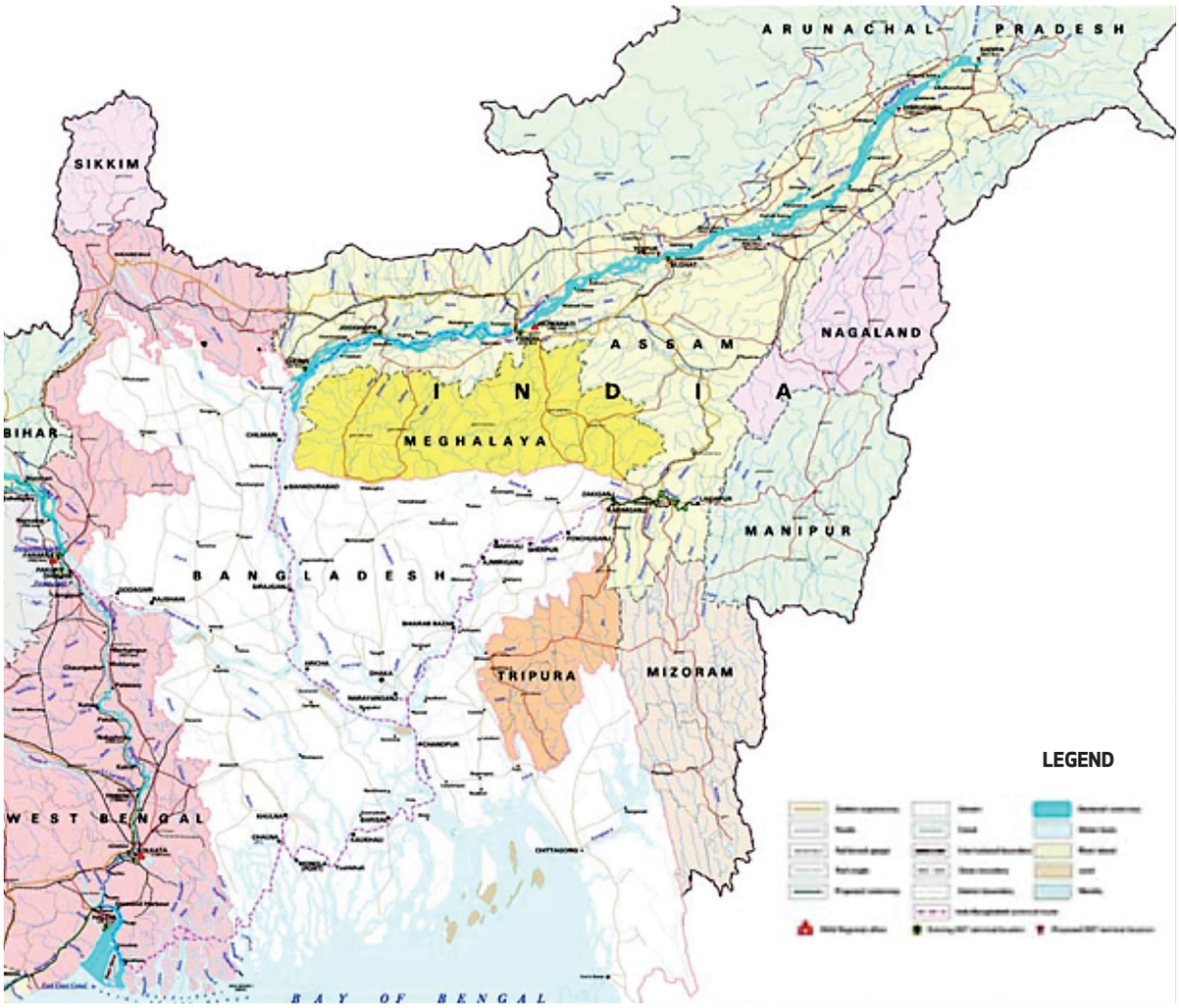
It may come as a surprise to many to learn that mechanical propulsion was not introduced into India with the arrival of the Railways in 1853, but almost 30 years earlier in 1,823 when the first propelled craft - Diana - weighing 89 tonnes, sailed with passengers from Kulpi Road to Calcutta, a distance of 80 km on the Hooghly. In 1,863, regular steamer service commenced between Calcutta and Assam. As East India Company's interests rested more on enhancement of traffic to and from ports for obvious reasons, 19th century trade and commerce relied heavily on river and canal navigation. At its peak in 1876-77, the country boat traffic registered at Calcutta was about 180,000 cargo boats, 124,000 at Hooghly and about 62,000 at Patna.

However, the advent of the railways in the second half of the 19th century and rapid expansion of its network brought a sea change in the scenario. The decline of river navigation started from 1860 onwards and could not be stemmed thereafter. The phenomenal growth of road transport, particularly during and after World War II drove the last nail in the coffin for IWT. After 1947, the road network made its foray into every nook and corner of India. The country already boasted of one of the largest rail networks in the world. Both these transport modes wrested away the centres of economic activity from the waterways and the survival of IWT as a commercially viable mode of transport became well nigh impossible. Diversion of waters from rivers for irrigation and deforestation of hilly ranges leading to erosion and consequent accumulation of silt in rivers further compounded the problem.

The IWT report of 1970 summarised the situation, as it existed in 1969, as under:

11.3.1. The Brahmaputra has been serving for a long time as an important means of communication in Assam and the water route was linked to Calcutta, Bihar and Uttar Pradesh. The trade between Assam and Calcutta gradually flourished as the steamer service provided and economic means of transportation. Assam used to depend largely on inland water transport for its import and exports. The main products of

Figure 6.25
Brahmaputra River System along with Indo-Bangladesh Protocol Route



Source: Inland Waterways Authority of India (IWAI).

Assam are oil, tea, jute, timber, coal paddy and rice. When the services operated by Joint Steamer Companies were at their peak, about 93 per cent of tea and 90 per cent of jute crop used to move to Calcutta by river. The traffic gradually declined and by 1965, the tea traffic by river to Calcutta was reduced to 65 per cent and jute traffic to 25 per cent only. Large quantities of food grains, sugar, coal, fertilisers, machinery etc. also used to be moved by river route.

With the outbreak of hostilities with Pakistan in September 1965, the river route between Calcutta and Assam was closed.

There was a precipitous fall in traffic within a decade.

The economic advantages of this mode compared to other modes have been emphasised by a number of high powered committees including the National Transport Policy Committee[3] and a number of reports and studies[4]. Some of these studies also pointed out the role that this mode could perform to take care of the maintenance of ecological balance.

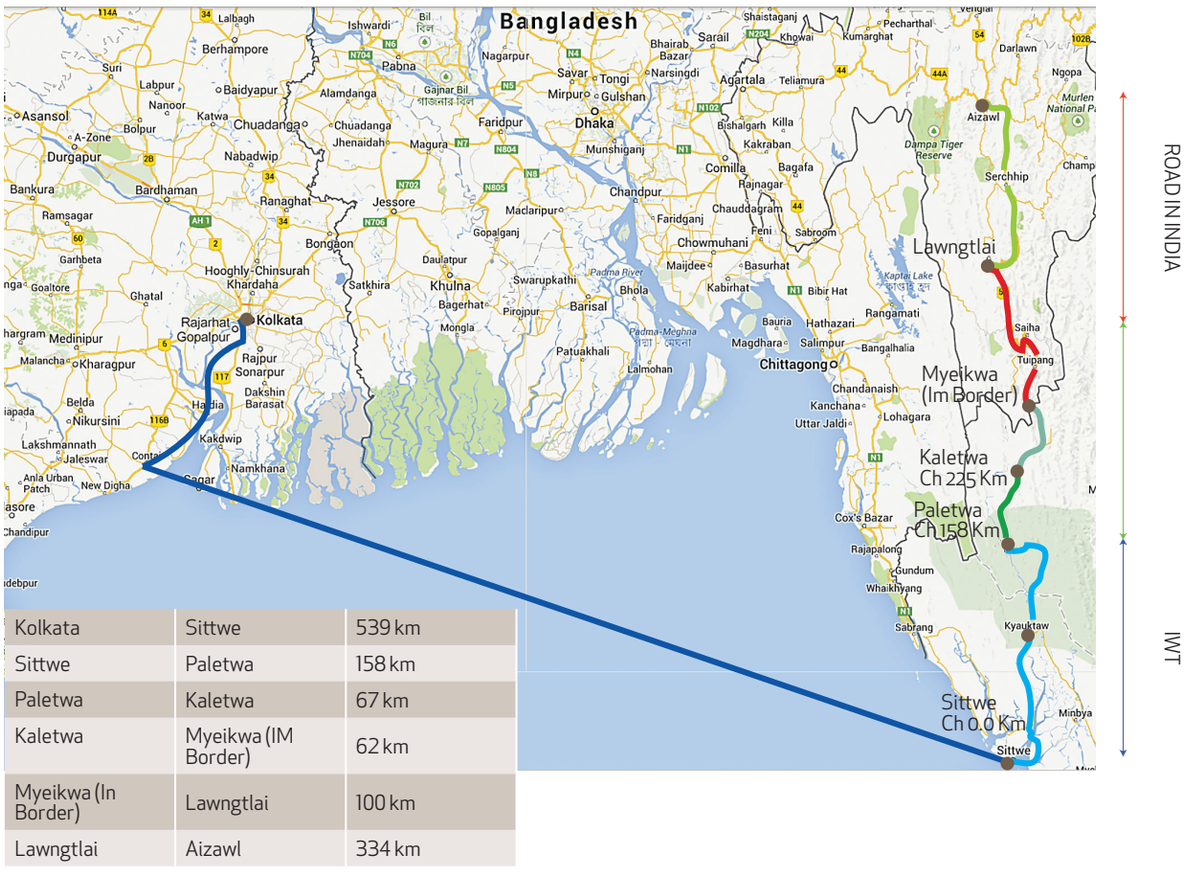
IWT DEVELOPMENT IN THE NER

The Inland Waterways Authority of India (IWAI) was set up under the IWAI Act of 1985, based on recommendations by several committees, the main being NTPC, 1980. The IWAI is responsible to develop and manage National Waterways for navigation .

On 1 September, 1988, 891 km of the river Brahmaputra between the Bangladesh border to Sadiya was declared as National Waterway 2 (NW-2) by an Act of Parliament. At present, the waterway is being

3. GoI (1980).
4. NCAER (1974); UNDP (1993); Rao and Kumar (1996).

Figure 6.26
Kaladan Multimodal Transit Transport Project



Kolkata	Sittwe	539 km
Sittwe	Paletwa	158 km
Paletwa	Kaletwa	67 km
Kaletwa	Myeikwa (IM Border)	62 km
Myeikwa (In Border)	Lawngtlai	100 km
Lawngtlai	Aizawl	334 km

Source: Ministry of Development of North Eastern Region (MDoNER).

used by vessels of the government of Assam, Central Inland Water Transport Corporation (CIWTC), Border Security Force, tourism vessels, and other private operators. The Brahmaputra now has several small river ports. In addition, there are more than 30 pairs of ferry ghats (crossing points) on the Brahmaputra, transporting both passengers and cargo. Long cruise tourist vessels make regular trips between Sivsagar near Dibrugarh and the Manas wild life sanctuary near Jogighopa.

Apart from the Brahmaputra system, the other riverine system is that of the Barak (Surma) river. This too had a substantive role to play in transport in the region, again relying on connectivity through (present-day) Bangladesh at Karimganj. This provided good access to commercially active centres like Agartala in Tripura. However, the Barak river system is now effectively navigable only for six months of the year and the through traffic through Bangladesh is again governed by the uncertain protocol arrangements with that country[5]. IWAI is also working to declare Barak river as National Waterways VI. It is likely to be done in the immediate to near future.

However, IWT still lacks policy focus and investments, Operators with required fleet size of vessels have not emerged either in private or in public sector. This has been a major bottleneck in the promotion. The Brahmaputra and Barak have not been fully commercially exploited for transportation purposes. IWAI is not an operator while the public sector, CIWTC is sick and has squandered away the advantages of fleet strength. The private sector, in both India and Bangladesh, has not emerged due to various policy reasons. Despite the inherent advantage of IWT in general and its natural fit for transportation in the NER, a policy regime needs to be created that will promote investment in appropriate fleets of vessels in both public and private sectors.

SIGNIFICANCE OF IWT FOR NER

The North East Region being riverine offers immense scope for development of IWT. IWT has a natural fit with the bulk commodities that the NER imports from and exports to the rest of India–tea, oil, cement and coal are exported; foodgrains, fertilisers, petroleum products are imported. All these commod-

5. Rangaraj and Raghuram (2005).

Table 6.16
National Waterway 2 Terminals

LOCATION	TYPE OF TERMINAL (FIXED/FLOATING)	PURPOSE
Hatsinghimari	Ro-Ro	For cargo cum passenger berthing facility – presently dropped due to severe erosion
Dhubri	Ro-Ro terminal under construction	For completion of customs and immigration both for incoming and outgoing vessels on Protocol route in addition to handling of cargo vessels and passenger ferries.
Jogighopa	Floating terminal with a steel crane pontoon.	For transportation of Meghalaya coal through waterway.
Pandu	Fixed/permanent terminal with two go-downs and RCC jetty	Pandu is the major location on NW-2 as an entry point to NE States.
Tejpur	Floating terminal with a steel crane pontoon.	For handling of cargo vessels, local ferry service. ODC cargo is also expected at this terminal in view of upcoming hydro power project.
Biswnath Ghat	Floating Terminal	For handling of PDS cargo by FCI.
Silghat	Floating terminal with a steel pontoon.	For movement of POL of Numaligarh Refinery.
Neamati	Floating terminal with a crane pontoon	For handling of cargo vessels, local ferry service. ODC cargo is also expected at this terminal in view of upcoming hydro power project.
Dibrugarh	Floating terminal with a steel pontoon	For handling of cargo vessels, local ferry service. ODC cargo is also expected at this terminal in view of upcoming hydro power project.
Opp. Dibrugarh	Floating terminal with steel pontoon.	For handling of FCI cargo.
Sengajan/ Panbari	Floating terminal with a crane pontoon	Considered in view of regular movement of Indian army IWT fleet.
Oriumghat	Floating steel pontoon	To facilitate vessels going to Arunachal Pradesh and BSF / Army

Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

ities being non-perishable and high volume are suitable for transportation by IWT. It would be cheaper than road or rail but slower. But fast transportation is not required for these commodities. Investment in waterways can provide alternative routes for movement of bulk cargo for Nagaland and Manipur which would be a cheaper option and will not face blockages and similar exigencies. Plans and investment for IWT have to be anchored within a multimodal transport plan. As multimodal transport planning is yet to take off in the NER, IWT's full potential has not been leveraged.

Optimal use of IWT for transportation of bulk commodities will open up the narrow chicken's neck corridor for transportation of passengers through fast moving rail connections, evacuation of power, telecommunication links etc. Tourism is also a potential user of IWT. Transport of Over Dimensional Cargo (ODC) for hydropower development in the North East essentially requires IWT as there are limitations on hill roads.

Undivided Bengal and the NER were an integrated economic market prior to Independence where the riverine transport system was intensively used for movement of cargo and passengers. The present challenge is to recreate those routes by combining investment with multi-modal planning.

Thus, development of IWT requires active and positive participation by Bangladesh. India's relation-

ship with Bangladesh is dependent upon the political climate. IWT arrangements should be devised in such a manner that stakeholders, both in India and Bangladesh, derive value from developing and using IWT.

Optimal development of IWT will happen when there is commonality of purposes among:

- Stakeholders such as the Food Corporation of India and the oil companies, tea industry, cement industry.
- Owners of fleet of vessels of the right size
- The goodwill of Bangladesh and its participation
- Multi-modal transport planning

The objective is to integrate IWT within intermodal transport systems to provide door-to-door services for the movement of domestic and international cargo traffic, thereby responding to market demand for convenient and competitive service while optimising the economic, financial, environmental and social benefits that can be derived from each mode in the entire transport chain in the North East.

SCHEMES/PROJECTS UNDERWAY

Indo-Bangladesh Inland Waterways Protocol
An inland water transit and trade protocol exists between India and Bangladesh under which inland vessels of one country can transit through specified routes of the other country. The existing protocol routes are

i. Kolkata-Pandu-Kolkata
ii. Kolkata-Karimganj-Kolkata
iii. Rajshahi-Dhulian-Rajshahi
iv. Pandu-Karimganj-Pandu

For inter-country trade, five ports of call have been designated in each country: Haldia, Kolkata, Pandu, Karimganj and Silghat in India, and Narayanganj, Khulna, Mongla, Sirajganj and Ashuganj in Bangladesh. Under the Protocol, 50:50 cargo sharing by Indian and Bangladeshi vessels is permitted both for transit and inter-country trade.

KALADAN MULTIMODAL TRANSIT TRANSPORT PROJECT

The Project envisages development of an alternate connectivity to Mizoram through Myanmar. The project is piloted and funded by the Ministry of External Affairs. Following are the various components of the project:

- Port & IWT: Construction of a Port at Sittwe in Myanmar and development of inland navigation along river Kaladan from Sittwe to Paletwa (158 km) including supply of six 300 tonne capacity cargo barges. IWT terminals are to be constructed at Sittwe and Paletwa.
- Highway (Myanmar): Construction of a road from Paletwa to the Indo-Myanmar border with Mizoram (125 km)
- Road section in India: Construction of a road from the Indo-Myanmar border till NH-54 at Lunglei in Mizoram (100 km)

Terminal facilities
Terminal facilities for loading and unloading of cargo are being maintained by IWAI at strategic locations like Dhubri, Jogighopa, Pandu, Silghat, Neamati and Dibrugarh. Dhubri is the first important terminal on the Brahmaputra. Pandu (Guwahati) is being developed as a multi-modal transport hub which can serve the entire NER. The existing temporary IWT terminal at Jogighopa is proposed to be upgraded to a bulk cargo handling terminal for products like Meghalaya coal, with rail connectivity up to the terminal.

DEVELOPMENT STATUS

Details of terminals at 11 locations being maintained on NW-2 for handling cargo vessels and passenger ferries are given in Table 6.16.

Encouraging infrastructure has been built on the Brahmaputra by IWAI. Fixed terminals are proposed at Dhubri and Hathsinghimari on both banks of the river with RO-RO services.
The Barak also has small ports at Karimganj, Badarpur, and Silchar and ferry services at several places across it. In Arunachal Pradesh, the rivers Lohit, Subansiri, Burhi Dihing, Noa Dihing, and Tirap are used for navigation by small country boats in stretches where there are no rapids.

POTENTIAL BUSINESS OPPORTUNITY

The largest expected cargo movements in the NER shall arise from the ambitious power projects being implemented by various private sector companies along with the National Hydroelectric Power Corporation (NHPC), North Eastern Electric Power Corporation (NEEPCO), and National Thermal Power Corporation (NTPC) on various tributaries of the Brahmaputra, particularly in Arunachal Pradesh. These developments are expected to generate cargo movements of about 50-100 million metric tonnes over a period of 20 years (2.5 to 5.0 million metric tonnes per year). Accordingly, the infrastructure requirements for the same will be substantial. IWT can play the most momentous role in catering to needs of such an immense scale.

As regards specific projects, the proposed transportation of coal from Haldia through the Indo-Bangladesh Protocol Waterway to Jogighopa and onwards to the NTPC power plant at Bongaigaon is a PPP project undertaken between NTPC, IWAI and a private operator, that has the potential of proving the utility of waterways for commercial operations. Other projects that have great potential for movement of waterways in NER are:

In October 2007, a closed-door meeting of the Chief Ministers of the NE states, the External Affairs Minister and other senior Ministers saw the first formal articulation of the connectivity needs of the NER with neighbouring countries.

- Transportation of foodgrains of FCI from Kolkata to Tripura through Ashuganj (in Bangladesh) and within NW-2.
- Transportation of food grains and fertilisers between mainland and NER, especially Assam and Tripura
- Transportation of containers on the Kolkata-Pandu-Kolkata route, and the Kolkata-Patna-Kolkata route.
- Transportation of pipes and other cargoes of Oil and Natural Gas Corporation (ONGC) and Oil India Ltd. from Kolkata to Dibrugarh/ Jorhat/ Karimganj/Agartala via Ashuganj.
- Transportation of perishable cargo produced in Meghalaya and consumable goods for West Garo Hills between Phulwari, Dhubri and at other locations by Ro-Ro vessels.
- Proposed terminals on the Brahmaputra at Dhubri and Hathsinghimari to facilitate transportation between Phulbari and Dhubri.

RECOMMENDATIONS

IWT traffic in the NER on the mighty Brahmaputra has to be seen in two segments:

- Traffic across the boundary on international waters in Bangladesh i.e. from Sadia to Kolkata/Haldia
- Traffic entirely within the national boundary i.e. from Sadia to Dhubri/Jogighopa

The first segment, movement across Bangladesh, has exciting prospects for both countries, but its estimated potential could never be exploited due to short-term extensions of Indo-Bangladesh Inland Waterways Protocol.

From 2001 to 2012, the protocol has been renewed about 26 times. The existing protocol is valid upto 31st March 2015.

If the protocol could be extended in one go for at least 20 to 25 years, it would spur private players into action to provide investments both in capital in the form of modern mechanically propelled boats as well as in operations and marketing. This would provide stability to the trading environment with a concomitant confidence building in both public and private sectors to join hands for possible PPP projects. As it is in mutual interest of both India and Bangladesh to keep this protocol route navigable, the Indian government should consider assisting Bangladesh not only in maintaining the channels navigable, but also for upgrading the system to ensure night navigation smoothly.

In case a long duration protocol is not forthcoming from Bangladesh, we should concentrate on developing IWT on the Sadia to Dhubri segment. NTPC, 1980, had delved into the financial aspect of IWT at quite elaborate length. What it did not perceive at that time was the way inter-modal traffic would gain acceptance in the next 20-25 years. The NER is devoid of large scale industry. It cannot generate a 'block rake load' for finding acceptance on rail. Hence, this report suggests developing inter-modal hubs at Badarpur and Dhubri. IWT can be very conveniently as well as gainfully utilised for bringing containers (40 ft or 20 ft) by barges/boats to these hubs for aggregation and subsequent transport by rail from these to the rest of India. For smooth transfer of goods from one mode of water to the other, the integration point i.e. the inter-modal hub should necessarily have facilities for:

a. Permanent berths
b. Handling gear like shore cranes and gantries (for containers)
c. Mobile cranes, forklift trucks and trailers
d. Storage sheds, warehouses and open stacking yards
e. Reliable power supply and sufficient lighting (for shore connections to vessels etc)
f. Water supply
g. Bunker supply
h. Rail yard adjacent to the riverside berth
i. Proper road connectivity

Once adequate infrastructure is put in place, IWT is bound to get a fillip. This would auger well for the growth of small scale industry in the region.

Government should also survey the possibility of constructing a navigable canal from the Brahmaputra to Ganga via the Siliguri neck to ensure round-the-year IWT traffic from the NER to Kolkata/ Haldia. Inland Waterways Authority and Central Rail Warehousing Corporation (a subsidiary of Central Warehousing Corporation) are proposing to jointly develop a multi-modal logistic hub at Jogighopa with a rail siding.

CREATION OF BARAK RIVER NATIONAL WATERWAY

In the pre-Independence era, the Barak river was used for IWT quite intensively. After 1947, this traffic ebbed and vanished altogether by 1965. There is now a need to develop the Barak river as a national waterway, preferably for connecting Manipur and Nagaland to Chittagong port. In case that does not fructify due to political issues with Bangladesh, the river can still provide a connection between the proposed inter-modal hub at Badarpur and the hinterland served by the river.

CREATION, MAINTENANCE AND REPAIR FACILITIES FOR VESSELS

Right from its inception in the 19th century, IWT was developed with its focus at Kolkata. It was hence natural that the maintenance facilities for the mechanised boats engaged in this movement were developed around the city. But to make the movement from Sadia to Dhubri independent of the rest of the segment, it is imperative that maintenance and repair facilities for these boats are developed at Pandu (near Guwahati) without any delay. This will also make strategic sense.

DEVELOPMENT OF A GIS-BASED STATISTICAL INFORMATION SYSTEMS

GIS-based statistical information systems should be developed to support policy, management and operational decision-making.

STIMULATING INVESTMENTS

If an enabling policy and planning framework is put in place, investments can then be stimulated in areas such as:

- Ships, ferry services and transport enterprises
- Modern material handling facilities on the Brahmaputra river at key nodes, e.g. for coal in Jogighopa for the Bongaigaon NTPC thermal power plant
- Appropriately designed barges that can promote containerised traffic on the Brahmaputra and Barak rivers
- Creation of multi-modal hub facilities at appropriate points such as Badarpur
- Facilitation of cargo transhipment between seagoing ships and inland vessels for onward distribution
- Small scale inland water transport for both passengers and cargo: Passengers and cargo are moved via inland water transport both in the organised sector and in the unorganised sector. In the unorganised sector, the fleet consists of wooden boats equipped with agricultural pumps. At present, there are no data regarding the transport volumes within this sector. However, this mode of transport is essential to small or remote communities for the transport of agricultural and commercial products to and from regional markets and growth centres, especially during the monsoon and flooding season. Therefore, relatively small investments in transport facilities for private or small-scale transport services would increase the strategic connectivity of rural communities through ferry services and small goods transport. An analysis should be undertaken to identify strategic nodal points through which increased access to markets, education, or health services might bring benefits to the region. Modernisation of country craft development should be taken in hand to extend services to the feeder route.

For such investments to become feasible, they would have to pass the test of economic and financial viability. This will be facilitated by the clear announcement of public investment programmes related to the strengthening of IWAI for undertaking the creation of waterways infrastructure, and a stable policy framework that results from international arrangements referred to above.

There is a growing realisation that increased economic partnership with Bangladesh will bring substantial benefits. While India's foreign policy has seen certain developments to this end during the last couple of years, the traction needs to be sustained.

The desired development of IWT cannot be achieved through public investment alone; the private sector has a crucial role to play. As brought out by Dr Sriraman in his paper Long term perspectives on IWT in India, the 9th Plan has clearly recognised and envisaged the role of private sector in IWT, particularly in:

- Ownership and operation of vessels for cargo and passenger movement
- Fairway development and maintenance
- Construction and operation of terminals and river ports
- Provision of mechanised handling systems, maintenance of navigational facilities etc.
- Pilotage facilities
- Setting up and operating IWT training institutions

Apart from permitting Foreign Direct Investment upto 100 per cent of equity, government support has been outlined as conduct of pre-feasibility, preparation of DPRs by IWAI, land acquisition, long-term cargo assurance, equity participation etc. While the private sector response has so far been lukewarm, there are indications of some private investments being planned, particularly for vessel acquisition and construction of barges/jetties. Greater participation by the private sector shall be ensured through favourable policy framework and viable traffic volumes.

CROSSING THE BRAHMAPUTRA

As mentioned before, the 890 km length of Brahmaputra from Dhubri to Sadia has three existing bridges, and two more are under construction. Both for security and general communication, this is grossly

insufficient. Safe, modern and regular ferry services with RO-RO facilities should be operational at proper intervals. Currently, more than 70 ferry services are operational in Assam, out of which 50 services are being operated by the IWT department of the government of Assam.

IWAI is working on building terminals and RO-RO connectivity between Dhubri and Hathsingimari. A study should be conducted to locate more points where quality ferry services and RO-RO services should be introduced.

CONNECTIVITY WITH NEIGHBOURING COUNTRIES

LOOK EAST POLICY

The Look East Policy (LEP) was launched in 1992 just after the cessation of the Cold War and around the time when India was embarking on its first, and effective, dose of liberalisation. It was a strategic policy decision taken by the government and to quote Prime Minister Dr. Manmohan Singh, 'it was also a strategic shift in India's vision of the world and India's place in the evolving Indian economy'.

As a result, gradually but surely, India has begun to figure in the strategic thinking of Southeast Asia and there has been increasing cooperation on many fronts. ASEAN too began considering closer ties with India. India also started recognising the growing influence of ASEAN in the region while the LEP provided the right backbone to support domestic and public consensus in desirability of forging closer engagement with Southeast Asia. ASEAN has indeed emerged as a strong group of nations whose economy has been constantly looking up. There is hence a major potential in ASEAN-India cooperation on infrastructure. The Comprehensive Asian Development Plan (CADP) and the Master Plan on ASEAN connectivity (MPAC) emphasise the importance of ASEAN connectivity with neighbouring countries in South East and East Asia. ASEAN-India connectivity is the main theme of the CADP Phase II report. Development of the transport infrastructure in the NER and its simultaneous integration with ASEAN will not only shore up the Indian economy but also enhance India's reputation in the South East Asian region. (See Chapter 13, Volume II on Promoting International Transport Connectivity) between India and the South and South East Asia Regions.

NER TO PLAY THE ARROWHEAD

In October 2007, a closed-door meeting of the Chief Ministers of the NE states, the External Affairs Minister and other senior Ministers saw the first formal articulation of the connectivity needs of the NER with neighbouring countries. Fortunately, the following years have seen growing closeness of relationships between India on the one hand and Bangladesh and Myanmar on the other. As rightly expressed in NER Vision 2020, North East India is India's gateway to South East Asia. The Look East Policy also envisages increasing commercial interchanges between NER, our international neighbourhood and beyond to South East Asia. At present, however, India's international transport linkages with the East are highly underdeveloped, as are its linkages with Bangladesh. However, with the increasing realisation to develop such international linkages, a couple of transport projects are being undertaken while certain others are contemplated. These projects have been outlined here in addition to the Committee's recommendations. The ongoing activities and recommendations have been discussed country-wise and not sector-wise.

IMPROVING LAND CONNECTIVITY

Land connectivity is the most effective and essential form of linkage across the international borders. Before considering country-specific external linkages, it is important that the complementary internal transport infrastructure develops as adequate integration to market places and centres of production alone will ensure equitable spread of benefits accruing from such investments. Due to the history of close cultural, commercial and economic linkages, there has been a free flow of informal trade across these borders. To formalise these linkages, we have to initiate operation of Land Custom Stations (LCSs) and the proposed Integrated Check Posts (ICPs) at suitable locations where sizable volumes of traffic is anticipated.

Of the total 5,437 km of international border of the NER, 1,880 km is with Bangladesh and 1,643 km is with Myanmar. (Table 6.1)

There are 38 LCSs notified under section 7 of the Customs Act, 1962, in the NER. But even today, most of these notified LCSs have very poor road connectivity. The government of India is working to upgrade the following five LCS to Integrated Check Posts at an approximate investment of Rs 120 million each:

A. With Bangladesh
   i. Dawki in Meghalaya
   ii. Agartala in Tripura
   iii. Satarkandi in Assam
   iv. Khwarpuchia in Mizoram

B. With Myanmar
   v. Moreh in Manipur

A new statutory authority, the Land Ports Authority of India, has been created under an eponymous Act recently. The ICPs will function under this authority, though sovereign functions will continue to be

Table 6.17
The Trilateral Highway

S.NO.	STRETCH	REMARKS
1.	Tamu-Kalewa	Part of the Friendship Road. Good condition.
2.	Kalewa-Yagyi	India is constructing this stretch.
3.	Yagyi-Chaungma-Monywa	Myanmar is constructing this stretch.
4.	Monywa-Mandalay	Monywa-Mandalay stretch is already developed.
5.	Mandalay-Meiktila Bypass	This stretch is part of Mandalay-Yangon expressway. It is well developed.
6.	Meiktila bypass Taungoo-Oktwin-Payagyi	This stretch is part of Mandalay-Yangon Express Way. It is well developed.
7.	Payagyi-Theinzayat-Thaton	It is in good condition.
8.*	Thaton-Mawlamyine-Kawkareik	It is in good condition.
9.*	Kawkareik-Myawaddy	It is understood that Thailand is looking for funding from ADB to develop this stretch.
10.*	Myawaddy-Mae Sot	It is in good condition.

Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.
Note: * Stretches from 8 to 10 are being developed by Thailand though the stretches are in Myanmar.

provided by the designated departments. This initiative is worthwhile. However, certain issues still need to be addressed.

i. The LCSs which are not being upgraded to ICPs do not have any single-point administrative control for their management or development. Their development is done by state governments with funds from Assistance to States for Developing Export Infrastructure and Allied Activities (ASIDE) scheme of Commerce Ministry. Hence, their development is bereft of systematic planning and dependent on states' priorities.

ii. The second drawback is that backward integration in terms of connectivity suffers. As there is tremendous pressure on the state governments for different roads catering to different ethnic/pressure groups, connectivity to LCSs which are perceived as Central Government responsibility remain neglected.

It is, therefore, recommended that a special programme to provide linkages to the Land Custom Stations should be taken up. Along with roads, improvement in the facilities at the LCSs should be taken up in a planned manner.

IMPROVING INTERNATIONAL AIR CONNECTIVITY

While country-specific transport linkages (particularly through road, rail and water) are discussed in detail in the following sections, a possible option to develop international connectivity through the NER with India's neighbouring countries also becomes relevant and needs consideration. Building on the recommendation made in the section on aviation earlier, the Hub and Spoke model proposed with smaller aircrafts can extend their operations to Dhaka, Thimpu, Myanmar and even further to the commercially active city of Mandalay. As such, certain airports are being made international as part of India's Look East Policy to boost the NER's connectivity and trade with South East Asia. Therefore, exploring viability of the Hub and Spoke model and with certain (Imphal and Agartala are proposed) airports becoming international, the air connectivity between the cities of the NER and Myanmar, Bangladesh and other neighbouring countries would be easier and boost trade, tourism and people-to-people contact.

BANGLADESH

The transport links with Bangladesh that were broken as a result of the Partition and then completely severed after the 1965 Indo-Pak War have been discussed in detail. The resultant damage to the economy of the NER is also well understood. Sincere efforts are needed by both nations to reconstruct and further develop their connectivity links and strengthen bilateral ties. There is a growing realisation that increased economic partnership will bring substantial benefits. While India's foreign policy has seen certain developments to this end during the last couple of years, the traction needs to be sustained and focused on-ground implementation.

ONGOING DEVELOPMENTS

Following high-level interactions between the Prime Ministers of the two countries, there has been an agreement on several important transportation and trade milestones.

- India to gain access to Chittagong and Mongla Ports in Bangladesh
- Agartala-Akhaura Railway line, which will provide rail connectivity between Tripura and Bangladesh
- Development of border haats on the Indo-Bangladesh border which will promote trade and connectivity
- Bridge over river Feni between India and Bangladesh at Sabroom, Tripura. It is recommended that this should be a rail-cum-road bridge to link the under-construction Agartala-Sabroom railway line to Chittagong
- Development of Sabroom-Ramgarh and Dhemagiri-Tegamukh border points which will provide new connectivity between Bangladesh, Tripura and Mizoram. It may be stated here that Mizoram, prior to Independence, had exchange of commodities through the Dhemagiri-Tegamukh route via the Karnaphuli river. Presently, Mizoram has no connectivity to Bangladesh.
- Reviving the Kulaura-Mahisashan rail link

EXTENSION OF THE INDO-BANGLADESH PROTOCOL

The Indo-Bangladesh Protocol on Inland Water Transit and Trade has been applicable since 1972. Four routes are specified with five ports of call in each country. The protocol permits inland vessels of one country to transit through the specified routes of the other country. The existing protocol routes are:

- Kolkata-Pandu-Kolkata
- Kolkata-Karimganj - Kolkata
- Rajshahi-Dhulian-Rajshahi
- Pandu-Karimganj-Pandu

For inter-country trade, following five ports of call have been designated in each country:

Ports of Call in India

- Haldia (West Bengal), Kolkata (West Bengal), Pandu (Assam), Karimganj (Assam) and Silghat (Assam).

Ports of Call in Bangladesh

- Narayanganj, Khulna, Mongla, Sirajganj and Ashuganj.

A point earlier made needs reiteration. The IWT Protocol should be extended for 20 years so that both India and Bangladesh's business can make informed long term investment choices and benefit.

REGIONAL MOTOR VEHICLE AGREEMENT

A draft Regional Motor Vehicle Agreement expected to provide an enabling legal framework for seamless travel across SAARC borders has been on the drawing board for several years now. North Eastern states would be largely benefited by such an agreement.

NEW BUS SERVICES

An Agartala-Dhaka bus service has been in operation since 2003, underscoring the close bonds on both sides. Bus services on both sides linking Sylhet to Shillong and Dawki, Dhaka and Shillong, and Dhaka and Guwahati should also be started.
emphasis

CONNECTING MEGHALAYA AND TRIPURA WITH BANGLADESH

Connecting Meghalaya with Bangladesh at Dawki, Shella, Baghmara, Burengapara and Mahendraganj and similarly Tripura at Kalkalighat, Kamalpur, Khowai, Ranir Bazar and Sabrum will develop international linkages with Bangladesh. This will facilitate alternate routes between these two states, with rest of the country, access to the Asian Highway network and connectivity with major cities in Bangladesh.

By linking Mizoram at Tlabung with Bangladesh, a much shorter route between Mizoram and Tripura (at Sabroom) could be developed. Apart from this, alternate routes between Mizoram and Meghalaya can be developed through Bangladesh (via Chittagong and Dhaka).

INDO-BANGLADESH RAIL CONNECTIVITY

A prestigious project has already been taken in by the Government of India by providing funds for connecting Akhaura (Bangladesh) and Agartala (India). This will provide access to Dhaka as well as Chittagong. However, this will remain on metre gauge which would need transshipment at Agartala. Possibility should be explored for mobilising fund for conversion of line from Agartala to Dhaka-Chittagong from MG to BG to have seamless freight operations on this route. When India and Bangladesh finally agree for opening of Chittagong, this seamless connectivity will unlock value for

both India and Bangladesh. It will also provide a unifying connectivity from Kolkata to the NER and beyond via Dhaka–Agartala. There is already a proposal for surveying a rail connection from Belonoia (India) to Chittagong (Bangladesh) which may also be pursued.

MYANMAR

There has been a series of high-level visits between India and Myanmar in 2010, 2011 and 2012. With the advent of democracy in Myanmar, relations are on an upswing. The main gateway between Myanmar and India is at Moreh (Manipur)–Tamu (Myanmar). Arunachal Pradesh, Nagaland, Manipur and Mizoram share a 1600 km border with Myanmar along with strong cultural and ethnic links. Due to difficult terrain and insurgency on both sides, transportation linkages have not adequately developed.

India has built the Moreh-Tamu-Kalemyo-Kalewa (TKK) Friendship Road in Myanmar. Apart from Moreh, the only other connecting links are at Pangsau Pass in Arunachal Pradesh and Zawkhathar in Mizoram. Recently, it has been decided to develop Pangsau Pass as a first formal border haat between India and Myanmar on the lines of the Indo-Bangladesh border haat on the Meghalaya border. At Zawkhathar, India has a well-developed LCS but hardly any trade takes place as links between Zawkhathar and Rih and beyond in Myanmar are very poor. *India is now developing the Rih-Tiddim Road with grant assistance to Myanmar*.

The proposed Trilateral Highway between India, Myanmar and Thailand as part of the Asian Highway project can be a game changer for the NER as it will provide direct road connectivity to the markets of South East Asia. It is expected to be completed by 2016. The known status of this road beginning from Moreh in Manipur to Mae Sot in Thailand is shown in Table 6.17.

Along with the initiated transport projects, certain others are recommended:

IMPHAL-MANDALAY BUS SERVICE

A bus service between Imphal and Mandalay has been a persistent demand from Manipur. Though it was expected that a protocol would be signed between the two countries during the recent visit of Prime Minister, Dr Manmohan Singh, to Myanmar in May 2012, due to certain technical reason it could not materialise. It is understood that the Myanmar Government is positive on the idea. *It is recommended that the bus service should be started without waiting for a perfect road as the road from Tamu to Mandalay is not good in some parts*.

INDO-MYANMAR RAIL CONNECTIVITY

The railway link to Imphal is expected to be completed by 2016. While this line is under construction, the survey for extending the line from Imphal to Moreh and from Moreh to Mandalay should be completed. A railway link (BG) upto Mandalay will open great opportunities for trade and travel between India, Myanmar and South East Asia. It is also suggested that the Kaladan transport project (discussed below) also should have rail connectivity from Sittwe port to a suitable point in India (Mizoram)—either Sabroom or Lawngtlai.

KALADAN MULTI-MODAL TRANSIT TRANSPORT PROJECT

It is a strategically important project for India providing link from Indian ports on the East Coast to Sittwe in Myanmar and onwards to the waterway on the Kaladan river. It will link South Mizoram to Myanmar providing an alternate connectivity to the NER, the others being the Chicken's Neck and the Indo-Bangladesh Protocol waterway route. Getting transit right to Bangladesh for NER is uncertain. Hence, the strategic importance of the Kaladan project cannot be over-emphasised. It is recommended that a draft transit protocol between India and Myanmar be worked out soon and discussions undertaken. To strengthen the connectivity through Sittwe and to make Imphal a railway hub for the region, the following routes are recommended:

i. **Rail link from Sittwe (Myanmar):** The Kaladan Multi-modal Project is providing link from Sittwe through a waterway and road link in Myanmar. The Government of India has decided to provide funds for development of Sittwe port. However, the port does not have rail connectivity. It is recommended that rail connectivity from Sittwe to Aizawl should be conceptualised as it would help us exploit the investment in Sittwe port properly. Proper arrangements for handling containers on this route also have to be ensured. The line from Sittwe port can join Silchar which in turn is proposed to be connected to Meghalaya (proposed Dhubri-Silchar-Badarpur).
ii. **Connectivity from Sittwe through Mizoram-Manipur:** It is suggested that a railway line be built from Paletwa (Myanmar)–Indo Myanmar border–Lawngtlai (Mizoram)–Aizawl–Churachandpur–Imphal. This could be a long term projection. Due to the low draft of Sittwe port, it cannot carry ships beyond 10,000 tonnes. A new deep sea port is being built in Myanmar at Kyaukpyu which can take vessels bigger than what Sittwe can take. To enable larger ships from mainland India to be able to dock in Myanmar and transport goods northward to the NER by land, India can consider a railway line starting from Kyaukpyu instead of SIttwe.

iii. **Imphal as new rail hub (national and international):** Through these new railway projects, Imphal too can become a rail hub in future in the following manner:
   a Present proposal: Jiribam-Tupul-Imphal (National Project)
   b Eastward extension: Imphal-Moreh-Mandalay
   c Northward extension: Imphal-Kohima-via Northern Nagaland-Tirap (Arunachal Pradesh)
   d Southern extension: Line coming from Paletwa (on the Kaladan multi-modal route)-Indo-Myanmar border-Lawngtlai-Aizawl-Churachandpur-Imphal.

It is proposed that Imphal be made a hub for railway connectivity with Myanmar from two sides and also get Nagaland and Arunachal Pradesh.

BHUTAN

India partners closely with Bhutan in its development as much as it does to be its biggest trade partner. A free trade regime (under the India-Bhutan Trade and Commerce Agreement) exists between India and Bhutan which is reflective of the strong bilateral ties that concede to mutually beneficial economic linkages between the two countries.

Currently, the major items of exports from Bhutan to India are electricity (from Tala, Chukha and the Kurichhu hydroelectric project), base metals and articles, minerals, vegetable fat and oils, alcoholic beverages, chemicals, cement, timber and wood products, cardamom, fruit products, potatoes, oranges and apples, raw silk, plastic and rubber products. Major exports from India to Bhutan are petroleum products, mineral products, base metals and articles, machinery, automobiles & spares, vegetable, nuts, spices, processed food and animal products, chemicals, wood, plastic and rubber. The Agreement on Trade and Commerce also provides for duty-free transit of Bhutanese merchandise for trade with third countries. Sixteen exit/entry points in India identified in the Protocol for Bhutan's third country trade are Jaigaon, Chamurchi, Ulta Pani, Hathisar (Gelephu), Darranga, Kolkata, Haldia, Dhubri, Raxaul, Panitanki, Changrabandh, Phulbari, Dawki, New Delhi, Chennai and Mumbai. Of these, Kolkata, Haldia, Mumbai and Chennai are the designated seaports, Dhubri is the riverine route, New Delhi, Chennai, Mumbai and Kolkata are the air routes and Raxaul is the rail route. The others are the designated road routes.

During 2010, imports from India were of the order of Rs 29 billion and constituted 75 per cent of Bhutan's total imports. Bhutan's exports to India in 2010 amounted to Rs 26 billion and constituted 90 per cent of its total exports. Total trade in 2010 grew by about 26 per cent from 2009.

There is an urgent need to improve connectivity between India and Bhutan both by road and rail. By connecting Jashingang Dzong (in Bhutan) with Arunachal Pradesh and Assam three alternate routes will be developed improving inter-state connectivity. These routes are:

Connectivity between Assam and Arunachal Pradesh via Bhutan

i. Tawang (Arunachal Pradesh)-Jashingang Dzong (Bhutan)-Darranga (Assam). This will provide an alternate route between Arunachal Pradesh and Assam.
ii. Tawang (Arunachal Pradesh)-Jashingang Dzong-Mongar-Dzong-Kogkha-Tongsa Dzong-Shemgang Dzong-Gelekphu (all in Bhutan)-Rani Khata (Assam). This provides another alternate route between Assam and Arunachal Pradesh.

Connectivity between West Bengal and Arunachal Pradesh via Bhutan (circumventing Assam)

iii. Tawang (Arunachal Pradesh)-Jashingang Dzong-Mongar-Dzong-Kogkha–Jongsa Dzong-Punakha-Gasa-Dotanang-Pokangnag-Thimphu-Kyapcha-Chanakha (all in Bhutan)-Jaigaon (West Bengal).

Rail Connectivity between India and Bhutan

iv. There are on-going surveys for rail connectivity to Bhutan with three alignments under consideration at present. It is suggested that a possibility be explored, reaching right upto Thimpu, the capital of Bhutan, in one of these alignments. Alternatively, Thimpu may be connected to Itanagar via Tawang via rail.

SUMMARY

It is for the first time that while formulating the National Transport Policy, special and specific attention has been paid to the transport needs of the North Eastern Region. The Committee decided to look at the situation under three categories:

1. Intra-Regional transport connectivity
2. Inter-Regional transport connectivity
3. Trans Border Movement

It was considered necessary by the Committee that the development of transport in the North Eastern Region should be ahead of the transportation links to be developed with the neighbouring countries so that the NER can exploit fully the connectivity with

neighbouring countries by way of enhanced trade and commercial activities. In a nutshell, recommendations for the NER are:

ROADS

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

i. It is necessary to form a separate body under the aegis of MODONER to monitor the construction activities in the sector.
ii. Road maintenance is a huge challenge for the NER. It is recommended that a policy decision be taken to cover maintenance expenditure under the Plan. All road contracts should have in-built provision of periodic maintenance and its reporting by the contractor for a period of initial five years. Subsequently, the state governments should be responsible for drawing a master maintenance plan, preferably in blocks of five years. This master maintenance plan shall then form the basis on which the funding agencies will release funds.
iii. It is imperative to have a GIS mapping of roads in this region for which MoRTH should provide funds to the states and undertake the responsibility without any delay.
iv. There is a need for changing the technology being used for construction of roads to improve their longevity.
v. There is a need to have training institutions to develop skills in the local population for good maintenance of roads constructed both with the present technology and the superior technology whenever adopted.
vi. There is a need for foot suspension bridges in abundance.
vii. While four-laning of many routes has been recommended and many of them have already been sanctioned, the Committee feels that it would be prudent to have an additional two lane constructed on the other side of the hill so that in case of landslides, the whole route does not get blocked/and suspended. It may also help in meeting the environmental considerations.

RAIL

i. New railway lines, one connecting Sittwe in Myanmar to Tirap in Arunachal Pradesh across Mizoram, Manipur and Nagaland and another line connecting Dhubri to Silchar via Meghalaya is considered essential to improve transportation in the region.

ii. The railway has now extensive knowhow of tunnel construction. They should reduce distances by making prudent use of tunnels.

CIVIL AVIATION

Civil aviation holds the key to not only linking the region to the rest of India, but also catalysing trade and commerce with the neighbouring countries.

Guwahati Airport must be developed as a major international airport as a gateway to ASEAN countries.
It would be financially desirable to make a model for bringing in PPP as suggested in the report to develop a viable civil aviation network in the region.
It is felt that bringing in private operators may change the scenario so much that cheap air travel may become possible through induction of smaller aircrafts with better technology for which onetime capital cost may be met by the Government and the private operators may be asked to operate the services without any dependence from subsidy for day-to-day operations.

In keeping with the geographical contours of the region and the thin spread of population, we are of the view that a hub and spoke model with hubs at Guwahati, Imphal and Agartala should be developed for the region.

DONER should catalyse development of meteorological forecasting network in the region to make civil aviation predictable and safe. The necessary investments for that may be provided by the Government through DONER.

Development of skills among the local population not only for operations of aircrafts but also for maintenance needs to be undertaken. This can be done by bringing in an institute not only for developing aeronautical engineers but also for subordinate maintenance staff. This would facilitate night halt of aircrafts at various locations and provide connections in early morning so that local population may be in a position to reach Kolkata/Delhi/Mumbai in the morning hours to attend meetings and return in the evening.

There is a vast network of airports in the region due to the war effort during World War II, but many of them are lying dormant. It has been suggested that a few of these airports should be made operative within a time frame for civilian use to provide better connectivity not only for men but also for cargo.

These would help establish connectivity required for horticulture/floriculture/aquaculture common in the region.

INLAND WATERWAYS

i. Large paraphernalia already exists for inland water transport in the river Brahmaputra. Proper usage of this capital is necessary,

which can be achieved by entering into a long time treaty with Bangladesh Government to provide access from West Bengal through Assam to their river system. This can be possible if the Indo-Bangladesh Protocol on Inland Water Transit & Trade is extended for at least 10 years at a time to attract investment.

ii. Maintenance of barges and other supporting equipment must be developed near Guwahati without any further delay. This would make the barges available for the longer duration for transportation.

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

iv. Barak River should be utilised for inland water transport in the North Eastern Region and also connecting it to Bangladesh by taking up this project as a National Project on similar lines as has been done for river Brahmaputra.

v. The optimal use of the waterways in the North East requires investment in vessels and their regular operations. Apart from the policy regime of an extended period of the Indo-Bangladesh Protocol, an agency either in the public sector or with introduction of private players has to be found.

vi. Infusion of PPP in inland water transport.

DEVELOPMENT OF MULTI-MODAL HUBS

The geography and demography of the region is spread in such a manner in the North Eastern Region that the committee feels that development of multi-modal hubs at two stations will facilitate smooth transportation in the region in times of calamity as well as insurgency. These hubs have to be developed at following stations:

- Dhubri
- Badarpur

At both stations, it is possible to have connectivity from rail, road, inland water transport as well as civil aviation. These multi-modal hubs can be later on given to private players for operation or may be run by a corporation developed for the purpose.

CONNECTIVITY WITH SOUTH EAST ASIA

The Look East Policy envisages increasing commercial interchanges between NER, our international neighbourhood and beyond to South East Asia. At present, however, India's international transport linkages with the East are highly underdeveloped, as are its linkages with Bangladesh. India could not leverage the shared colonial experience, cultural affinities and an incredible historical baggage to build relations with Southeast Asia. The Committee recommends that it is an opportune time for India to develop strategic long term view on intensifying international transport linkages from the north east region to its neighbours like Bhutan and Bangladesh as also the ASEAN countries, Myanmar in particular. For such international linkages to be productive there has to be even better transport integration of the region internally, and with the rest of India.

Annex 6.1

State-wise Airports/Advanced Landing Grounds

[Updated as of April, 2012]

AIRPORT AIRFIELD/ ADVANCED LANDING GROUNDS (DISTRICT)	OWNERSHIP	STATUS	PLANS
ARUNACHAL PRADESH			
Aalo (West Siang)	Ministry of Defence (Indian Air Force)	Being developed for dual use (military & civil) depending on availability of land for civilian conclave. Indian Air Force and Airports Authority of India are developing the military and civil enclave respectively.	State government to inform whether 7 acres for civil enclave will be available. Defence portion will be completed by March, 2014.
Pasighat (East Siang)	Being transferred to Indian Air Force by AAI.	-do-	AAI will construct civil enclave on 5 acres to be retained by it. Lease agreement for transfer of Pasighat airport from AAI to IAF is being finalised.
Ziro (Lower Subansiri)	Ministry of Defence (Indian Air Force)	-do-	State government to inform whether 10 acres for civil enclave will be available. Defence portion will be completed by March, 2014.
Daporijo (Upper Subansiri)	Airports Authority of India	Will be developed by AAI depending upon the availability of land from the State Government.	State government to inform whether land for civil enclave will be available. Daparizo Aerodrome to be developed and operationalised by AAI for ATR-42 operations. Additional 34.3 acres requested from State Govt. Development works can be taken up after provision of additional Land and fund.
Mechuka (West Siang)	Ministry of Defence (Indian Air Force)	Being developed as Advanced Landing Ground	Will be completed by March, 2014.
Tawang (Tawang)	-do-	-do-	
Tuting (Upper Siang)	-do-	-do-	
Vijaynagar (Changlang)	-do-	-do-	
Walong (Anjaw)	-do-	-do-	
Tezu (Lohit)	Airports Authority of India	Being developed for ATR-72 type of aircraft with VFR	Being developed with funds with NEC. Will be ready by December, 2013. The State government has transferred Tezu Aerodrome along with additional 108 acres of land to AAI in Sept. 2010 for upgradation / development for ATR-72 type of operation. NEC has sanctioned Rs.0.8 billion in 2009-10 to AAI.
Itanagar (Papum Pare)	Proposed Greenfield - The site of the proposed airport is under discussion.		
ASSAM			
Guwahati (Kamrup) (DGCA licensed as Public Use Category as on 31.12.2011)	Airports Authority of India	Operational International Airport. Being developed as Inter-Regional Hub.	Runway extension by 360 metres already completed and commissioned. Apron expansion to accommodate 11 additional parking stands completed and commissioned. Construction of Parallel Taxi Track subject to availability of land from IAF planned. Installation of Cat-I Approach Lights for Runway 02 will be taken up subject to availability of land from IAF. Construction of new integrated terminal building subject to availability of land for city side development.
Dibrugarh (Dibrugarh) (DGCA licensed as Public Use Category as on 31.12.2011)	-do-	Operational	Extension of runway from 1829 to 2286 metres and allied works. Construction of aircraft maintenance hangars and apron for A-321 hangar.

AIRPORT AIRFIELD/ ADVANCED LANDING GROUNDS (DISTRICT)	OWNERSHIP	STATUS	PLANS
Lilabari (Lakhimpur) (DGCA licensed as Public Use Category as on 31.12.2011)	-do-	Operational	Night Landing Facilities – being planned, requires provision of additional land from State Govt.
Jorhat (Jorhat)	Indian Air Force (civilian enclave)	Operational	Expansion of Civil apron at a cost of Rs 0.08 billion. Construction of new terminal building subject to provision of 9 acres of land as requested from State Govt. for City side development.
Tezpur (Sonitpur)	-do-	Operational	--
Silchar (Cachar)	-do-	Operational	New Domestic Terminal Building subject to land availability.
Rupsi (Dhubri)	Being transferred to Indian Air Force. To be developed for dual use.	Non-Operational	AAI Aerodrome being transferred to IAF for its development and operationalisation of ATR-72 type of aircraft. AAI will construct and manage a civil enclave.
MANIPUR			
Imphal (Imphal) (DGCA licensed as Public Use Category as on 31.12.2011)	Airports Authority of India	Operational	Night Landing facilities have been installed and commissioned on 21st May, 2010. Additional 640 acres approximately provided by State Govt. for future airport development for bigger size aircraft like Boeing 747-400. Construction of aircraft maintenance hangars for A-321 hangar. Runway extension by 350 metres in phase-I for wide bodied 'D' category aircraft is in planning stage.
MEGHALAYA			
Shillong (Barapani) (East Khasi Hills) (DGCA licensed as Public Use Category as on 31.12.2011)	Airports Authority of India	Operational	Construction of boundary wall around newly acquired land.- DPR for safety and security infrastructure including perimeter wall etc. Runway extension Expansion of apron for A-321 type of aircraft. Construction of new ATC tower and technical block Construction of new Fire Station Construction of Isolation Bay. Installation of Night Landing Facilities and ILS.
Tura (West Garo Hills)	Government of Meghalaya	Though the airport is operational, there are no regular flights.	Aerodrome belongs to state government. of Meghalaya. On the request from state government, AAI has submitted a DPR for expansion of existing airport for operationalisation of ATR-72 aircraft to Ministry of Civil Aviation and State Govt along with the request to provide approximately 56.5 acres of additional land. State government is yet to respond.
MIZORAM			
Lengpui (Aizawl) (DGCA licensed as Public Use. Category as on 31.12.2011)	Government of Mizoram	Operational	--
Turial (Aizawl)	Airports Authority of India	Non-operational	

AIRPORT AIRFIELD/ ADVANCED LANDING GROUNDS (DISTRICT)	OWNERSHIP	STATUS	PLANS
NAGALAND			
Dimapur (Dimapur) (DGCA licensed as Public Use Category as on 31.12.2011)	Airports Authority of India	Operational	
Cheithu (Kohima)	Proposed Greenfield – under discussion		
SIKKIM			
Pakyong (East Sikkim) Greenfield Airport	Airports Authority of India	Under construction Proposed date of Completion – June, 2014 Actual operationalisation may take another six months.	
TRIPURA			
Agartala (West Tripura) (DGCA licensed as Public Use Category as on 31.12.2011)	Airports Authority of India	Operational	Construction of new control tower in progress - Nearing completion Construction of aircraft maintenance hangars for A-321 hangar. State government has been requested to provide 303 acres for expansion and airport development, which includes: (i) 31 acres for shifting of Glide Path – required for full landing distance available on runway; (ii) 26 acres for runway strip – for DGCA license;
Khowai (Khowai)	Airports Authority of India	Non-operational	As per study, cannot be developed
Kailashahar (North Tripura)	-do-	-do-	Cannot be developed for ATR-72 operations due to one side bandh and other side highway.
Kamalpur (North Tripura)	-do-	-do-	AAI conducted feasibility study for its operationalisation for ATR-72 which requires provision of 50.5 acres of land which has already been requested from State Govt. State Govt. is yet to respond.

Source: Airports Authority of India.

Annex 6.2

SMALL AIRCRAFTS FOR INTRA-REGIONAL CONNECTIVITY: ANALYTICAL MODEL

An analytical model to assess the viability of operating aircrafts to provide intra-NER connectivity is presented below to illustrate that operating small aircrafts can make business sense.

Considering the significance of the development of the civil aviation industry in the NER, an exercise has been carried out to examine the typical economics of airline operations. The main objective of this exercise is to identify a workable option for providing regular and reliable air service in the North East Region.

METHODOLOGY AND RESULTS

Owing to the absence of data on operation of air services, the committee has relied upon the data provided by one of the private airline operators. This data has been modified keeping in view the Indian conditions in discussion with the aviation experts. Liberal norms have been adopted to work out the cost. Accordingly, the cost of operations worked out could perhaps be on the higher side.

The cost per available seat kms has been computed for 3 different scenarios - 2,000, 2,500 and 3,000 flying hours over a distance of 100 nm, 200 nm, 300 nm (Model calculation on viability with 2000 flying hours is placed at Annex 6.4).

The identification and classification of cost elements was based on the data provided for running

Table 1
Computation of Revenue per Passenger Kilometre

ORIGIN-DESTINATION	REVENUE PER PASSENGER (INR)	AIR DISTANCE BETWEEN O-D (KM)	REVENUE PER PASSENGER KM (INR/KM)
Aizwal-Imphal	2,395	172	13.92
Guwahati-Agartala	2,495	267	9.34
Aizwal- Guwahati	2,675	288	9.29

Source: NTDPC.

Table 2
Computation of Revenue per Passenger Kilometre

ORIGIN-DESTINATION	REVENUE PER PASSENGER (INR)	AIR DISTANCE BETWEEN O-D (KM)	REVENUE PER PASSENGER KM (INR/KM)
Aizwal-Imphal	3,439	172	20
Guwahati-Agartala	3,439	267	12.88
Aizwal-Guwahati	4,429	288	15.38

Source: NTDPC.

a Dornier 328 Jet aircraft. For a typical 32 seater aircraft, the study indicated that the operating cost per ASKm (available seat Km) for all the different scenarios were in the range of Rs 8.96 to Rs 11.73. Assuming a load factor of 75 per cent under the various scenarios, the operating cost per RPKms turns out to be in the range of Rs 11.95 to Rs 15.64. This cost is further subjected to reduction since the above calculation has not taken into account the aspect of exploring air based freight transportation of:

i. Floriculture, horticulture and spices
ii. Express Mail and Postal Services

Since tourism is at its nascent stage in the NER, scheduling of hopping flights during the day hours is another possibility to promote inter-regional, intra-regional as well as international connectivity in the NER.

Table 6.1 provides existing system of pricing of air tickets by Air India in the NER. The figures have been extracted from the airline's official webpage and the calculation thus involves some level of judgment and empiricism due to lack of sound database.

The above air fares are prevalent in a time lag of two months from the day of booking an air ticket. Table 6.2 shows the price structure between the cities on a very short notice period, say a day or two.

The results show that on a liberal basis, the simple average RPKms, ranges between Rs.10.85 to Rs.16.09 depending on the ticketing scenario. Since the data of foot count of passengers travelling between O-D was not available, weighted average method could not be adopted.

It is observed that the simple average cost of airline operations for all the different scenarios, turns out to be Rs 13.40 at a load factor of 75 per cent while the simple average revenue charge per passenger from Air India for above three flights is Rs 13.49. Figuratively, this implies that on varying the load factor, the differential between the operating cost per ASkm and the Revenue per passenger km would diverge distinctly. This value would also differ on taking into account the revenue earned for movement of cargo by airline operators. For a load factor of 60 per cent, the operating cost turns out to be Rs 16.75 while it is Rs 14.36 at a load factor of 70 per cent. Thus, it provides a unique vantage point to call firsthand that there requires a shift in the paradigm of providing capital subsidy for airline operators in the NER once the available resources are allocated efficiently.

This calls for introducing a new and innovative policy based on operating smaller aircrafts. Airlines shall be required to focus on operationalising the existing smaller airports/airfields based on hub-and-spoke model which hinges on small aircraft-centric operations without locking up huge capital. This approach shall not only be cost-effective, but will also meet the local requirement and yield potential returns as unutilizsd and idle assets available in the region are put to productive use.

Annex 6.3
On-going Surveys (Railways)

PROJECT	REMARKS	KMS	COST (RS BILLION.)
ARUNACHAL PRADESH			
New Line from Lekhapani to Kharsang	Survey completed. Report under examination	31	3
New Line from North Lakhimpur to Shilapathar via Along	Survey completed and Report under examination.	248	112
New Line from Jagun to Nampong via Jairampur.	Survey not yet sanctioned.		
New Line from Miao via Jagun and Kharsang.	Survey not yet sanctioned.		
New Line from Pasighat-Tezu-Parsuramkund.	Survey in progress	130	
New line from Rowta to Twang via Udalgiri-Shikardanga-Kalaktang-Shergaon-Tenga.	Not yet sanctioned.		
New Line from Misamari-Tawang	Survey in progress	329	
ASSAM			
New Line from Silghat to Tezpur along with construction of bridge river across River Brahmaputra	Survey in progress sanctioned in 2011-12	33	
New Line from Salona to Khumtai	Survey completed, Report under examination.	99	29
New Line from Jorhat to Sibsagar. This part of Chaparmukh-Dibrugarh. To be done under PMRVY	Survey completed, 2010-11 and examined.	344	35
2nd Railway Bridge at Saraighat across River Brahmaputra	Survey completed, Report under examination.		3
New Line from Tirap – Lekhapani	Survey completed, Report under examination	6	0.5
New Line from Pancharatna to Silchar	Shelved by Board	437	182
Doubling of New Bongaigaon to Kamakhya via Goalpara	Survey in progress	178	
Doubling of New Bongaigaon to Kamakhya via Rangiya	Survey completed	150	
Doubling of Digaru to Dibrugarh	Survey completed	520	32
Railway Electrification from Guwahati to Dibrugarh	RE from Katihar to Guwahati is sanctioned and work is in progress.		
MANIPUR			
New Line between Imphal-Moreh (Myanmar)	Survey to be sanctioned.		
MEGHALAYA			
New Line from Jogighopa (Panchratna)-Tikrikila-Selsella-Zikzak-Baghmara-Ranikor-Shella-Dawki-Silchar.	Shelved by Board	437	1.82
New Line from Jowai-Lokro	Survey in progress	170	
New Line from Shillong to Chandranathpur	Survey sanctioned in 2011-12		
MIZORAM			
New Line from Sairang to Indo-Mayanmar Multi Modal Transit Transport Route at Hruitezwl and lateral extension to Tlabung and Chaphai.	Deferred		
Lalabazar (Assam)-to Vairengte (Mizoram)	-	20.3	3.6
NAGALAND			
New Line from Dimapur to Tizit	Survey is in progress	190	
New Line from Amguri to Naginimora	Survey completed and report under examination	31	3.8
New Line from Tuli-Tuli Town	Shelved	9	1.0

PROJECT	REMARKS	KMS	COST (RS BILLION.)
TRIPURA			
New Line from Agartala-Akhaura BG rail line as a National Project. (Total length on Indian side 5.4 Kms & cost Rs 1.0555 billion)	Survey in progress	10	2.5
New Line from Belonia (Tripura) to Belonia (Bangladesh) and Sabroom- Ramgarh.	Survey not yet sanctioned.		
SIKKIM			
Extension of New Line from Sivok -Rangpo (sanctioned) & Rangpo to Bhusuk (Gangtok)	Sivok – Rangpo sanctioned & being done by IRCON.	69	49
New Line between Mirik-Rangpo	Mirik-Gangtok:-Survey already done. Railways has been asked to explore possibility of connecting this line to Sivok-Rangpo-Gangtok line at some point to save on cost.	163	117

Source: Final Report of Working Group on Improvement and Development of Transport Infrastructure in the North East for the NTDPC.

Annex 6.4
Model Calculation based on 2000* Flight Hours per year

NETWORK A/C UTILISATION	
Average Annual Block Hours per A/C	2308 BH per year
Average Annual Flight Hours per A/C	2000 FH per year
Average Annual Flights per A/C	1847 Sectors per year
Average Sector Distance	367 km
Annual Weeks of Operation	52 weeks per year
Flying Hours Per Month	166.67

CALCULATION OF TOTAL COST		
	TOTAL (P.A.) (MILLION)	PER HOUR
Fuel		
Average Fuel Price(Rs 63/ltr for 2000 hours @1050 lt/hr)	132.3	66,150
Ownership		
Ownership Cost per year	29.7	14,850
Insurance per year	4.95	2,475
Interest p.a.	32.30	16,151
Flight Crew		
Captain Salary per year	6	3,000
Co-pilot Salary per year	4.2	2,100
Crew Attendant (2 in nos.) per year	1.08	540
Maintenance, Charges and Handling		
Engineer Cost @ Rs 250,000 per month	3	1,500
Routine Maintenance Spares (excluding TBO)	5.5	2,750
2 technicians and 2 helpers salary @ Rs 200,000 pm	2.4	1,200
Landing gear overhaul reserve(@Rs 1,500/hour)	3	1,500
APU Overhaul Reserve(@Rs 1,000/hr)	2	1,000

CALCULATION OF TOTAL COST		
	TOTAL (P.A.) (MILLION)	PER HOUR
Annual Cost of Labour	0.15	75
Engine Overhaul Reserve(12,000 per hour)	24	12,000
Landing, Parking and Hangarage charges(@Rs 10,000/day)	3.65	1,825
Technical Office and Admin Expenses	13	6,500
Passenger Handling	60	30,000
Transportation and Airport Expenses	30	15,000
Catering	18	9,000
Total Direct Operating Cost	**375,23**	**187,616**
Total Cost	**375,23**	**187,616**

Note: * Model calculation based on 2,500 and 3,000 flight hours have also been similarly undertaken

SECTOR ECONOMIC DATA				
SECTOR RELATED DATA		CITY A-B	CITY A-B	CITY A-B
Sector Distance	nm	100	200	300
Available Seats Per Flight	Seats	32	32	32
On Board Passengers per flight	pax	24	24	24
Annual Utilisation (Block Hours) Per A/C	BH/Year	2,901	2,531	2,366
Annual Utilisation (Flight Hours) Per A/C	FH/Year	2,000	2,000	2,000
Annual Utilisation (Flights) per A/C	Sectors/Year	5,405	3,183	2,198
Flight Time Per Sector	Min	22.2	37.7	54.6
Block Time Per Sector	Min	32.2	47.7	64.6
Block Fuel Per Sector	Kg	431	677	842

CALCULATION OF DIRECT OPERATING COST				
Interest	Rs/Sector	5,976	10,148	14,696
Ownership Cost	Rs/Sector	5,495	9,331	1,3512
Insurance	Rs/Sector	916	1,555	2,252
Fuel	Rs/Sector	24,477	41,565	60191
Captain Salary	Rs/Sector	1110	1,885	2,730
Co-pilot Salary	Rs/Sector	777	1,320	1,911
Crew Attendant	Rs/Sector	200	339	491
Engineer Cost	Rs/Sector	555	943	1,365
Routine Maintenance Spares (excluding TBO)	Rs/Sector	1,018	1,728	2,502
2 technicians and 2 helpers salary	Rs/Sector	444	754	1,092
Landing gear overhaul reserve	Rs/Sector	555	943	1,365
APU Overhaul Reserve	Rs/Sector	370	628	910
Annual Cost of Labour	Rs/Sector	28	47	68
Engine Overhaul Reserve	Rs/Sector	4,440	7,540	10,919
Landing, Parking and Hangarage charges	Rs/Sector	675	1,147	1,661
Technical Office and Admin Expenses	Rs/Sector	2,405	4,084	5,914
Passenger Handling	Rs/Sector	11,101	18,850	27,298
Transportation and Airport Expenses	Rs/Sector	5,550	9,425	13,649
Catering	Rs/Sector	3,330	5,655	8,189
Direct Operating Cost	**Rs/Sector**	**69,423**	**117,886**	**170,715**
Direct Operating Cost per ASM	**Rs/Sector**	**22**	**18**	**18**
Total Operating Cost	**Rs/Sector**	**69,423**	**117,886**	**170,715**
Total Operating Cost per ASM	**Rs/Sector**	**22**	**18**	**18**
Total Operating Cost per ASKM	**Rs/Sector**	**12**	**10**	**10**

OPERATING COST BREAKDOWN PER AIRCRAFT	IN PERCENTAGE		
Fuel Cost	35.26	35.26	35.26
Crew cost	3.01	3.01	3.01
Maintenance Charges and Handling	43.89	43.89	43.89
Ownership	7.92	7.92	7.92
Interest	8.61	8.61	8.61
Insurance	1.32	1.32	1.32
Total	100.00	100	100
Aizwal to Imphal 172 km price charged by Air India	Rs 2,395		
Revenue Per km	Rs 13.92		

Source: NTDPC.

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