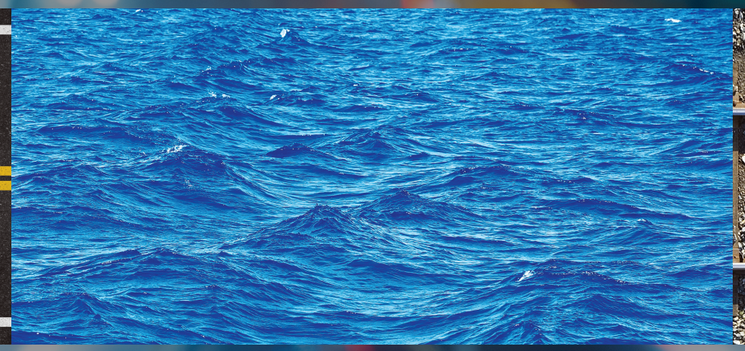
NTDPC INDIA TRANSPORT REPORT

VOLUME II
MAIN REPORT
PART I

INDIA TRANSPORT REPORT









MAIN REPORT

MOVING INDIA TO 2032

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NATIONAL
TRANSPORT
DEVELOPMENT
POLICY
COMMITTEE

ROUTLEDGE

सत्यमेव जयते
Government of India

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MAIN REPORT
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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

Rakesh Mohan
Chairman
rmohan1948@gmail.com
Tel. : 4331-1176

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)

Dr. Manmohan Singh,
Prime Minister of India
South Block,
New Delhi.

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New Delhi
31 December 2013

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PREFACE

The Government of India set up a High Level National Transport Development Policy Committee (NTDPC) on 11 February 2010. The main objective of setting up this Committee was to develop long term national transport policy (with a twenty year horizon) which facilitates overall growth and efficiency in the economy, while minimising energy use and effects on climate change. A somewhat similar Committee constituted by the Government to look at long term transport policy was the National Transport Policy Committee under the chairmanship of Shri. B. D. Pande, a former Cabinet Secretary. That committee submitted its report to the Government in May 1980. This was followed up by the Steering Committee on Perspective Planning for Transport Development in 1988.

The Constitution of the NTDPC and its terms of reference are at Annex P.1.

At the outset, I would like to express my deepest appreciation to the Prime Minister and Shri. Montek Singh Ahluwalia, Deputy Chairman, Planning Commission for having the vision to constitute the NTDPC and then providing it with all the support that was essential for its functioning throughout its long tenure. The Committee was initially given a tenure of 18 months. Because of the complexity of the task and volume of work, its tenure had to be repeatedly extended and we are grateful to the Government for having the patience and understanding to allow us to complete our work to our satisfaction.

I would also like to express my gratitude to the Member Secretary of the Planning Commission and the team of officers and staff from both the Administration as well as Transport Divisions, from whom the Committee received utmost cooperation in the initial days of its life while setting up the secretariat, conducting meetings and appointing officials and staff. Smt. Vini Mahajan, Joint Secretary, Prime Minister's Office provided excellent guidance and support in the setting up of the Committee.

This is the third Committee on infrastructure issues which I have had the privilege to be associated with. The first was the Expert Group on Commercialisation of Infrastructure Projects which issued the *India Infrastructure Report* in June 1996. The second was the Expert Group on Indian Railways which issued the *Indian Railways Report* in July 2001. The work involved in the current report has been the most complex by far and has involved a very large number of institutions and individuals in its preparation. I would like to record my personal gratitude to all the institutions and experts who have contributed to the preparation of this report.

The work of the Committee was greatly facilitated by the generous provision of excellent office facilities and infrastructure support provided by the Infrastructure Development Finance Company (IDFC) in their New Delhi offices. A very special word of thanks for this generous gesture goes to Shri. Deepak Parekh, Chairman of the IDFC at the inception of the NTDPC, and Dr. Rajiv Lall, then CEO & MD, and now Executive Chairman.

The Committee held 21 meetings over the period of almost 4 years of its existence, mostly on Saturdays. A list of the dates on which the meetings were held and the venue are given below.

1. 15 March 2010, Planning Commission
2. 18 May 2010, Planning Commission
3. 26 June 2010, Planning Commission
4. 31 July 2010, Rail Bhavan
5. 21 August 2010, Rail Bhavan
6. 28 October 2010, Metro Bhavan
7. 8 January 2011, Rajiv Gandhi Bhavan
8. 12 February 2011, Planning Commission
9. 26 March 2011, Rail Bhavan
10. 14 May 2011, Rail Bhavan
11. 11 June 2011, Rail Bhavan
12. 18 June 2011, Rail Bhavan
13. 19 November 2011, Rail Bhavan
14. 31 March 2012, Rail Bhavan
15. 7 July 2012, Rail Bhavan
16. 28 July 2012, Rail Bhavan
17. 5 January 2013, Rail Bhavan
18. 23 February 2013, Planning Commission
19. 15 July 2013, Rail Bhavan
20. 19 August 2013, Rail Bhavan
21. 30 November 2013, Rail Bhavan

The NTDPC is grateful to the respective Chairmen, Railway Board, for hosting most of the meetings of the Committee.

We are also grateful to the Government of South Africa for having graciously hosted the Committee, during their visit to South Africa between 19-28 March 2012. The team benefited from the delibera-

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tions and interaction with the Deputy Minister of Transport as well as from their field visits.

INTERIM REPORT OF THE NTDPC

In view of the length of time that it has taken us to prepare the Final Report of NTDPC, Shri. Montek Singh Ahluwalia, Deputy Chairman, Planning Commission, requested the NTDPC to submit an Interim Report so that could be used in the preparation of the 12th Five Year Plan. A number of NTDPC Members contributed to its preparation, which was coordinated by Shri. B. N. Puri, Member Secretary. Shri. Rishab Sethi contributed significantly to its preparation. The Report was submitted in April, 2012 (http://planningcommission.nic.in/sectors/NTDPC/Interim%20Report_NTDPC_2012.pdf, accessed 27 March 2014).

I am grateful to all members of the NTDPC and their delegates for actively participating and contributing to the work of the Committee throughout the lengthy period of its existence.

We received consistent support from all the ex-officio members, the Chairmen, Railway Board and all the Secretaries of the various ministries represented. Advisor to Deputy Chairman, Planning Commission, Shri. Gajendra Haldea withdrew from membership of the Committee in its late stages due to his official pre-occupations. We benefitted from his contribution in the earlier stages.

I would like to record a particular debt of gratitude to what emerged as the core group of independent members: Shri. K. L. Thapar, Shri. S. Sundar, Shri. D. P. Gupta, Professor Dinesh Mohan, Shri. M. Ravindra and Shri. Cyrus Guzder along with Shri. Vivek Sahai, who held my hand and provided constant encouragement throughout the period. Each of them are recognized experts in the area of transportation and they gave very generously of their time to guide me with great deal of patience throughout this period. NTDPC also benefitted from the consistent support of the institutions with which they are affiliated: in particular, the Asian Institute of Transport Development (AITD), The Energy and Resources Institute (TERI), and the Transport Research and Injury Prevention Programme (TRIPP) of the Indian Institute of Technology, Delhi. This report could not have been compiled without their generosity and lifelong dedication to the development of efficient transport in India.

The compilation of this report has been a very complex operation since we have had the task of, on the one hand, preparing detailed sectoral reports on each of the transport sectors, and on the other, addressing each of the cross-cutting themes needed to be addressed across the transport sectors in a consistent fashion, while keeping in focus an integrated view of the whole transport sector. As will be appreciated while going through individual sector chapters, each sector by itself is extremely complicated with its own laws, regulations and peculiarities, and which had to be captured in each case. Addressing the cross cutting issues involved wider consultation, both domestically and internationally. The work of the NTDPC has therefore involved the participation and existence of a great many people, all of whom have contributed generously, and largely on a *pro bono* basis.

WORKING GROUPS

The Committee was provided with a broad terms of reference to begin with. Considerable discussion took place in the first three meetings on how we should organize the work of the Committee. Should it be organised on a sectoral basis or on cross cutting themes? We concluded that it was necessary to look at each sector in depth, while simultaneously initiating work on various cross cutting themes that were identified. Hence, initially, the Committee appointed the five sectoral Working Groups:

i. Railways
ii. Roads
iii. Civil Aviation
iv. Ports and Shipping
v. Urban Transport

Subsequently, as the discussions proceeded, the NTDPC decided to appoint an additional set of two special Working Groups on specific issues.

A presentation given by the Ministry of Coal gave rise to the understanding that the future growth of the country, being highly dependent on corresponding growth in energy production, would need a coordinated approach for significant transport investment to ensure timely and efficient transportation of coal and other key energy related commodities. Hence, it was decided to appoint an additional Working Group on "*Integrated Strategy for Bulk Transport of Energy and Related Commodities in India*".

Second, as discussions proceeded, it became clear that because of the isolation of the North East from the rest of the country, which arose at the time of independence and partition, it would be necessary to take an integrated view of the transport needs of the North Eastern region. Hence, it was also decided to constitute a full Working Group on "*Improvement and Development of Transport Infrastructure in the North East*".

Each of the Working Groups appointed their own respective sub-groups to facilitate their work.
The composition and terms of reference of these Working Groups and Sub-Groups are given at Annex P.2 and Annex P.3.

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I am grateful to the Chairmen of the Railway Board and respective Secretaries of sectoral Ministries for agreeing to chair the sectoral Working Groups and for taking personal interest in the deliberations and preparation of the Working Group reports. As would be seen from the composition of these Working Groups and various sub groups formed by them, all the Ministries and associated organisations contributed generously to the work of these groups.

1. **The Working Group Report on Railways** was prepared under the direction of Shri. S. S. Khurana, Shri. Vivek Sahai and Shri. Vinay Mittal, former Chairmen, Railway Board. Shri. Ranjan Jain, former Advisor (Infrastructure), Shri. Sushant Mishra, then Executive Director, Shri. Girish Pillai, Advisor (Infrastructure) and Shri. Mukul Mathur, Executive Director, Railway Board were particularly instrumental in preparing the Report of the Working Group. Sushant Mishra and Ranjan Jain had earlier been associated with the preparation of the Indian Railways Report in 2001, and also with the Sam Pitroda report on "Modernization of Indian Railways" more recently. The continuity of their association with developments in thinking on railways reform helped greatly in the preparation of this report. The Report was submitted to the Government on 9 August 2012.
(http://planningcommission.nic.in/sectors/NTDPC/Working%20Group%20Reports/Railways/Report%20of%20Working%20Group%20on%20Railways_Submitted%20to%20the%20Govt%20on%20Aug%209th,%202012.pdf, accessed 27 March 2014).

2. **The Working Group Report on Roads** was prepared under the direction of Shri. Brahm Dutt, Shri. R. S. Gujral and Shri. A. K. Upadhyay, former Secretaries, Ministry of Road Transport & Highways. Shri. Arvind Kumar contributed to the drafting of the report. The report was submitted to the Government on 4 July 2012.
(http://planningcommission.nic.in/sectors/NTDPC/Working%20Group%20Reports/Roads/Report%20of%20Working%20Group%20on%20Roads_Submitted%20to%20the%20Govt%20on%20July%204th,%202012.pdf, accessed 27 March 2014).

3. **The Working Group Report on Ports and Shipping** was prepared under the guidance of Shri. K. Mohandas and Shri. Pradeep Kumar Sinha, former Secretaries, Ministry of Ports and Shipping. Shri. Arvind Kumar and Shri. M. M. Hasija contributed to the drafting of the report. The report was submitted to the Government on 25 September 2012.
[http://planningcommission.nic.in/sectors/index.php?sectors=National%20Transport%20Development%20Policy%20Committee%20(NTDPC, accessed 27 March 2014).]

4. **The Working Group Report on Civil Aviation** was prepared under the guidance of Shri. M.M. Nambiar and Dr S. N. A. Zaidi, former Secretaries Ministry of Civil Aviation. Shri. M. Kannan, was primarily responsible for drafting of the report. The report was submitted to the Government on 4 July 2012.
(http://planningcommission.nic.in/sectors/NTDPC/Working%20Group%20Reports/Civil%20Aviation/Report%20of%20Working%20Group%20on%20Civil%20Aviation_Submitted%20to%20the%20Govt%20on%20July%204th,%202012.pdf, accessed 27 March 2014).

5. **The Working Group Report on Urban Transport** was prepared under the direction of Dr. Sudhir Krishna, Secretary, Ministry of Urban Development and his predecessors Shri. M. Ramachandran and Shri. Navin Kumar. Shri. S. K. Lohia contributed greatly to the preparation of the report. The report was submitted to the Government on 4 July 2012.
(http://planningcommission.nic.in/sectors/NTDPC/Working%20Group%20Reports/Urban%20Transport/Report%20of%20Working%20Group%20on%20Urban%20Transport_Submitted%20to%20the%20Govt%20on%20July%204th,%202012.pdf, accessed 27 March 2014).

6. **The Working Group Report on Integrated Strategy for Bulk Transport of Energy and Related Commodities in India** was prepared under the guidance of Shri. P. Uma Shankar, former Secretary, Ministry of Power. Dr. Anupam Khanna and Shri. Daljit Singh of the NTDPC were mainly instrumental in the drafting of the report. The report was submitted to the government on 24 June 2013.
(http://planningcommission.nic.in/sectors/NTDPC/Working%20Group%20Reports/Bulk%20Transport%20of%20Energy/WG%20Report%20on%20Bulk%20Transport%20of%20Energy%20.pdf, accessed 27 March 2014).

7. **The Working Group Report on Improvement and Development of Transport Infrastructure in the North East** was prepared under the direction of Shri. Vivek Sahai, former Chairman, Railway Board. Smt. Jayashree Mukherjee, Joint Secretary, Ministry of Development of North Eastern Region (DoNER) was responsible for drafting of the report. Smt. Bunty Prasad, Ms. Jayati Chandra, former Secretaries, Ministry of DoNER, were very generous in their support of this work. This report was submitted to the government on 4 July 2012.
(http://planningcommission.nic.in/sectors/NTDPC/Working%20Group%20Reports/NER/Report%20of%20Working%20Group%20on%20North%20East_Submitted%20to%20the%20Govt%20on%20July%204th,%202012.pdf, accessed 27 March 2014).

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8. **Information and Communication Technology (ICT)**: Efficiency in the transport sector is undergoing significant transformation with the introduction of ICT in this sector. Moreover, development in seamless transfer across modes is being enabled by the new applications of ICT. Accordingly, we requested Shri. T. V. Mohandas Pai, Member, NTDPC and former CFO of Infosys to help the NTDPC in developing an approach to ICT in transport. He readily agreed and oversaw the work on ICT in Transport which was led by Shri. C. N. Raghupathy, with assistance from Shri. Deepankar Khashnabish and Shri. Kripakaran of Infosys and Shri. Daljit Singh of NTDPC. Our grateful thanks to all of them.

As would be seen from the composition of these Working Groups and their Sub-Groups, a whole host of experts, officials and institutions were involved in the work of these Working Groups and the subsequent preparation of their reports, which finally culminated in the sectoral chapters in Volume III of this Report. I would like to express my deep appreciation of all the contributions made all concerned.

I want to record a particular debt of gratitude to Shri. P. Uma Shankar, former Secretary, Ministry of Power who chaired the Working Group on "Integrated Strategy for Bulk Transport of Energy and Related Commodities in India" despite the fact that his portfolio was not, prima facie, connected with transport. As will be evident from the Working Group Report, and from Chapter 8, Volume II of this Report, a great deal of data collection and modelling had to be undertaken to accomplish this task. This would not have been possible without the special support of Shri. Uma Shankar.

I am similarly indebted to Shri. Vivek Sahai who agreed to chair the Working Group on the North East after stepping down as Chairman, Railway Board. Given his long experience in the Railways, he then became part of the "core group" and gave generously of his time and advice.

SPECIAL STUDIES

In organising its work, the NTDPC also decided to commission a few special studies on issues that were cross cutting across sectors.

1. **Fiscal Issues and Allocative Efficiency:** This study was assigned to the National Council for Applied Economic Research (NCAER). We are very grateful to Shri. Suman Bery, former Director General and Dr Shekhar Shah, Director General of NCAER, for agreeing to undertake this work and providing enough latitude to the researchers for completing the task while responding to our repeated requests for revisions and data collection. Very detailed work was carried out both in modelling and data collection by Dr. Rajesh Chadha and Dr. Sourabh Pal. They cheerfully and patiently accepted our many comments and went through various drafts as requested by us. Shri. B. N. Puri, assisted by Dr. Krishna Dev, Geeta Garg and Honey Gupta, guided and contributed towards finalisation of the report. The study was submitted to the Government on 4 January 2013. (http://planningcommission.nic.in/sectors/NTDPC/Study%20Reports/NCAER/Study%20on%20Fiscal%20Issues%20and%20Allocative%20Efficiency_Submitted%20to%20the%20Govt%20on.pdf, accessed 27 March 2014).

   I would also like to record my appreciation to Dr. Sudipto Mundle (then at National Institute of Public Finance and Policy (NIPFP), now Member, 14th Finance Commission) for reviewing the report and providing us with very useful comments.

2. **Life Cycle Analysis Study of Transport modes:** There is increasing concern on the differential environmental impact of different transport modes. It is found, often, that some erroneous conclusions are drawn because a comprehensive evaluation is not taken of full life cycle impacts involved in construction and operation of different modes. This study was entrusted to The Energy and Resources Institute (TERI). We are very grateful to the very innovative work done by Dr. Akshima Ghate with able assistance provided by Ms. Raina Singh, Ms. Tarika Sinha and Shri. Apoorv Vij. She was also assisted by an Advisory Committee consisting of Shri. S. Sundar, Shri. D. P. Gupta, Shri. M. Ravindra, Prof. Dinesh Mohan, Shri. B. N. Puri (all Members of NTDPC), Dr. Anupam Khanna (NTDPC), Shri. S. K. Mishra (Railways), Shri. Arvind Kumar (MoRTH) and Shri. S. D. Sharma (DMRC). Shri. S. Sundar provided overall direction at TERI. Our grateful thanks to all who have contributed their time in the preparation of this report. The study was submitted to the Government on 4 January 2013. (http://planningcommission.nic.in/sectors/NTDPC/Study%20Reports/TERI/Study_Life%20Cycle%20Analysis%20of%20Transport%20Modes_Submitted%20to%20the%20Govt%20on%20Jan%204,%202013/LCA_Final%20Report%20Vol%20I.pdf, accessed 27 March 2014). (http://planningcommission.nic.in/sectors/NTDPC/Study%20Reports/TERI/Study_Life%20Cycle%20Analysis%20of%20Transport%20Modes_Submitted%20to%20the%20Govt%20on%20Jan%204,%202013/LCA_Final%20Report%20Vol%20II.pdf, accessed 27 March 2014).

3. **Regulatory Framework for Transportation:** This study was entrusted to Dr. Rajat Kathuria (then Professor, International Management Institute) and now Director, ICRIER. He prepared

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a detailed paper on the subject which was discussed at various times in the NTDPC Secretariat and by the NTDPC. This work was condensed to the chapter now appearing in the report Chapter 6, Volume II, Regulatory Issues: An Overall Approach). Shri. S. Sundar and Ms. Jessica Seddon very kindly gave their time to review the study in its various stages.

4. **Institutional Development for Long Term Transport Policy in India:** This study was entrusted to the Indian Institute of Human Settlements (IIHS) under the supervision of Jessica Seddon, then Head of Research at the IIHS. The key issue that engaged the attention of NTDPC, which is a recurrent theme of the report, is the development of institutional capacity in the country to integrate transport strategy and planning over time. As economic conditions over time and there are new technological developments, it is essential that the country develops adequate institutions that can adapt the extant transport strategy on a continuing basis. In preparing the study, Jessica was assisted by H. S. Sudhira and research assistance from Aruna Raman, Amogh Arakali, M. T. Vishnu, Arindam Jana and Anushree Dey. In view of the importance of this study for the development of transport strategy in India, it was discussed with selected members of NTDPC and other experts in various meetings. Shri. K. C. Sivaramakrishnan, Shri. Anil Baijal (former Secretaries of Ministry of Urban Development) and Shri. V. K. Shunglu, a former Comptroller & Auditor General of India, kindly agreed to review the material prepared and to participate in the discussions with us. The final chapter on this issue (chapter 5, Institutions for Transport System Governance) owes much to the sage advice received from the collective wisdom embodied in these respected senior administrators.

I want to record a special debt of gratitude to Jessica Seddon for assisting us in reviewing a number of chapters far beyond the one that she was primarily responsible for her study on institutional development for transport system governance. She gave us very significant assistance in reviewing various drafts related to urban transport, regulation, capacity development, and safety. She has done this despite her own very heavy load of work, reflecting her long-standing association with transport policy in India.

TECHNICAL ASSISTANCE FROM THE WORLD BANK

The Committee was concerned that it should reflect best practices that are now developing across the world in the transportation area. In order to incorporate these developments in the work of the NTDPC, the Committee requested the Secretary, Department of Economic Affairs, Ministry of Finance to facilitate Technical Assistance (TA) from the World Bank. The TA was coordinated for the World Bank by Shri. Ben Eijbergen, Lead Transport Specialist in South Asia Region and Shri. Arnab Bandopadhyay, Sr. Transport Engineer from the Delhi office of the World Bank. I am grateful to Dr Roberto Zagha, Director of the World Bank in India for enabling and facilitating the commissioning of this Technical Assistance. The anchors of the different sectors were:

• Railways	Paul Amos
• Roads	Clell Harral
• Ports and shipping	Marten van den Bossche
• Urban Transport	Ken Gwilliam

Overall, 24 papers were submitted to the NTDPC and each paper was discussed with select Members of NTDPC and other experts in the NTDPC secretariat. The papers were then revised after the Secretariat provided its comments to the World Bank. Two international workshops were also held in New Delhi on 6-8 February 2012 and 15 June 2012 to discuss the papers with a wide variety of stakeholders, representatives of government ministries and selected invited practitioners from other emerging market countries. The papers were submitted to the government on 9 August 2012. A list of the papers is at Annex P.4, along with the programmes of the two international conferences.

The World Bank team also helped in organising the South Africa visit of the NTDPC in March, 2012. The programme of that visit is at Annex P.5.

I would also like to express my deepest appreciation to the World Bank for providing the services of Shri. Bhaskar Naidu, Statistical Officer, Development Data Group of the World Bank, who developed the macro model which is the basis of the overall investment projections made in Chapter 3 of this report. Bhaskar Naidu had made a similar contribution in the preparation in the *Indian Infrastructure Report* in 1996. He has since made such modelling efforts for a host of other countries in the world. He developed and simulated the model innumerable times over the last three years during the preparation of this report. Continuous revisions had to be made with changing economic conditions in India, and revisions of data during this period. He has given his time far beyond the call of duty which is deeply appreciated and acknowledged.

ASIAN DEVELOPMENT BANK

The NTDPC has placed considerable emphasis on promoting international transport connectivity between India and rest of the South Asia region and beyond to South East Asia. We requested the Asian Development Bank through the Department of Economic Affairs, Ministry of Finance to provide us

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assistance in this regard in view of the considerable work done by the ADB on international transport connectivity in South East Asia. We thank Mr. Hun Kim, Country Director, ADB for his support. Ms. Kavita Iyengar drafted the final chapter after several much lengthier drafts with great deal of dedication, knowledge and interest. She has had to do much of this during her own time in addition to her normal duties at the ADB. Critical inputs were provided to her by Cuong Minh Nguyen and assistance from Elizabeth Tan at ADB, Manila. I am deeply grateful to Kavita for all the work she has put in into this enterprise and I do hope that this work will indeed result in new initiatives promoting international connectivity within the South Asia region.

CONSULTATIONS WITH STATE GOVERNMENTS

Responsibilities for the transport sector are shared between central and state governments in different ways. It was therefore felt essential to hold consultations with state governments. Initially, a questionnaire was sent to all state governments in order to elicit their views on various issues of relevance to them. Subsequently, a series of meetings were organized as follows:

1. 8-9 October 2012 at Patna, with state governments of Bihar, Chhattisgarh, Jharkhand, Odisha and West Bengal (invited, but not able to attend)

2. 4-5 February 2013 at Mumbai, with state governments of Goa, Gujarat, Madhya Pradesh, Maharashtra and Union Territories of Daman & Diu and Dadra & Nagar Haveli.

3. 27 May 2013 at Chandigarh, with state governments of Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab and Union Territory of Chandigarh.

4. 1 August 2013 at Jaipur, with state governments of NCT of Delhi, Rajasthan, Uttarakhand and Uttar Pradesh.

5. 26 August 2013 at Bengaluru, with state governments of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Union Territories of Andaman and Nicobar Islands, Puducherry and Lakshadweep.

Annex P.6 lists the participants in each of the above meetings. Annex P.7 gives in brief the issues highlighted in those meetings and the way forward suggested.

The NTDPC is very grateful to the state governments of Bihar, Maharashtra, Rajasthan and Karnataka and of the Union Territory of Chandigarh for hosting these meetings. In addition, the Working Group on Improvement and Development of Transport Infrastructure in the North East held consultations with state governments at Guwahati, Assam. We are grateful to the State Government of Assam for hosting these meetings.

PREPARATION OF THE FINAL REPORT

The preparation of this complex report has been a truly cooperative effort. However, I would like to acknowledge the specific contributions made by the many individuals who gave generously their time through various drafts and revisions of each of the chapters.

Chapter 2 Trends in Growth and Development of Transport
Shri B. N. Puri was primarily responsible for the preparation of this chapter. He received able assistance from Shri. Honey Gupta and Ms. Geeta Garg from the NTDPC Secretariat. Dr. Somik Lall also contributed to this chapter in the initial stages.

Chapter 3 Macroeconomic Growth Backdrop: Transport Investments Requirements: 2012-32
I am deeply indebted to Shri. Bala Bhaskar Naidu for developing and simulating the macro-economic model on which this is based. Dr. Somik Lall, Dr. Krishna Dev and Shri. Amod Jain, and Shri. Muneesh Kapur, Advisor, IMF also contributed to the preparation of this chapter.

Chapter 4 Integrated Transport: Strategy and Logistics
This chapter was prepared by Shri. B.N. Puri and Shri. Rishab Sethi with consistent advice from Shri. K.L. Thapar and Shri. Cyrus Guzder. We also received useful inputs from Shri. Pritam Banerjee of DHL. Dr. Krishna Dev provided further assistance.

Chapter 5 Institutions for Transport System Governance
Ms. Jessica Seddon was primarily responsible for the preparation of this chapter with advice and contributions from Shri. B. N. Puri, Shri. S. Sundar and Shri. K. L. Thapar.

Chapter 6 Regulatory Issues: An Overall Approach
This chapter was prepared by Dr. Rajat Kathuria. Ms. Jessica Seddon and Shri. S. Sundar contributed significantly to the development of this chapter.

Chapter 7 Energy and Environment
We received generous assistance from the International Council on Clean Transportation (ICCT) based in Washington DC. Shri. Gaurav Bansal, Dr. Anoop Bandivadekar, Dr. Alan Lloyd and Mr. Michael Walsh contributed to the work embodied in this chapter. We are grateful to the ICCT for providing this assistance. We are also grateful to Dr. Sarath Guttikunda for his contribution to this chapter. The chapter was pre-

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pared under the direction of Shri. S. Sundar by Ms. Akshima T. Ghate of TERI and Shri. Gaurav Bansal.

Chapter 8 Transportation of Energy Commodities

This chapter was prepared by Shri. Daljit Singh under the direction of Dr. Anupam Khanna.

Chapter 9 Fiscal Issues

The work embodied in this chapter was done by Dr .Rajesh Chadha and Dr. Sourabh Pal. Shri. B. N. Puri, assisted by Shri. Honey Gupta and Ms. Geeta Garg, steered the drafting of chapter.

Chapter 10 Potential of Information and Communication Technology to Enhance Transport Efficiency

This chapter is based on the work done by Shri. C. N. Raghupathy, Shri. Dipankar Khashnabhish, Shri. Kripakaran, under the direction of Shri. T. V. Mohandas Pai. Shri. B. N. Puri, along with Shri. Daljit Singh contributed tremendously to the final drafting of this chapter.

Chapter 11 Research and Human Resource Development

Chapter 12 Safety

These chapters were primarily prepared by Professor Dinesh Mohan, with review and advice from Shri. K. L. Thapar and Ms. Jessica Seddon.

Chapter 13 Promoting International Transport Connectivity between India and South and South East Asia Region

The primary work for this chapter was done by Ms. Kavita Iyengar of the Asian Development Bank. She received critical inputs from Mr. Cuong Minh Nguyen and assistance from Ms. Elizabeth Tan at ADB, Manila. We are also grateful to Shri. Shyam Saran, former Foreign Secretary, Shri. Ashok Kantha, Secretary (East), Ministry of External Affairs and Ms. Renu Pall, Joint Secretary, Ministry of External Affairs, for their valuable inputs to this chapter.

SECTORAL CHAPTERS

1. Railways

A great deal of work, discussion and deliberation went into the preparation of this chapter. Very significant contributions were made by Shri. M. Ravindra, Shri Vivek Sahai, Shri. K. L. Thapar, Shri. S. Sundar, Shri. B. N. Puri, Shri. Cherian Thomas, Shri. Ranjan Jain, Shri. S. K. Mishra and Dr. Krishna Dev. Shri. Sourabh Anand and Ms. Jyoti Gujral of the IDFC did the excellent final drafting of this chapter.

2. Roads and Road Transport

This chapter was primarily prepared by Shri. D. P. Gupta, with contributions from Shri. B. N. Puri. Shri. Rishab Sethi, and Dr. Krishna Dev, Ms. Shruti Jain provided valuable assistance.

3. Civil Aviation

The primary work on which this chapter is based was done by Shri. M. Kannan and Shri. Rishab Sethi. Shri. B. N. Puri, Shri. K. L. Thapar and Shri. Cyrus Guzder made valuable contributions. Ms. Vidya Satchit provided assistance in the initial stages.

4. Ports and Shipping

We received significant assistance in the preparation of this chapter from Shri. Rahul Chaudhary and Shri. Thomas Netzer from McKinsey and Co. in its initial stages. The final draft is greatly due to the intensive work put in by Shri. B. N. Puri, Shri. Honey Gupta and Ms. Geeta Garg. Advice received from Shri. S. Sundar and Shri. Bharat Sheth has been of great value in the preparation of this chapter. Shri. M. M. Hasija, Shri. Ajit Khot and Shri. Anil Devli also provided useful comments.

5. Urban Transport

This chapter has been prepared primarily by Shri. Shubaghato Dasgupta with very significant contributions from Professor Dinesh Mohan, Shri. S. Sundar, Ms. Jessica Seddon, Shri. S. K. Lohia and Shri. B. I. Singhal.

6. Transport Development in the North East

This chapter has been prepared by Shri. Vivek Sahai, Shri. B. N. Puri, Ms. Jayashree Mukherjee, and Shri. Honey Gupta. Ms. Shruti Jain provided valuable assistance.

Each of the chapters went through extensive debate and discussion at the meetings of the NTDPC and in other meetings held in the NTDPC Secretariat throughout 2013. Each chapter was circulated to all the Committee Members for comments and then revised on the basis of comments received.

SECRETARIAT OF THE NTDPC

As may be seen from the description of work undertaken by the NTDPC, a great deal of background work has gone into preparation of this final report, which required coordination at all stages. We operated with a relatively lean Secretariat, all members of which have contributed to the work of the NTDPC far beyond the call of normal duty. Dr. Anupam Khanna, was Principal Advisor and Dr. Somik B Lall was Senior Consultant in the NTDPC Secretariat in the initial period of the Committee's work until mid-2011. Dr. Anupam Khanna continued to assist the Committee through his work on Transportation of Energy Commodities; and Dr. Somik Lall continued to assist in the preparation of chapter 3. Shri. Daljit Singh joined the NTDPC Secretariat in mid-2011 and has contributed significantly to the overall work of the Committee since then, though particularly in the

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work on Integrated Strategy for Bulk Transport of Energy and Related Commodities in India, and on Information and Communication Technology (ICT). Shri. Shubaghato Dasgupta has been a Consultant in the Secretariat concentrating essentially on all the work connected with the urban transport.

We have been fortunate to get the assistance of a number of Research Assistants during the tenure of the Committee. Shri. Amod Jain worked in the Secretariat as an Associate on leave from McKinsey and Co., from the inception of the NTDPC until mid-2011. He contributed very significantly to the preparation of the basic data that was used in the macro-economic model used in Chapter 3 of Volume II. He also prepared a large number of Boxes that have been used in the report. Shri. Rishab Sethi has been with the NTDPC since early 2011 and has contributed very significantly to the work on Roads, Civil Aviation and Integrated Transport Strategy and Logistics. Shri. Honey Gupta has been with the Secretariat since mid-2012 and has contributed a great deal to the work connected with Ports and Shipping, Fiscal Issues and the North East. Ms. Shruti Jain and Ms. Geeta Garg worked in the Secretariat from mid-2010 until mid-2013. They provided research assistance on a wide variety of work carried out in the Secretariat.

Shri R. K. Sharma, Administrative & Accounts Officer (AAO) shouldered much of the administrative burden of the NTDPC as AAO. He has worked to keep all our accounts and other administrative actions consistent with government procedures and conventions. He has been instrumental in taking away a good deal of the administrative burden from the Chairman and the Member Secretary. Ms. Asha Jhulka worked as PS to the Member Secretary and helped a great deal in organising the large number of meetings that had to be set up during the tenure of the Committee.

I would like to convey the appreciation of the NTDPC to CRIS personnel, Shri. G. K. Maishi, GM, Ms. Seema Vadhera, Manager, and Shri. Rahul Gupta, Sr. Software Engineer who have maintained the website of NTDPC since its inception.

Shri Vinod Tejpal, Shri. Shatrudhan and Shri. Brajesh Tiwari have been with the NTDPC Secretariat almost throughout its existence as office support staff. They have worked far beyond the call of duty at all times with a very cheerful countenance and efficiency.

A special word of appreciation goes to Shri. K. Raghuraman, my PS, who has been a rock of support throughout the existence of the NTDPC. He has helped me to keep track of all the work of the NTDPC through this whole long period. This has not been easy since I have spent significant time in the United States throughout the tenure of the Committee: first as Professor at Yale University, and later as Executive Director at the International Monetary Fund (IMF). His loyalty, sincerity, devotion to work and efficiency would serve as an example to all.

During the existence of the NTDPC, I have functioned four months at a time during September-December 2010, 2011, 2012 as Professor in Yale University in United States. I was also then appointed as Executive Director in the International Monetary Fund effective November, 2012. During these periods, I have also received significant assistance from colleagues in these institutions. At Yale, I received assistance from Shri. Rahul Ahluwalia and Shri. Ashraf Virk who helped me in preparing a number of the Boxes that appear in Sectoral reports and which have been extracted from the papers submitted to NTDPC as part of the World Bank technical assistance. Ms. Carla Mills provided excellent administrative assistance. My grateful thanks to all of them for being generous with their assistance.

At the IMF, I received assistance from Shri. Ravi Sundararajan in the compilation of the final draft chapters by conducting consistency checks, drafting and introducing uniformity in the formatting of different chapters. It would not have been possible to finish this task without his very efficient assistance.

In addition, my colleagues, Shri. K. V. Eapen, Dr. Janak Raj, Shri. Muneesh Kapur and Dr. Manoj Govil provided excellent support so that I could also discharge my duties as Executive Director effectively, while also providing useful comments on various chapters in this Report. Shri. Davinder Sandhu, formerly of the Prime Minister's Office also provided useful comments. Shri. S. Gopavajhala provided very able administrative assistance all through.

Dr. Krishna Dev has been a Consultant in the NTDPC Secretariat throughout its existence. He has been a pillar of strength in much of the administrative work connected with the Committee and in assisting in the work of the Working Groups, the commissioning of the studies, the monitoring of the World Bank technical assistance and of the final report preparation. He has kept in order all the records of the Committee's work, the papers prepared, the reports prepared and the many versions that each chapter has undergone. He did all these extremely efficiently and quietly with a great degree of sincerity and devotion to work. I owe him a deep debt of gratitude for accomplishing all these tasks very cheerfully, while exhibiting great humility.

Shri B. N. Puri has worked as Member Secretary of the NTDPC from its inception. As Senior Consultant Planning Commission he was instrumental in setting up the Committee including drafting of its TOR. Shri. Puri has been an anchor of Indian transport policy in the Planning Commission for a good por-

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tion of his career. He was associated with the original NTPC in 1980. He has therefore provided the continuity and institutional memory that is so necessary in the compilation of a report like this. The NTDPC has also benefited immensely from his knowledge of all the Ministries associated with transport and personnel at all levels. He has done a truly outstanding job of coordinating all the activities of the NTDPC throughout its existence. He has also shouldered the burden of coordinating the final preparation of all the chapters with a painstaking eye to detail, including cross-checking of all the data that are embodied in the Report. He has done all these in a very patient and quiet manner which is typical of his self-effacing personality. My sincerest appreciation goes to him for taking away much of the worry that would otherwise have fallen on me. The Indian transport sector owes a great deal to his devotion and continuity of work that he has exhibited throughout his career.

This Report has taken an inordinately long time in its preparation, much longer than any of the other Expert Group Reports that I have had the privilege of being associated with. This mainly reflects the enormous complexity of the task that the NTDPC confronted: the development of an integrated view across sectors; adequate in-depth treatment of each sector; the forging of broad agreement on various contentious issues; consultation and coordination with the government departments and ministries; and consultations with state governments. The rapidly changing macroeconomic conditions that have led to a significant economic slowdown in the last couple of years also led to repeated revisions in the macroeconomic modelling framework used to make projections in the Report.

I would like to conclude on a personal note. This is by far the most difficult task that I have undertaken during my relatively long policy advisory career, while simultaneously undertaking teaching and other advisory assignments in India and abroad, culminating in my appointment as Executive Director at the International Monetary Fund. I have been able to do all this because of the understanding displayed and unstinted support provided by all my colleagues in different institutions over all these 3 to 4 years.

Most of all, I am truly indebted to my wife Rasika, and children Tarini and Rasesh, who supported me all throughout and who have been most patient over this whole very difficult period.

It is my earnest hope, along with all my colleagues in the NTDPC, that this Report will generate active discussions leading to substantive change in how transportation policy is approached in India. The focus must be on the facilitation of all our people and businesses for their travel and freight needs.

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1. NTDPC's APPROACH TO TRANSPORT POLICY



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1. NTDPC's APPROACH TO TRANSPORT POLICY

We all use transport in our daily lives. Children travel to school, their parents commute to work and shop for their daily needs; people visit friends, and travel for entertainment purposes, sports and games…There are myriad reasons for travelling both short and long distances, out of necessity as well as for pleasure; for fulfilling personal needs and for business requirements. The transportation of both passengers and goods is thus an intrinsic part of our daily lives.

The production of goods and services needs efficient transport services to take them to where they are needed. Transport connects producers and consumers. Farmers need roads and transport to take their produce to market to serve the country's daily needs. The emerging standard for manufacturing and distribution, with complex supply chains, increasingly requires efficient and responsive logistics systems. Food supply has scaled up and requires timely, predictable freight to avoid wastage. Manufacturing operations are becoming increasingly complex, characterised by specialisation and outsourcing. Their supply chains now look more like networks and may be local, national or global. With transport becoming cheaper, faster and more efficient, it is not unusual for a product to contain components sourced from a multitude of locations spread locally within a country or globally, but subject to 'Just in Time' (JIT) inventory systems. Transport then has to be quick, reliable and predictable. Thus, people's livelihoods depend increasingly on the availability of low-cost and efficient transport, both for convenience in their daily lives and for efficient and competitive production of goods and services. Inadequate transport facilities impinge on higher productivity; higher transport costs increase transaction costs which reduce efficiency and competitiveness, thereby affecting the whole economy.

But we also need to think carefully about how we create the transport system that will best serve India in the coming decades. We need to do it cost-effectively—generating a transport system that is accessible and affordable to all. We must do it with close attention to passengers and shippers' needs. The system must be safe for both passengers and the transport of goods and responsive enough to meet evolving economic and social geography. High cost, inconvenient, unsafe and inadequate provision of transport impinges particularly on opportunities lost for the very large number of poor people, be they labouring in inaccessible farms or living in large cities with poor transport to work and play. Moreover, urban design affects peoples' accessibility to jobs and other needs: large distances generate demand for cheaper travel, which may not be sustainable.

We also must think about how to create an environmentally sustainable transport system, one that delivers mobility and freight movement with the least possible energy use and emissions. Transport currently accounts for 18 per cent of India's commer-

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cial energy use, and 55 per cent of the country's use of petroleum products. Given that 85 per cent of the crude oil refined in India in 2011-12 was imported, the trajectory of the transport sector has serious implications for the nation's energy security. Second, the transport sector is a leading contributor to climate-changing emissions such as CO_2 and dark particulate matter. Transport-related emissions are also a significant contributor to urban air pollution, which in turn affects public health and damages crop yields in downwind areas. Third, the increasing loss of lives and life changing injuries that are occurring in the transport system are unacceptable. The design of a safe transport system is an imperative need for the future.

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

That all modes of the country's transport network are under severe pressure is clearly evident. As the country is poised for significant economic growth in the next two decades, it has become urgent to plan effectively the expansion of the existing network capacity, and the addition of new transport links and corridors. To achieve a significant improvement in productivity and efficiency, while introducing measures that reduce CO_2 emissions and unit costs, it is however imperative that future planning of the network should be aimed at a better integration of the various modes, so as to facilitate the development of multi-modal transport, both within the country and for our export-import trade. This will also call for heavy investments in transport infrastructure; a massive effort at building capacity in the human resources area to raise the level of skills and professional knowledge in the sector; and accelerating reform measures to ease and simplify the regime of taxes, levies and procedures that currently impede the smooth and rapid flow of transport across the country.

The National Transport Development Policy Committee (NTDPC) was constituted by the Government of India in 2010 to formulate a long-term transport policy to address just these issues. Prior to this, the government had carried out two similar exercises. The National Transport Policy Committee submitted its Report in 1980 and the Steering Committee on Perspective Planning for Transport Development in 1988. The latter Report, among other aspects, covered the entire spectrum of newly-emerging technologies for principal transport modes and suggested possible choices in the context of our economic and social milieu.

The present Report is devoted to setting the conditions for a coherent transport strategy for India in the long term: the horizon is 2032, two decades from the beginning of the country's 12th Five Year Plan to the end of its 15th, which shall also bring us to 85 years as an independent nation. Our vision is that a well-developed and competent institutional system for planning, management and execution of transport should be in place by the end of this period, if not earlier, as it blends investment in and delivery of transport services by the public, private and joint sectors alike. The Report abstracts from current methodologies to solve today's problems, while forging a coherent strategy for the transport sector as a whole and for each of the modes of travel.

This Report draws on the considerable work that has been carried out in the infrastructure sector over the past two decades or so, in India and elsewhere. In particular, it may be seen in some ways as a continuation of the thinking embedded in two previous reports connected with infrastructure and transport—*India Infrastructure Report 1996*[1] and *The Indian Railways Report 2001*[2]. This Report represents new thinking on how to look at different transport sectors in an integrated fashion, and suggests mechanisms and measures for carrying this approach forward in a manner that reduces the resource costs involved. It also addresses a number of wider issues that affect all transport modes.

The India Infrastructure Report[3] set the stage for the commercialisation of infrastructure as a whole. It facilitated introduction of the private sector in infrastructure, which had largely been in the public sector prior to the 1990s. The Indian telecom sector is now predominantly private, providing among the cheapest services in the world; considerable private investment has also been made in the production of power; the extent of public private projects in roads in India is on the cutting edge in the world despite the emergence of some problems. Thus, much has changed in infrastructure as a whole since the mid-1990s: it is appropriately seen much more as commercial enterprise than hitherto.

The Indian Railways Report[4] served to focus attention on the need for much greater investment in the railways along with the emerging need for a significant reorganisation. This was seen as necessary to enable Indian Railways to undertake the capacity expansion and modernisation necessary for the rapidly growing Indian economy. It provided the rationale for the need for significant expansion of the railway system and focused on the means of raising adequate resources for the volume of investment projected. Although not much has changed in

1. Mohan (1996).
2. Mohan (2001).
3. Mohan (1996).
4. Mohan (2001).

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the railways over the past decade, there is now much greater debate and increasing focus on the need for reform, reorganisation and expansion. The initiation of the dedicated freight corridors (DFC) is one illustration of some significant change that has indeed been put into motion. The time is now ripe for a very new thrust for undertaking higher and more effective investment in modernising and enhancing the capacity of the Indian Railways system to serve the transportation needs of the country in the future.

NTDPC provides a renewed focus on significantly enhancing the priority that should be attached to the expansion, restructuring and reorganisation of Indian Railways so that its continuing loss in market share can be arrested and even reversed in the larger interest of the country.

Since the mid-1990s, spanning three Five Year Plans, much has changed in the Indian transport sector, but much has also remained the same. We do now have four-lane highways criss-crossing the country; the Golden Quadrilateral is essentially complete; and East-West and North-South highways are well-advanced. The experience of long-distance travel by road for both passengers and freight today is different from what it was in the 1990s and earlier. Civil aviation has been totally transformed with the initiation of a multiplicity of competing airlines and advent of low fares, guaranteed overnight inter-metro air express services, along with availability of frequent flights between the main urban centres.

There isn't however much substantive change in the railways; urban transport remains inadequate, infrequent, unreliable, unpleasant and unsafe; there are indeed new modern container handling private port terminals, and some new private ports in the state sector, but the overall structure has not changed much, and efficiency in the port sector continues to be relatively low compared with ports globally. The institutional structure for provision of transport is about the same. The changes that have occurred, significant as they are in themselves, have been on a piecemeal sporadic basis with little strategic intent.

Meanwhile, the economy has undergone significant transformation with 7-9 per cent growth being experienced over a decade until the recent slowdown. During this period, India ascended from its low income status to a middle income status quite successfully and without experiencing much restructuring pain.

The challenge confronting the country now is to take the next steps to achieving a sustainable middle income status and beyond over the next 20 years. To achieve this, economic growth over the next 20 years has to be at rates that are at least as high as those achieved in the last 20. But our aspirations are and must be even higher. And transport growth and development must be commensurate with this aspiration. We must aim for per capita income to at least

Transport investment is a response to emerging demand, but it is also an economic growth driver in itself. Transport planning and planning therefore must be seen as central to the growth planning process.

double every 10 years so that real per capita income by 2032 is around four times what it is today. That is the example set for us by our Asian neighbours over the last two to four decades, both small and large. It would then reach around US$ 6,000 (at 2012-13 prices): similar to the present per capita income of China, and just above that of Thailand now.

For this to happen, adequate transport provision in terms of quality, quantity and resource-efficiency is essential. If the required transport investment is not made, and in time, to satisfy both the burgeoning passenger and freight demands, the aspirational growth envisaged will simply not be achieved. *Transport investment is a response to emerging demand, but it is also an economic growth driver in itself. Transport planning and provision therefore must be seen as central to the growth planning process.*

Changing demographics and prosperity with growing incomes will increase the demand for transport infrastructure and its services on a continuous basis. Indian manufacturing growth has faltered in recent years. If this is not revived again to attain growth rates significantly higher than overall Gross Domestic Product (GDP) growth, as it was between 2005 and 2010, India's economic transformation to middle income status will be stymied. For Indian manufacturing to grow and be competitive globally, transport costs have to be minimised, both for inland and international transport. East Asian manufacturing capacity has become globally competitive on the basis of efficient transport provision and logistics expertise. Their manufacturing capacity is based largely on the sea coast with easy access to efficient and cheap international shipping. Much of Indian manufacturing is, however, based in inland locations across the country. Thus, our challenges are even greater in ensuring efficient and competitive transport facilities within the country so that manufacturing and other production is connected to ports that are competitive, and shipping that is cost competitive. The goals of inclusive development will be difficult to achieve without necessary spatial diversity and activity dispersion.

The agriculture sector will also undergo very significant transformation over the next two decades, and much of this transformation will be dependent on universal connectivity of all habitations in the country. High food inflation in recent years has resulted, in part, from supply bottlenecks related to fruits, vegetables, poultry, fish, meat, milk products and the like, whose demand will keep increasing

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with higher household incomes. The establishment of efficient supply chains is not feasible without connectivity. This is essential for the spread of income and employment opportunities in rural areas, particularly the less connected ones.

Adequate investment in transport is therefore essential for achieving higher Indian economic growth over the next 20 years and beyond. Hence this Report.

WHAT IS DIFFERENT IN THIS REPORT?

Much of the thinking on transport in India has been project-centric, done within single-mode silos. The focus has been on stepping up investments to address specific problems, usually well after logistic and transport dislocations have begun to appear. Even the Five Year Plans are essentially a collection of projects that are not necessarily connected. The Plans lack an overall coherent strategy to develop transport networks within and across modes designed to leverage transport investments for achieving economic growth. The visions of the National Highway Development Project (NHDP) and the Prime Minister's Gram Sadak Yojana (PMGSY) are exceptions in this regard. By its very nature, transport as a system connects cities, towns and villages within and across countries; and people as consumers and producers to manufacturers, wholesalers and retailers, and vice versa, once again within and across countries. The 'system' is also composed of various elements: the infrastructure itself, the norms for access and use of the infrastructure (which significantly affect infrastructure's capacity to support flows of goods and people), and the vehicles that move on the infrastructure. *So, a key requirement for thinking on transport strategy is that it must be system based*. In other words, it must cut across modes of transport, administrative geographies, and integrate capital investment with regulatory and policy development.

We need to develop human resource capacity and responsive institutions that observe, analyse and act on developments as they occur while remaining embedded within overall strategies that are articulated.

Whereas this Report also addresses sectoral issues in detail, its focus is on cross-cutting themes underlying transport strategy and resulting investment programmes (Chapters 3 and 4, Volume II). *It is less focused on specific solutions than on developing human resource capacity and responsive institutions that observe, analyse and act on developments as they occur while remaining embedded within overall strategies that are articulated* (Chapters 5 and 11, Volume II). We have been dismayed to find a significant lack of expertise within the whole transport system from policy making agencies to executing ones. Hence, the Report provides a sharp focus on research and human resource development in all segments of the transport sector, and overall.

The Report projects India's requirement for transport over the next 20 years to 2032 and what transport investments need to be made on a phased basis to get us there (Chapter 3, Volume II). We are however fully aware that today's projections at some point will indeed be wrong, as conditions change beyond what may be expected or projected today. Transport needs are determined by economic growth as it occurs, by the emerging pace and pattern of urbanisation, by developments in differential sectoral growth, shifts in consumer and producer preferences, and by changes in demographics and technology. But these trends will themselves be impacted by emerging developments in energy availability and prices, and new technologies. So, the economic and regulatory framework underlying transport must be price-responsive. Within a 20-year framework, it is quite possible that radically new transportation technologies may develop or alternative energy sources like solar energy may well become available, cost-competitive and viable. We can recall that there was no internet just 20 years ago; it is now ubiquitous in our daily lives, and has transformed the whole logistics business and other segments of transport services. *Thus, the country must have planning capacity in transport that, on the one hand, develops coherent medium and long-term strategies, but on the other, is also able to respond on an ongoing basis to changes that occur over time.* When significant transport investment has to be made, it must be done with considerable forethought.

Transport infrastructure lasts a long time. For example, the basic Indian Railways network was laid out in the latter part of the 19thcentury. It has determined much of the spatial distribution of economic activities in India over the last 100 or more years. Within cities, the specific layout of suburban rail networks, as in Mumbai, and of underground metro systems in cities such as London, Paris, New York and Tokyo, have determined the spatial pattern of growth and activity of these cities over a long period. On a different plane, large coordinated investments in mega ports and airports in Amsterdam/Rotterdam, Singapore, Dubai, Hong Kong have enabled these countries to become globally competitive despite their small size and lack of domestic resources. Indeed, transport investments have been among the key drivers of economic growth in these countries. Similarly, Japanese investment in the Shinkansen in the 1960s, along with coordinated investment in ports and airports in Tokyo/Yokohoma/Osaka, greatly influenced the concentration of economic activity in this region, and the Japanese economy's rapid growth in the 1960s and 1970s. In the United States, the interstate highway system planned in the late 1950s has

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determined the spatial pattern of the economic activity to a very significant extent.

Technology has always played a crucial role in human affairs. In the transport sector, because of the lumpy nature of the investments, it tends to change in cycles. These used to be long, but in the last 30 years, have grown much shorter. India needs to build this fact into its approach to transport policy.

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

Consistent with this long-term view, in formulating a transport strategy for India, it is also imperative that this be undertaken within the larger context of connectivity within South Asia and between South Asia and South East Asia. NTDPC has taken a conscious view that much greater attention should be paid to the development of these links across our borders (Chapter 13, Volume II). This focus has been absent in the formulation of national transport strategy so far.

As political and diplomatic conditions improve in the region, consideration will need to be given to promote connectivity of countries with one another through a dense web of transport links, encompassing road, rail, waterways, and air. A corollary to this is the need to develop modern, efficient and convenient cross-border transport linkages, in particular, by rail and road. Many of our border areas have been left deliberately underdeveloped because of an outdated notion of security which looks upon borders as walls separating India from a hostile neighbourhood, rather than as connectors bringing peoples and economies together. Transport linkages across our border regions must be developed in tandem with 'backward linkages', i.e., links with the Indian heartland. If the latter fall behind the former, there is a danger of further alienating our border regions and the people inhabiting them. *Consequently, NTDPC has further focused specially on the transport needs of the North East Region (NER) which has otherwise suffered from relative transport isolation within the region itself, connectivity with the rest of India and cross-border with all the countries surrounding the North East* (Chapter 6, Volume III). The route dispersal guidelines formulated by the Ministry of Civil Aviation to promote viable air services to remote areas such as the North East, the Andaman Islands, Lakshadweep and Ladakh, have not met their objectives, while the mechanism of cross-subsidisation with passenger air fares has only created undesirable market distortions. NTDPC has made a recommendation on an alternative model of direct subsidy with viability gap funding, which can be managed, as required, to meet national strategic objectives.

Many of our border areas have been left deliberately underdeveloped because of an outdated notion of security that looks at borders as walls separating India from a hostile neighbour rather than connectors bringing peoples and economies together.

NTDPC's view on focusing on international connectivity is similar to that adopted within Europe to facilitate achievement of the common market, and in South East Asia for similar proportion of trade within that region. Equal emphasis has to be given to the development of physical networks as to the soft institutional mechanisms necessary for seamless transfer of goods and services across borders. The current lack of intra-regional trade within South Asia and between South Asia to South East Asia stands out, making South Asia the least integrated region in the world. This must be corrected through the development of transport linkages in all modes.

This NTDPC vision is also consistent with that taken by the Government of India as articulated in its Look East Policy. The government has taken various initiatives to forge closer and deeper economic integration with Eastern and South Eastern neighbours so that trade with these countries can increase at a rate consistent with the expected growth of the East and South East Asia region as a whole.

THE GROWTH CHALLENGE

This Report builds on the macroeconomic growth framework pioneered in the *India Infrastructure Report 1996*[5]. Building on the very significant growth departure of the Indian economy recorded since the turn of 1980s and accelerated in the 2000s, overall economic growth projected over the next 20 years is to rise from the expected 7 per cent in the 12th Plan to 9 per cent per annum in subsequent periods until 2032. Whereas such growth projections were regarded as reasonable until just two years ago, the significant downturn in 2012-14 has raised scepticism regarding the reality of projections at this level. Whereas we have indeed tempered growth expectations during

5. Mohan (1996).

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the 12th Five Year Plan period until 2016-17, we believe that there is little reason to doubt the feasibility of achieving the kind of growth projected for the next 20 years, reflecting the record of the last 30 years, and particularly that of the last 10. The achievement of such growth will indeed need very significant policy reform in a range of activities. That such reform has been carried out on a relatively continuous basis since the early 1980s, intensifying in the 1990s and accentuated in the infrastructure sector since the mid-1990s, gives us confidence in the potential ability of the country's policy making system to rise to the challenges of the future. In principle, therefore, Indian institutional capacity for governance and reform has exhibited considerable resilience. Thus, we should not let the current climate of scepticism cloud our vision for the long-term future. We have therefore retained high growth projections between 8.5 to 9 per cent during the 13th, 14th and 15th Five Year Plans covering the period 2017-32 (Chapter 3, Volume II). As this Report emphasises, however, the institutional development and reform needed to get to the next steps in the ladder towards achieving middle income status will be of a much higher order than that achieved in the past.

Total investment in transport was about 2.6 per cent of of GDP during the 11th Five Year Plan. This needs to rise to about 3.3 per cent in the 12th Plan, and then stabilise at about 3.7 per cent during the rest of the period till 2032.

The basic macroeconomic reason for this optimism is maintenance of the relatively high levels of gross domestic savings which had reached almost 37 per cent of GDP in 2007-08. Despite the slowdown in economic growth, gross domestic savings have remained in excess of 30 per cent, while suffering a decline particularly in public sector and household financial savings. Just as India was able to achieve a correction in public sector savings from negative levels in 2000-01 to significantly positive ones from 2003-04, one can be optimistic about a similar turnaround over the next few years with the exercise of appropriate fiscal responsibility, and restraint in yielding to pressures promoting the subsidy culture, particularly in the provision of infrastructure services. In principle therefore, resource availability, both domestic and international, for maintaining the kind of high growth envisaged should not be a constraint.

INVESTMENT REQUIREMENTS

To achieve the kind of growth as projected over the next 20 years, the overall required investment rate would need to increase gradually to around 40 per cent from the current 35 per cent of GDP over the period. The key ingredient for achieving such growth would be restoration of industrial growth to 10 per cent plus over the next three to four Five Year Plans. There is a symbiotic relationship between efficient transport provision and industrial growth. Thus, the high growth projected will not be possible without enhanced infrastructure spending, and the enhanced infrastructure spending will be infructuous if manufacturing growth does not accelerate significantly.

Our macroeconomic exercise suggests that it is feasible for total investments in infrastructure to increase from the 11th Plan average of about 5.8 per cent of GDP to 6.9 per cent in the 12th Plan and then to around 8 per cent in the subsequent Plan periods upto 2031-32 (on national accounts basis)[6]. In absolute terms, this implies that the annual level of investment in infrastructure would need to increase from the current Rs 6 trillion ($100 billion) to about Rs 30 trillion ($570 billion) by 2032 at constant 2012-13 prices. Total infrastructure investment is projected to rise from about Rs 25 trillion ($ 425 billion) in the 11th Plan to Rs 40 trillion ($ 745 billion) in the 12th Plan and further to Rs 70 trillion ($1.25 trillion), Rs 100 trillion ($1.9 trillion) and Rs 155 trillion ($2.9 trillion) in the 13th, 14thand 15th Plans respectively (all at 2012-13 prices).

Of this, about 75-85 per cent of total infrastructure investment would have to be domestically financed, while the rest of about 15-25 per cent could come from external sources, assuming that 30-40 per cent of total capital inflows go into the financing of infrastructure.

Total investment in transport, both public and private, was of the order of about 2.6 per cent on average during the 11th Five Year Plan. NTDPC projects that to achieve the kind of growth envisaged overall, this investment in transport would need to increase to about 3.3 per cent of GDP in the 12th Plan, and then stabilise at about 3.7 per cent of GDP during the rest of the period until 2032[7].

In absolute terms, this implies an increase in total transport investment from about Rs 10.4 trillion ($190 billion) in the 11th Plan to about Rs 19 trillion ($350 billion) in the 12th Plan and Rs 30, 45 and 70 trillion ($ 575, 850 and 1300 billion) respectively in the 13th, 14th and 15th Plans. In this scenario, both public and private sector investment in transport will need to increase as a proportion of GDP. It is estimated that public sector investment in transport was about 1.8 per cent of GDP in the 11th Plan. This is projected to increase to 2.0 per cent in the 12th Plan and then remain stable at 2.1 to 2.2 per cent till the 15th Plan. We are projecting a somewhat higher pace of increase in private sector investment from less than 1 per cent of GDP in the 11th Plan period to about 1.3 per cent in the 12th Plan and around 1.5 to 1.6 per cent of GDP

6. About 1-1.5 per cent of GDP can be added to make these projections comparable to the Planning Commission definitions of infrastructure investments.
7. Here again, about 0.5-0.7 per cent of GDP can be added to be comparable with Planning Commission investment concepts.

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in the following Plan periods until 2032. In absolute terms, this implies very significant increases in private investment in transport. In terms of feasibility of such projections, this would imply that about 5-7 per cent of the total flow of resources to the organised private sector should be utilised for transport investment.

About 75-85 per cent of total infrastructure investment would have to be domestically financed, and the rest from external sources, assuming that 30-40 per cent of total capital inflows go into financing of infrastructure.

These are clearly very large numbers, even if we look at the more immediate future of the next 5-10 years. Broadly speaking, a major step up in transport investment is required in the current 12th Plan and further in the 13th Plan ending in 2022, in both the public and private sectors. The expectations from the private sector are ambitious, perhaps without equal in the rest of the world. If they do not fructify, the government needs to put contingency plans in place, so that public sector resource mobilisation and execution can substitute for any shortfalls in private sector investment. In any case, as indicated, public sector investment itself has to increase significantly and there can be no expectation of its reductions in transport. In general, it is much easier for the private sector to invest in rolling stock. Private investment in fixed infrastructure is more difficult to organise.

The increase in public sector investment is primarily due to the increased investment proposed in the railways. Overall, a greater effort will need to be made to strengthen and commercialise all public sector entities that invest and manage public sector transport infrastructure at both the central and state levels. The railways in particular will need very significant organisational and accounting reform (Chapter 1, Volume III) if the kind of capacity and quality expansion envisaged is to be achieved. *NTDPC* is proposing a *significant increase in investment in railways from about 0.4 per cent of GDP over the last two decades to around 0.8 per cent in the 12th Plan and then rising to around to 1.1 to 1.2 per cent of GDP in the subsequent three Plan periods. The investment should primarily be on productive capacity enhancement of the system. This would then bring investment in railways at par with that in roads and bridges which increased from about 0.4 per cent of GDP in 2000-01 to about 1.2 per cent by 2011-12. This is manifested on the ground by the progress achieved in the National Highway Development Project (NHDP) and the Pradhan Mantri Gram Sadak Yojana (PMGSY).*

The much enhanced level of investment in roads over the past decade or so relative to previous periods demonstrates that it is possible to achieve such an enhancement in a short period of time. *NTDPC is of the view that it is now time to shift this focus to the railways.*

Where will all these resources come from? In public sector investment, we have projected that 70 per cent of total public sector transport investment may be expected to come from the Budget, with the remaining 30 per cent coming from Internal and Extra Budgetary Resources (IEBR). As for the 1.3 to 1.6 per cent of GDP expected to be invested by the private sector in transport over the next 20 years, up to about a third could come from foreign sources. Whereas foreign equity financing of private sector transport investment could possibly be comparable to that of the domestic private sector, domestic debt financing will have to be significantly higher than foreign debt financing, if private investment in transport is to be sustainable. This is reasonable since most cash flows in the domestic transport sector are in domestic currency, although in sectors such as ports and airports, foreign borrowings are naturally hedged. What these projections illustrate is that if we account for the sustainability of the Indian balance of payments over the long term, the extent of external borrowing for the transport sector would be somewhat limited to about 0.25 to 0.30 per cent of GDP overall, leaving the rest of debt required to be raised in domestic markets. It is therefore of utmost importance that much greater efforts are made to invigorate the pension and insurance sectors for greater domestic long-term savings to flow into these funds which would then be the natural source for funding transport and other infrastructure investment. It is these contractual savings that are made for the long term and are hence particularly suited for investment in transport infrastructure assets, that can then provide stable returns on a sustained long-term basis.

The generation of this level of funds from both domestic and foreign sources for both the public and private sectors in transport will be dependent on the economic sustainability of such investments. This requires the levy of user charges, levies and cesses, as appropriate, in all segments of the transport sector, so that its economic viability is seen as feasible and stable. *NTDPC therefore believes that economic pricing and adequate regulation are essential for sustainability of the transport system and hence for attracting the kind of resources that are needed for transport investment.*

These projections were made top down in a macroeconomic modelling framework. NTDPC also made bottom-up estimates for investment requirements in each of the sectoral transport sectors. One of the interesting findings of NTDPC is that the bottom-up aggregate and sectoral estimates provided by the respective Working Groups for the later two Plan periods (2022-32) turn out to be lower than the macroeconomic-consistent model projections of availability of resource flows for transport infrastructure. This is unusual since unconstrained bottom-up

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projections are usually far in excess of what is feasible. What these projections suggest is that we can be more ambitious in our transport planning in the 13th Plan and beyond. This outcome suggests that the many proposals in this Report that relate to:

- capacity development
- safety enhancement in all sectors
- use of information technology
- environmental projection through more stringent fuel standards, etc
- universal connectivity of all habitations through PMGSY
- connectivity with and within the North East; and
- international connectivity

have high probability of being financed. Furthermore, beyond the 13th Plan, we can also be more ambitious in implementing full connectivity with all-weather roads of all habitations in the country, and enhancement of their quality. More ambitious projects such as high-speed rail transport and mass rapid transit systems could also be examined more realistically for their economic viability and resource intensity in the period beyond the 2020s.

The given land resources of the country have to meet myriad requirements of its large population. The ever-increasing economic activities are putting great pressure on this scarce resource. Hence, there is an imperative need to have a closer look at the requirements of land for transport projects. Besides, it is equally essential to develop common user facilities at the terminals. In this scenario, it would be prudent to find strategies that minimise the time lag in acquiring land for such projects.

All projections suggest that overall economic growth could be stymied if appropriate strategic choices are not made now to facilitate significant capacity expansion of the Indian railway network.

TRENDS IN TRANSPORT DEVELOPMENT

At present, India's transport networks are severely capacity constrained. During the last six decades, growth in total freight traffic has been broadly consistent with that of GDP, while that in passenger traffic has been much greater. It is now expected that with increasing complexity in the economy, rising incomes and hence greater demand for goods, both food and non-food, the elasticity of freight traffic may well be higher over the next couple of decades. On this basis, NTDPC has projected that freight traffic may increase from around 2,000 billion net tonne kms (BTKM) in 2011-12 to between 10,500 to 13,000 BTKM by 2032, an increase by a factor of about 5-6 BTKM. The increase in total passenger traffic would be much higher and may well increase by a factor of about 15 over this period. There has been a veritable explosion in air traffic over the past 20 years: domestic passenger traffic increased from about 7.5 million in 1990-91 to about 60 million in 2011-12. These trends suggest that it will be much in excess of 400 million by 2031-32; and international passenger traffic may grow from around 40 million now to over 200 million over the same period. These numbers provide an idea of the key growth challenges facing investment in transport (Chapter 2, Volume II and Chapter 3, Volume III).

A significant feature of developments in the Indian transport network has been the relative decline of railways and corresponding increase in that of roads for both passenger and freight transport. The share of railways in freight traffic fell from about 90 per cent in 1950-51 to about 40 per cent by the end of 1990s and further to just over 30 per cent by 2011-12. The fall in passenger transport was even greater with the railways share falling from about 70 per cent in 1950-51 to about 15 per cent in 1999-2000 and only about 10 per cent by 2011-12. With the kind of growth envisaged in both the economy and the consequent growth in transport, such a pattern of mode share in transport sector is not sustainable. Loss in the share of railways is a global phenomenon, but the decline in India is somewhat steeper than in other large economies. In view of the expected uncertainties related to the availability of future crude oil supplies, the attendant adverse implications for energy prices and the damaging environmental impact of fossil fuels, it is essential that an attempt be made to reverse this trend or at a minimum to arrest it. *This requires making strategic decisions in terms of the relative allocation of resources between rail and road, accompanying pricing and taxation policies and legal changes, which can then be used to nudge transport demand toward desired modal shares.*

The key issue therefore facing the country is the desired strategy for capacity expansion for the railways over the next 20 years. All projections for the growth in demand for both freight and long distance passenger services suggest that overall economic growth could be stymied if appropriate strategic choices are not made now to facilitate significant capacity expansion of the railways, as has been done in China over the past decade or so. Such an expansion would not take place in a business as usual scenario. *As indicated there would have to be significant allocation of public resources for investment in the railways which, however, will be difficult to implement without corresponding investment in capacity building and significant reorganisation of the railways system as a whole* (Chapter 1, Volume III).

Thus, a vision similar to that of NHDP should be laid down for the railways now, so that we may expect a much expanded and transformed railway network

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by 2032. If this is not done, the progressive achievement of NHDP itself will only accelerate the loss in the railways transport share, leading to overall economic inefficiency and a pattern of energy usage that could lead to greater pollution and environmental degradation.

Better understanding of relative energy usages and life-cycle energy costs of different transport modes would be very helpful in such decision making. This Report has made a beginning in this area (Chapter 7, Volume II). Urban transport faces a similar challenge arising from the increasing use of personalised motorised vehicles, lack of efficient public transport systems, and inadequate facilities that discourage walking and cycling.

India has experienced relatively higher rates of growth in its trade since the early 1990s. Going forward, the Government envisages an increase in India's share of world trade from the current 0.8 per cent to 1.5 per cent over the next 20 years. Such high growth in trade needs corresponding investment in ports in a timely manner. At present, there is no comprehensive and coherent strategy for the location of ports in the country or indeed for the overall investment programme of these ports, that is in its turn, linked with the corresponding investments in roads, railways, logistics and coastal shipping. Our specialised work on the transportation of energy commodities has also highlighted the need for such a strategic programme for port investment. Each of the world's major economies has a few mega ports which are then well-connected with the inland transport system through road, rail, inland waterways and coastal shipping. At present, India has no mega port comparable to the size of such ports in other countries. Consequently, at present, a good proportion of India's maritime trade is transhipped in Colombo or Singapore. *NTDPC is therefore recommending the establishment of four to six mega ports over the next 20 years with two to three on each coast.* The location of these ports would need harmonisation with plans for NHDP on the one hand and the Dedicated Freight Corridor (DFC) system being currently planned for the railways on the other so that there is efficient connectivity (Chapter 8, Volume II and Chapter 4, Volume III).

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.

As such a strategic review is taken for investment in ports; NTDPC also recommends the adoption of the concept of landlord ports and corporatisation of the existing Port Trusts. This model can then transform the Port Trusts to statutory landlord port authorities through specific legislation, while the terminal

Four to six Mega Ports should be established over the next 20 years, with two or three on each coast. These Mega Ports could be built by transforming some of the existing ports, if feasible, or by setting up totally new ports.

operations of the 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. Such significant organisational, legislative and regulatory reforms would be necessary if we decide to set up mega ports as recommended, and if Indian trade is to be facilitated on an integrated logistical framework connected adequately with the hinterland road and rail infrastructure (Chapter 4, Volume III).

The civil aviation sector has already witnessed a major transformation over the past 20 years, and particularly over the last 10. The growth envisaged over the next 20 years will be an order of magnitude higher in terms of absolute growth. It is expected that more than 1,000 aircraft will have to be added to the current stock of domestic aircraft. A comparable increase will take place in international airline aircraft serving Indian airports. Total passenger throughput is currently around 150 million: this is expected to increase to over 1.1 billion by 2031-32. We therefore need a coherent strategy that recognises the intermodal linkages required along with the physical expansion of aircraft, airports, air traffic control systems. This challenge also needs to be turned into opportunity: the development of airport hubs, international competitive airlines, facilities for maintenance, repair and overhaul, and even aircraft manufacturing. NTDPC recommends that a holistic view be taken of this growth opportunity through a modernised regulatory framework that encourages such capacity enhancement (Chapter 3, Volume III).

To ensure that the creation of new capacity is dovetailed into the overall framework of a multi-modal transport network for the country, it is recommended that a National Master Plan for airport development over a 20-30-year timeframe is drawn up; and an Airport Approvals Commission is established within the Ministry of Civil Aviation, to review and clear the plans on an ongoing basis. A crucial component of airport development is to ensure the provision of adequate infrastructure to process the country's air exports and imports. This can be created rapidly and cost-effectively by the development of off-airport processing facilities, similar to inland ports and container depots, to supplement the expansion of on-airport cargo terminals, and will require the Customs to adopt a more liberal approach to recognising and manning such facilities (Chapter 3, Volume III).

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India needs an efficient network with interchange points that receive short-haul smaller cargo for aggregation, provides longer-haul rail transport to ports and industries and the like, and vice versa.

The Report emphasises that India must adopt a holistic approach in designing integrated transport networks. One of the weaknesses of the planning of transport infrastructure has been the mismatch at the interfaces of the various modes. For example, India needs an efficient network with interchange points that receive short-haul smaller cargo volumes from roads from the hinterland for aggregation, and then provides longer-haul rail transport of vehicle loads forward to ports, industries, and the like, and vice versa from ports/industries to rural/urban centres through disaggregation. Similarly, while the size of the container ships has substantially increased, the corresponding facilities for evacuation of the containers from the ports have not kept pace. Special attention also needs to be given to the development of coastal shipping and inland water transportation, which are also characterised by low energy intensity. It is, therefore, essential to plan in an integrated manner across the entire movement chain. To achieve this, we need governance structures and an organisational culture that supports transport networks with seamless inter-modal and hierarchical connectivity and skilled human resources to innovate, develop and manage such structures (Chapter 4, Volume II).

THE GOVERNANCE AND INSTITUTIONAL CHALLENGE

INSTITUTIONAL DEVELOPMENT FOR TRANSPORT GOVERNANCE

The current approach to transport planning is essentially piecemeal. Given the availability of overall transport projections as we have made, both in the macroeconomic context and in terms of transport demand expectation, a more integrated approach is desirable. The desired end state is an overlay of transportation networks allowing for efficient transport of passengers on the one hand, and of each commodity type on the other, as well as natural interchange points where networks intersect and where large quantities are broken down into smaller volumes for last mile transportation into urban centres. A vastly superior logistics infrastructure is thus essential to achieve such a transportation system. We need a modal mix that will make feasible an efficient, sustainable, economical, safe, reliable, environmentally friendly and regionally balanced transportation system.

Choices should be made between the priorities to be placed on different investments. Given the scenario of significantly expanding magnitudes in terms of transport demands across all categories, it will be crucial to influence the development of the transport network so that there is optimal movement of passengers and of freight by matching cargo category with transportation mode. This implies some judgement on the normative modal shares that are desired for rail, road, air, shipping and inland waterways traffic which we have attempted to some extent.

At present, this prioritisation and decision making is disjointed. For example, decisions on investments on highways and expressways on the one hand and potential DFCs and even possible high-speed trains are made in isolation of each other. Similarly, investments in ports are also not coordinated as closely as they should be with other investments in the overall transport network and developments in the overall economy. This is illustrated in great detail in the work that NTDPC has conducted in the transportation of energy commodities (Chapter 8, Volume II). As demonstrated there, the requirements of energy supplies, consistent with the overall economic growth envisaged, implies a corresponding growth in the demand for coal and hence of its transportation from domestic mines and increasingly from international sources over the next couple of decades. To ensure adequate energy supply over the next two decades, it is therefore essential to undertake corresponding investments in adequate port capacity, in the laying of pipelines, and in rail infrastructure that connect the sources of energy supplies to the points of consumption and power production across the country. At present, this is done on a piecemeal basis.

The main reasons for this state of affairs is that the institutional framework for formulation of transport policy, planning and coordination in India is very weak. We do not have any single agency at either the central or state levels for coordination of policy formulation for the transport sector as a whole. In fact, the constitution of NTDPC itself reflects the lack of such an agency to devise overall transport policy strategies. In the absence of such arrangements, the responsibility of investment coordination rests with the Planning Commission. In addition, the Planning Commission is also expected to coordinate policy formulation for the transport sector as a whole, along with all the other areas of economic policy. Given the increasing complexity of the economy, and in the transport sector itself, the Planning Commission, as constituted at present, simply does not have the technical capacity to accomplish this task in a competent manner.

It might have been expected that the individual transport ministries themselves would have such technical capacity to aid the Planning Commission,

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which could then perform the function of integrating the ideas and strategies put forward by the different transport related Ministries. In fact, the individual ministries themselves are bereft of technical capacity to perform this function. Moreover, there is no continuity in the leadership, which could otherwise enable them to take longer term views. By way of illustration, we may note that during the existence of NTDPC of about three and a half years, there have been at least three Secretaries to the Government in each of these ministries and in some cases four. Given the current Indian administrative governance system, senior officials, while being competent administrators, do not in general possess domain knowledge of the ministries to which they are appointed. They are essentially birds of passage. This is not to decry the individual abilities and qualities of any of the administrators in the system, but is much more a reflection of systemic flaws in the administrative governance of transport infrastructure in India, along with other economic areas. With such an administrative system, where there is no continuity or domain knowledge in the ministerial or bureaucratic leadership of key transport and related ministries, there can be little expectation of the emergence of organised and integrated thinking for long-term transport strategy and investment. This has to be corrected.

NTDPC therefore believes that it is of the utmost necessity to develop suitable institutional entities at both central and state levels, which are endowed with adequate expertise to perform such coordination on a continuous basis. Such coordinating entities can then take into account logistic and inter-modal issues that are now essential for formulating and implementing coordinated transport planning and policy (Chapter 5, Volume II).

India faces three main institutional challenges in developing the governance infrastructure to support a transport system that will meet its needs over the coming decades. First, India will have to shed the old version of directive planning to move to a new skill of facilitation, recognising that capital investment in transport infrastructure and regulation or policy are instruments to affect the transport system rather than decrees that determine its final shape. Ultimately, mobility for passengers and services for freight are the products of individual responses to existing infrastructure, policy structures and pricing. Similarly, the transport system is one of many contributors to an emerging economic and social geography that is also the product of millions of households' and businesses' decisions about investment, living, travel, investment and consumption. It is coordination of policy, regulation and fiscal arrangements that influence costing, pricing and supply of transport services made in response to emerging demands. We have consequently provided some pointers to the kind of overall approach required for regulation on the one hand, and fiscal structures that affect transportation on the other (Chapters 6 and 9, Volume II).

Transport governance in India is far more centralised than international practice. The changes that we are recommending are to re-align transport governance with the principles of subsidiarity in federal design.

Second, progress has to be made in setting up institutional structures that integrate decision making across agencies that have historically focused on particular modes of transport and between elements of the system. Policies concerning physical infrastructure, its use, and investment in rolling stock have historically been undertaken in different parts of the federal system and agencies within each level of government. India's fragmentation of transport investment planning between modes of transport stands out in comparative context: *it is the only country among the 100 largest economies in the world that continues to maintain separate ministries for each mode of transport.* This fragmentation is deeply rooted in the Indian system and will be difficult to overcome. But NTDPC believes that the process has to be initiated to overcome these constraints and to ensure better governance in transport (Chapter 5, Volume II).

'Integration' does not mean centralised decision-making, but rather setting up of systems for information flow, knowledge generation, and continuous, interactive, dialogue between relevant organisations throughout the project cycle. NTDPC emphatically argues for a move towards decentralised coordination, enabled by information flow among agencies with clear responsibilities, and which moreover have adequate financial and human resources to carry out their mandates. NTDPC accordingly has provided a series of recommendations on how to strengthen capacity in the transport sector in all the sectors and at all levels of both government and executing agencies.

Third, India will have to reconsider the division of authority between levels of government. Transport governance in India is far more centralised than international practice, in part because of constitutional divisions of authority between levels of government; because of the power that fiscal centralisation awards to the Union government; and because of the allocation of and adaptation to scarce technical capacity that is currently available. The changes that NTDPC has recommended are to re-align transport governance with the principles of subsidiarity in federal design.

What are we then proposing for the institutional development in the transport sector?

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The increased participation of the private sector in the provision of both transport infrastructure facilities and services accentuates the role of regulation through appropriate institutions and frameworks.

First, *NTDPC proposes the immediate formation of a high level Office of Transport Strategy (OTS).* The OTS must have the resources to build a strong technical team, aggregate, manage and analyse transport data, and be able to assert itself as a compelling advocate of policies that leverage transport for development goals. The proposed OTS should be set up as an independent agency associated with the Planning Commission (possibly along the lines of the Independent Evaluation Office set up recently). The OTS mandate would be to build on the work of the NTDPC by providing ongoing technical support for sectoral investment programmes as they are accepted, evaluating alternatives for institutional reforms, setting up new entities as proposals are accepted, and updating the Committee's analysis in coming years. Strategic transport planning is not a one-time exercise, particularly in times of economic and political uncertainty. As a technical agency, it would effectively complete the triad of capabilities required for transport strategy: generation of sound policy options (OTS), review of consistency with social goals (government), and implementation (existing ministries and later the departments of the proposed Ministry of Transport). It would leave existing agencies to pursue their current mandates, but within a clearer strategic framework. An institutional structure will have to be developed so that the proposed OTS does not work in isolation, but has organic and continuous links with the implementing ministries/departments and the Planning Commission. It must also be given adequate powers so that its recommendations are implemented.

The OTS should be visibly technocratic. Its policy advisory functions should be backed by significant in-house expertise as well as research generated by centres of excellence and other transport research institutions recommended by the NTDPC (Chapter 11, Volume II). In order to emphasise the kind of agency that is being envisaged, it may be noted that a comparable institution, the Directorate General for Mobility and Transport in the European Commission has more than 2,000 professional staff; the unified US Department of Transportation has as many as 60,000 professional staff. We are clearly not proposing an agency of such size: this is only to make the point that an effective OTS for a country of the size, diversity and complexity of India requires very substantive technical capacity for transport oversight and generation of transport strategy on a continuous basis.

NTDPC also recommends that, given the federal nature of the country, it would be necessary also to set up state level Offices of Transport Strategy which have functions similar to the central OTS, and which would then have an on-going relationship with the central OTS. *Furthermore, the recommended Metropolitan Urban Transport Authorities (MUTA) should also perform OTS type functions at the city level.*

NTDPC recommends that consideration be given immediately to the actions that will be required to set up the national OTS within the 12th Plan period.

Second, after considerable discussion, NTDPC suggests the formation of a unified Ministry of Transport encompassing all transport sectors, as is the practice in all other large countries. We understand that this will not be easy, but it must be done in the medium to longer term. The current collection of ministries would then be subsumed within this unified Transport Ministry. The new unified Ministry of Transport must be carefully structured to create and maintain an incentive structure that encourages technical excellence, open-minded consideration of all available options, and consistent attention to transport system goals rather than particular means. The existing ministries should become departments focused on delivering effective transport infrastructure and services for each mode. Every country in the world and all of India's perceived peers, including China, have moved in this direction. Whereas it has often been observed that the Railways Ministry has been kept separate from the unified Transport Ministry, it is observed in recent times that the integration of railways into the larger Transport Ministry also takes place at a subsequent stage. That is usually coincident with the separation of railways operations into a corporatised entity somewhat removed from general government. Similar unification of transport functions can also take place at the state level.

REGULATION

The key new governance issue that has arisen in the last decade or two in the infrastructure sector as a whole, and correspondingly in transportation, is the increased participation of the private sector in the provision of both transport infrastructure facilities and services. This development accentuates the role of effective regulation through appropriate regulatory institutions and frameworks (Chapter 6, Volume II). Transport infrastructure facilities such as rights of way, railway track, airports, ports and roads involve heavy upfront investment and display significant economies of scale, and hence display monopolistic tendencies. Service provision (conveyance of passengers and freight in every mode) varies from being monopolistic, such as in the railways, to almost fully competitive such as in trucking and many inter-city bus services.

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Transport services have long been the domain of the public sector in view of the public good characteristics of many segments of these services. Some services may be seen as 'open access services' such as most inter-city and urban roads, apart from limited access highways: it is difficult, if not impossible, to exclude people from such infrastructure facilities or to charge for using them, and nor is it desirable. They thus have public good characteristics. In effect, tax revenues collected from the citizens effectively entitle people to expect the provision of a minimum level of transport infrastructure on a free and open access basis. It is, however, possible to exclude people from most other transport services and hence to charge them for their usage in trains, buses, trucks, airlines and shipping for both passengers and freight. With technological change, it is possible to charge them without exclusion, even for open access services, for example, through fuel cesses or electronic charging. Thus, many parts of transport infrastructure and services are now often classified as private goods that can be made subject to user charges that are based on economic costs. Levy of the fuel cess on diesel and petrol is one example of almost perfect user charge for the use of roads and infrastructure even when there is open access: the consumption of fuel by a vehicle is directly proportional to its weight and the distance travelled by it.

Nonetheless, the transport sector is replete with examples of limited competition, market failure and monopolistic elements that then require economic regulation: most cities have just one airport; the number of ports in any region is limited; it is difficult to construct a limited access highway between two nodes; and it is unusual to have more than one railway track between two cities. Thus, whereas there could be adequate competition between service providers, if permitted, such as buses, trains, airlines and shipping, it is unlikely that there can be competition between transport infrastructure facilities. Furthermore, while it is possible to charge and even exclude people from various transport services, there is also need to ensure universal access to transport. Charging for every transport service should not mean that the poor are excluded from the transport service that they need.

NTDPC believes that there is demonstrable need for regulation of various parts of the transport network: to limit potential monopolistic power exercised by owners of networks through regulated pricing; to manage congestion and air pollution and also to enforce safety regulations. In brief, regulation is needed both to manage the consequences of negative externalities and also to achieve positive externalities through enhanced safety and inducing network effects. One of the main goals of regulation is to induce firms to produce the service at the lowest possible costs, to align prices with costs so that affordable accessibility is ensured to the users of transport services, while monopolistic providers are restrained from making supernormal profits. This has become much more important with the growing use of public-private partnership (PPP) contracts in transport and introduction of the private sector transport in general. New problems have also arisen in the enforcement of PPP contracts, since such contracts are of typically very long duration and economic conditions may well change over the period of the contract. It is also necessary to ensure that there is adequate competition in the bidding for such contracts since once the contract is awarded, the concessionaire effectively becomes a monopoly provider. All of these new developments in transport necessitate enhanced quality of governance and regulation.

Regulation is needed both to manage the consequences of negative externalities and also achieve positive externalities inducing network effects. A key goal is to induce firms to produce the service at the lowest possible costs, to ensure affordability of access.

Designing good regulatory institutions is complex since it is important to ensure that there is adequate technical expertise in the exercise of regulation that is seen to be both competent and fair. Furthermore, attributes such as independence, transparency, accountability, legitimacy and credibility are also essential as we establish these regulatory institutions. Besides, safety and social regulations to reduce health and environmental impacts are also necessary to be integrated in the overall regulatory approach. Since private investors are confronted with considerable uncertainty and risk in making investments in transport facilities, which provide them returns over the long term, it is essential that regulatory frameworks provide them with stable conditions and a predictable environment that enables them to make credible commitments. Independence implies shielding regulatory agencies from political pressure to the extent possible. Whereas it is appropriate for a government to issue broad policy guidelines and directives, the regulatory agency should be given functional autonomy in its day-to-day activities. The credibility of the regulator also implies that it needs to follow a transparent consultative process in decision making which is seen as fair and representative of the different, often competing, interests in the relevant sector. It is also useful to provide financial autonomy to the regulator to ensure its independence. So far, the government has not seen it fit to provide financial autonomy to most of the regulatory institutions that have been set up. They are generally supported by budgetary allocations through their respective administrative ministries, which can have adverse consequences for the exercise of functional autonomy. It will be desir-

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able to find appropriate procedures that can indeed enable regulators in the transport sector to be financially autonomous.

The current proposal in the aviation sector to replace the Directorate-General of Civil Aviation with a Civil Aviation Authority (along the lines of the UK CAA) responsible for the operational regulation of airlines, with separate specialist divisions (covering air-worthiness, licensing, air-space management, etc.) is a step in this direction as it separates the regulatory function into an autonomous body, leaving the Ministry of Civil Aviation to focus on policy and establishing a more conducive environment, where the Government progressively withdraws from operations and encourages the states and the private sector to play a more active role in the development of the sector (Chapter 3, Volume III).

The multiplicity of state level transport-related taxes needs to be simplified and rationalised through a mechanism akin to that used to transform the complex state-level sales taxes to the state VAT system.

As regulators have spread across infrastructure sectors, some questions have arisen regarding the overall institutional design for regulation: should regulation and dispute resolution institutions be created for each sector and sub-sector, or should certain functions be consolidated across sectors? The alternative to sector-specific regulation is the single umbrella transport regulator with specialised departments. After considerable discussion and thought, NTDPC has opted to continue with the current approach of setting up separate regulators for each sector. The argument is essentially that in the current stage of development, it is necessary for the regulator to develop sector-specific technical, economic and legal expertise in an environment which is still developing and changing rapidly. However, as we move towards a unified Transport Ministry as NTDPC has proposed, it may also become feasible at a later stage to combine the various sector-specific transport regulators into an overall unified transport regulator as well.

As the transport sector develops and exhibits greater competition in different sectors, through both greater private participation and technology changes, the role of the transport regulator in price regulation often reduces. This has been observed in the telecom sector where the Telecom Regulatory Authority of India (TRAI) initially focused on tariff regulation, but increasing competition made pricing relatively free. Similar developments could take place in the operations of the Tariff Authority for Major Ports (TAMP) as there is increasing competition between port terminals. Thus, as transport development takes place, the burden on sector-specific transport regulators could indeed reduce thereby making the possibility of a unified transport regulator more realistic.

As in other aspects of governance, NTDPC emphasises the need for adequate development of technical competence in all the regulatory institutions so that their decision making processes and outcomes are protected from undesirable politicisation. The experience so far has been mixed. It is important that the leadership of regulatory institutions be seen as knowledgeable and competent so that their decisions are respected and hence implemented. There has been a tendency to staff the leadership of these organisations with superannuating civil servants who may not necessarily possess adequate domain knowledge: this must be corrected.

FISCAL ISSUES

The key issue in transport governance that has not been analysed adequately, and which is linked to both government and its regulatory institutions, is the impact of the many fiscal levies on both the supply of and demand for transport services. *We have documented the very wide proliferation and complexity of fiscal levies affecting transport both at the central and state levels* (Chapter 9, Volume II). The distinction between some tax levies (such as fuel cess) and user charges is often not clear cut. Given this complexity, it is difficult to analyse the differential fiscal incidence on different modes.

We have, for example, argued for the use of tax levies and charges (e.g., for parking) for urban transport demand management to discourage the use of personalised motorised transport usage in large cities, while also using this mechanism for funding urban transport investment (Chapter 5, Volume III). As argued in that chapter, the levy of such charges would need the cooperation of central/state and metropolitan authorities, including the proposed MUTAs. NTDPC has therefore proposed that *the multiplicity of state level taxes be simplified and rationalised through a mechanism akin to that used for transforming the complex state-level sales taxes to the simplified state VAT system, which is now moving towards a comprehensive Goods and Services Tax (GST).*

As this is done, among the tasks that the proposed OTS can do is to keep track of the various taxes and user charges levied and collected by different levels of government, and other user charges regulated by the various regulators. In principle, the combined public and private revenue collected from both providers and users of transport services should collectively finance the provision of these services in the system. Thus, there is a close link between the fiscal system as it affects transport services and the user

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charge regime, including cesses, as it affects investment in transport infrastructure facilities, the service providers and the ultimate users of the services.

NTDPC therefore views the governance system, the regulatory system and the fiscal framework as components of the overall transport system. Successful operation of this system requires the combined efforts of all the stakeholders to be participants through organised methodologies of mutual consultation.

SAFETY

The existing rates of fatalities and the rate of increase in accidents in transportation in India are both unacceptably high. More than 150,000 people died in transportation-related accidents in 2011 in India or more than 450 a day, the vast majority of them in road accidents. It is estimated that, in addition to the deaths, at least 1,500 persons were probably disabled, 7,000 hospitalised and more than 40,000 sustained minor injuries every day in traffic-related accidents. The cost of road traffic crashes alone may be about 3 per cent of the GDP. With continuing growth in traffic in all modes, particularly on roads, and with increasing speeds, the graph of traffic accidents is inching up inexorably. The situation is therefore quite serious and unless policies and evidence-based counter measures are put in place urgently, the situation is likely to worsen (Chapter 12, Volume II).

There is little expertise, data or information available in India to address the transport safety problem in a scientific manner. The international professional consensus is that it is not very productive to focus on human error alone. Since each accident is a result of a combination of human, vehicular and environmental factors, a sophisticated systems approach is a must in addressing transport safety issues. This approach has not been internalised yet by any official organisation or institution dealing with safety in India. The predominant approach is still based on principles of finding fault with the individuals concerned and then acting accordingly.

Business as usual with regard to safety in transport cannot be tolerated any longer. It is imperative that we give much more importance to transportation safety in India, and this will only happen if the whole system is improved and strengthened on an urgent basis. Significant reduction in accident rates has been seen in all modes of transport in developed countries since the 1960s and 1970s. The reduction has not been due to any single factor, but due to a systemic approach resulting in a wide variety of improvements in designing the vehicles, operating environment infrastructure and enforcement of safety regulation and standards. Thus, it is indeed possible to arrest the continuing increase in accident rates in India, and then to reverse the current

There is little expertise, data or information available in India to address the transport safety problem in a scientific manner. A sophisticated systems approach is a must, and this has not been internalised at all.

trend. The entire traffic and transport system must be designed to account for the limitation in capabilities of users and operators. The requirements of a safe systems approach are:

- an institutional structure that creates a demand for scientific work in safety issues;
- legislation and regulation to promote safety;
- monitoring and measurement (generation of national databases);
- assuring and improving the quality of safety services provided through professionals, individual institutions and the use of specific technology and devices.

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

In the aviation sector, the best practice in this regard is exemplified by the fully autonomous Accident Investigation and Safety Boards in Australia and the UK, where this is an absolute separation from the regulatory agency, the Boards are staffed by acknowledged professional specialists and there is a statutory requirement to publish every report, so that preventive measures can be quickly fed back into the safety regulatory regime. The decision of the Ministry of Civil Aviation to set up such a body in India sets a worthwhile precedent for the other sectors to follow.

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

Accordingly, NTDPC proposes that action should be initiated forthwith to establish National Safety Boards

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Capacity building in transportation is an urgent necessity. One per cent of investment in each sector should be earmarked for institution and capacity building in transport, in both the public and private sectors.

for road, railways, water/marine and air. These boards must be independent of the respective operational agencies; they should be headed by professionals at the highest levels and these boards should have adequate funding. The recommendations contained in the Report of the Sundar Committee on Roads and the Kakodkar Committee on Railways provide excellent guidelines for formulating the terms of reference for these boards. Furthermore, safety departments need to be set up within operating agencies at different levels for ensuring dayto-day compliance with safety standards, study effectiveness of the existing policies and standards, conducting safety audits, collecting relevant data, etc. The national safety agencies in each of the transport departments should also help in establishing multi-disciplinary safety research centres in independent academic and research institutions, and ensure adequate funding to achieve critical size and adequate levels of expertise.

As institutional development takes places in the area of safety in transportation, we can expect that safety concerns will get embedded in the design of both transport infrastructure facilities like roads, railway track, airports, ports and the like, as well as in the design of all vehicles. It is only if such motivated action is taken on an urgent basis that there can be any chance of reversing the current high growth in transportation accidents resulting in fatalities and severe injuries. This would constitute an important departure for the planning process since this issue has so far not been addressed in an organised manner. The task will be difficult in India in view of the extremely high growth that is expected in all sectors of transport.

NTDPC attaches the highest importance to this matter since it concerns the life and death of many of our citizens on a daily basis.

RESEARCH AND HUMAN RESOURCE DEVELOPMENT

This Report is distinguished by its emphasis on institution building for managing India's burgeoning transportation requirements over the next couple of decades and beyond. Consequently, future transport planning, policy making, regulation, execution, implementation and maintenance of transport systems will require a greatly enhanced number of transport professionals, researchers and educators to run the system. The kind of agencies suggested, the OTS at both the central and state levels, the MUTA at the city level, the various regulators, and the safety boards, will not be possible to set up unless there is an adequate supply of technocratic expertise at every level. At present, the country simply does not have even a fraction of the number of professionals required. Furthermore, the kind of capacity expansion proposed for each of the transport sectors—railways, roads, civil aviation, ports, urban transport and inland waterways—will also require very significant enhancement in the availability of high-quality engineers and associated personnel at all levels. In addition, the new concerns regarding energy and environmental sustainability will need to be integrated in our planning and execution activities, along with much greater concentration on safety issues.

India fares poorly in terms of knowledge output in the transport sector, in comparison with our peers such as China and Brazil. We do not have any institutes within government departments and operating agencies, university centres or stand alone institutions in any areas of transportation that compare favourably with such institutes in our peer countries. The few centres that exist are sub-critical in terms of resources expertise and size. We simply do not have appreciation of the size and sophistication of technical institutions that we need. This must change.

Thus, capacity building in transportation is a key necessity for urgent action so that we enhance the probability of successfully facing the emerging challenges in transport investment and operation over the next couple of decades. Capacity building comprises various challenges: building systems in research and development to update and upgrade capacity on a continuous basis; ensuring production of transport professionals in every sector; and consistent retraining and upgrading of existing personnel.

NTDPC has therefore recommended very significant institution building for transport research, development, education and training in all areas of transport activity (Chapter 11, Volume II). The effort necessary for setting up the structures of the institutions envisioned for the next two decades will be very substantial. The potential availability of adequate resources should not be an issue for this purpose. In comparison with the estimated magnitude of funds required for transport investment for the next 20 years, the resource needs for capacity building are relatively small. *NTDPC suggests that 1 per cent of investment in each sector be earmarked for institution building and capacity building in transport in both the public and private sectors. It is proposed that the Planning Commission may take up the various capacity building proposals made by NTDPC in mission mode and allocate enough resources for*

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this activity on urgent basis, within the period of the 12th Plan.

Accordingly, we have proposed a range of institutions to be set up for research and human resource development in the transport sector, each of substantial size: a standalone Indian Institute of Transport Research (IITR) is proposed which could be supplemented with various regional centres; centres of excellence in selected universities and engineering institutions; research institutions in each transport sector; and corresponding institutions at the state level. In addition to the standalone IITR, NTDPC has also proposed establishment of substantive research organisations in each of the transport sectors, railways, roads, civil aviation, ports and urban transport.

Correspondingly, NTDPC also recommends the setting up of an Indian Institute for Transportation Statistics (IITS) which should be responsible for coordinating and generating, where necessary, all the data required for the kind of transport strategy and planning that has been recommended in this report. IITS would be responsible for acquiring, preserving, managing, disseminating transport data, conducting statistical analysis and associated information for use by central, state and city transportation departments. The various research institutions proposed by the NTDPC would also need statistical support from such an institution.

One way of bringing about consistent technical upgradation of roads across the country is through the development of technical standards related to the quality of road surface, signage, pavement (sidewalks), and all other aspects of road design. Each level of road within the designated road hierarchy would then be uniform across the country, both for inter city roads and for urban roads. NTDPC therefore recommends the setting up of a high-quality roads standards institute which can then help in bringing up Indian roads to international-level quality (Chapter 2, Volume III).

Adequate financial and technical resources must be provided so that each of the institutions is of critical size and has the potential to develop expertise over the next 10 years. These institutions will require qualified professionals to staff them. Thus, there is need for adequate expansion of education in all transport related scientific and engineering disciplines across the country.

If we start such institution building, it will take 10 years or more to achieve significant results. Meanwhile, we must initiate a comprehensive programme for upgrading the technical quality and competence of existing personnel at all levels in the country. This must be done through a focused and sustained programme that covers all operating departments, institutions, corporations at both the central and state

While we build the necessary institutions, we must initiate a comprehensive programme for upgrading technical quality and competence of existing personnel in the transport sector at all levels in the country.

levels. The aim should be to sponsor 2-5 per cent of the staff in all such organisations for full-time education to the Masters level every year for the next 5-10 years. The organisations to be covered should include all the transport-related engineering organisations in the central government, state governments, public- and private-sector companies, and at the city level. *Once again, NTDPC recommends that this programme be initiated at both national and state levels within the 12th Plan period.*

Many will criticise NTDPC for the range and size of institutions recommended in this Report as being too large, too idealistic and unrealistic. In fact, the number, size and type of institutions being recommended is based on international comparisons, focusing on large countries with comparable levels of development. International experience suggests that it takes more than a decade to build viable quality institutions. We have had demonstrated successes in the past in the building of high quality technical institutions such as Indian Institute of Science (IISc), the Indian Institutes of Technology (IITs), Indian Space Research Organisation (ISRO), the National Aeronautical Laboratory (NAL), the Bhabha Atomic Research Centre (BARC) and others. *The vision that the NTDPC has offered for capacity building in the transport sector is therefore feasible to be achieved once we make up our minds and decide that such action is necessary to build an efficient, competitive, affordable and sustainable transport sector that is essential for the country's development in the future.* Moreover, if India is to emerge as a global power over time, it needs to invest significantly in human resource institutes to develop much greater soft power than at present.

THE ENERGY AND TECHNOLOGY CHALLENGE

A common theme running through this NTDPC Report is the need for upgrading Indian transport facilities in all their aspects and for modernisation across the board. Much of rolling stock in the Indian Railways is obsolete including both passenger coaches and freight wagons. As the volume of freight increases, and inter-modal transfers become the norm rather than the exception, rolling stock of freight will have to undergo a very significant transformation towards specialised wagons for specialised needs. It will be necessary to enable fast loading from ships as well as from domestic sources; simi-

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larly, container handling from ship to train and from train to truck will need to be made efficient at container freight stations. In the case of passenger rail coaches, as average speed increases with the transfer of freight trains to DFCs, the quality of passenger coaches will also need to be upgraded to increase passenger comfort. From the environmental point of view, the open toilet provision in Indian passenger trains is a disaster and a major health hazard[8]. Thus, a significant need is also for modernisation of toilets and other facilities on Indian trains. Existing open toilets also result in corrosion of coaches and tracks as well as resultant high costs in ensuring hygiene and cleanliness.

In urban transport, there is a great need for better technology for traffic management, for transport demand management, for encouraging public transport and non-motorised transport. Similarly, the improvement in the quality of buses for both energy efficiency and passenger comfort is necessary to wean away passengers from individual owned transport vehicles to public transport.

From the point of view of economy in energy usage, there is a clear and demonstrated need to reverse the increasing mode share of road transport in the country for both passengers and freight.

In the case of roads, there is very little standardisation in the quality of roads, road signs and other road furniture across the country. Each of these requires the development of technical standards and their enforcement (Chapter 2, Volume III). NTDPC has accordingly emphasised the development of technology institutions across the board and training to address these and other problems related to the modernisation of transport in India.

This also includes the increasing use of information and communication technology (ICT) to integrate the different transport systems to reduce energy use and to improve customer satisfaction. Most of the technologies that can be used in all these areas are available off-the-shelf in the world. India is therefore in the fortunate situation that it can indeed pick and choose the technologies that are suitable for usage in India, given its income levels, climate and other economic conditions (Volume II, Chapter 10). The challenge facing us is to make intelligent choices which are commensurate with our needs, income levels and availability of resources at different times. Our challenges also are complicated by the expectation of consistently high growth which results in constantly changing income levels, demand patterns and increasing availability of resources.

We have documented that with the projected overall economic growth in the country over the next 20 years, it is quite likely that much higher magnitudes of resources will be available for investment in transport from around the early 2020s and beyond. Thus, some technologies that may not be appropriate to adopt today might indeed become feasible from the resource point of view 10 or more years from now.

The world is awash with new ideas in transportation such as driverless cars, electric cars, high-speed trains, monorails, information technology-based charging systems, increasingly sophisticated emissions control systems, and the like. What is important is that we develop mechanisms to make technology choices in an economic manner that is consistent with our current economic conditions and which are adapted to the fast growing changes that we expect in the economy in the coming years. At the same time, where economically feasible, we should not be afraid to also leapfrog technologies so that we use the best in class available globally. To do all this, we need professional competence and an institutional framework that is capable of making such choices on a continuous basis. Hence, in this area also, NTDPC, while providing some focused recommendations that can be adopted readily, has once again emphasised the development of institutions in the area of information and other technologies also. Modernisation needs to be done across the board and in a manner that it serves the needs of all travellers on an inclusive basis.

Energy usage in transportation has been growing at rates corresponding to the growth in transportation itself. With the expectation of continuing high economic growth, along with that in transportation, we can expect similar growth in the use of energy in the business as usual framework. The uncertainties in energy supply, particularly petroleum products in the coming years and decades poses particular challenges for India since much of its petroleum is imported. The increasing share of road transport in both passenger and freight has further accentuated the increasing dependence of India on petroleum and petroleum products. Furthermore, concerns connected with climate change have brought additional focus to these problems as the economy grows and demand for energy increases, including that used in transport. As cities grow, and the number of large cities increases, the pollution concerns relating to emissions from vehicles also assume greater importance in relation to the serious adverse effects on health that is now clearly documented. Attacking these problems needs to be done on an integrated basis using all the various means available.

8. The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 has been passed by the Parliament and came into force on 6 December 2013. The Act prohibits manual scavenging and envisages provision of new cleaning devices and protective gears for existing water flush toilets in railway coaches.

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First, there is a clear demonstrated need from the point of view of economy in energy usage and associated positive results on climate change, to arrest and then reverse the increasing mode share of road transport in the country for both passengers and freight. The movement of bulk and over-dimensioned cargo should be considered for transportation through inland waterways and coastal shipping wherever possible. The advantages of this mode in terms of lower emissions and fuel consumption, even when compared with railways, should be fully harnessed. Similarly, within cities, while there will be an inexorable increase in ownership of private motorised vehicles, everything needs to be done to encourage the use of public transport and the use of facilities for non-motorised transport like walking and cycling. Nearly 98 per cent of energy needs of transportation are met through petroleum products, and almost half of the total consumption of petroleum products in India is on account of transport activities. Second, observing the improvement in air quality in many of the cities in developed countries, it is clear that technologies are available for reducing emissions made by motorised transport of every description. Tightening, and more importantly, enforcing vehicle emissions standards will drive further innovation in emissions control and even development of new industries, as it has in other settings around the world. Third, new technologies are also becoming available including information and communication technology for facilitating more efficient use of energy through greater integration of transport modes and logistics efficiency in freight transport. NTDPC has examined these issues in some detail and made appropriate recommendations across the Report. (Chapters 4, 7, 10, Volume II and Chapter 5, Volume III).

With the increase in personal motorised vehicles, and also the expansion of public transport vehicles, the air quality in most cities from middle sized cities to the larger cities has been deteriorating over time in India. One estimate suggests that around 150,000 people died in India in 2005 as a result of ambient fine particulate matter. This number has most likely increased since. In 2002, the WHO calculated a respiratory disease mortality rate of 58 persons per 100,000 in India. This rate is now likely to be much in excess of 100 persons per 100,000. A substantial portion of CO_2 emissions in India are released by the transport sector. In a business as usual scenario, overall transport CO_2 emissions could increase four fold over the next 20 years. Because of the prevailing low income levels, many people walk or use bicycles for their daily travel needs in Indian cities. It is essential that facilities are put in place, through regulations and standards, to make these modes pleasant for all, including the physically challenged, so that these modal shares are, at a minimum, retained over time. This will do much to contain the continuing increase in vehicular pollution. Thus, India requires a combination of measures for urban planning, transport infrastructure development and stringent enforcement of emissions control to reduce fuel consumption and emissions.

We recommend that an auto fuel policy committee should be formed every five years on a regular basis so that we may ensure the air quality for our citizens on a much more firm basis in the years to come.

We can observe that there has been considerable improvement in urban air quality in advanced countries such as the United States, Europe, Japan and South Korea over the last couple of decades. The days of consistent smog in large cities such as London, New York, Tokyo and others are gone. It is seldom that air quality in these cities now falls to levels that were seen on a regular basis in the 1950s and 1960s. It is therefore clear that it is possible to use technology to improve air quality even in the presence of rising vehicle ownership and use. The latest emission control technologies that are already available will have to be taken advantage of to leapfrog to tighter emission standards and reduce fuel consumption.

Vehicle emission standards have been tightened successively in India since the 1980s, both through new legislation and progressively through regulations concerned with vehicular emission. Similarly, fuel quality standards have also been tightened over time, but they remain well behind international best practices. Whereas the maximum sulphur content of 10 ppm in gasoline has already been mandated in Europe and Japan more than five years ago, the standard in India remains at 150 ppm countrywide and 50 ppm in selected cities. The diesel sulphur content remains higher than the gasoline sulphur content in most of the country and well behind international best practices.

The technology for improving fuel quality across the board is readily available and so is that for improving emission standards in vehicles. There is of a course a cost associated with enforcing such standards. Thus, compliance with such standards will take time and adequate resources should be made available for the purpose. *The NTDPC has provided its recommendations for reaching European fuel quality standards and emission standards by 2020* (Chapter 7, Volume II). At present, auto fuel policy committees are formed on a sporadic basis involving considerable delays in mandating newer standards.

NTDPC recommends that an auto fuel policy committee should be formed every five years on a regular basis so that we may ensure the air quality for our citizens on a much more firm basis in the years to come. The responsibility for fuel quality and emission stand-

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ards is currently spread across different Ministries such as the Ministry of Petroleum and Natural Gas, the Ministry of Heavy Industries, the Ministry of Urban Development, the Ministry of Road Transport and Highways and state governments. Whereas the relevant responsibilities will remain dependent on the Allocation of Business Rules across Ministries, *NTDPC recommends the formation of the National Automobile Pollution and Fuel Authority (NAPFA) to assume responsibility on institutional basis for setting and enforcing vehicle emission and fuel quality standards in India.* This is a reiteration of the recommendation made in 2003 by the Mashelkar Auto Fuel Policy Committee.

Through the use of Big Data, computing and analytics that match supply and demand for various services, information technology can help in more efficient energy usage, enhancing sustainability.

What is also necessary is a National In-use Vehicle Testing programme to be established to ensure safety, road worthiness and emission performance of end use vehicles, covering all motor vehicle categories. A model Inspection and Certification (I&C) regime needs to be established in a phased manner through the establishment of a dense network of modern I&C centres, along with corresponding investments in the police force and Regional Transport Offices. This will require allocation of appropriate resources through state governments. Given the environmental challenge, these initiatives need to be taken up on an urgent basis in the interest of ensuring better health for all our citizens.

To examine the differential environmental costs related to different modes, we also commissioned a special study on the Life Cycle Analysis of transport modes. In general, environmental impact assessment exercises carried out to support decision making in the transport sector do not consider the full life cycle energy and CO_2 impact of transport modes but instead focus on the tail pipe impact only. It is however necessary that a more integrated approach is adopted while analysing impact. This is because different transport modes involve varying degrees of construction and maintenance activities. While some modes may be highly material- and energy-intensive, others may be comparatively less energy-intensive. Material and energy consumption at various stages of a transport project, i.e., construction, operation and maintenance, need to be examined in order to fully understand their impact on environment. Such an approach would help identify the stages of a transport system that has maximum impact and would also therefore enable identification of appropriate mitigation strategies. It is found for example that metro rail projects for urban areas have the highest environmental costs of all alternatives at the construction stage, but such high capacity public transportation systems do exhibit the least observed carbon emissions because they generate no emission at the tail pipe. A life cycle analysis evaluation however indicates that a metro system generates more CO_2 on a life cycle basis, compared to say, a bus traffic transport system which can also be high capacity. Introducing life cycle impact situations can therefore bring more detailed understanding of the overall impact of system or proposed infrastructure project and therefore help decision makers to make informed choices based on the economic, social and environmental goals set by the national, state or city governments (Chapter 7, Volume II). The establishment of the OTS proposed by the NTDPC and other transport research organisations can be expected to develop such analytical methodologies for making the choices that the country will be confronted with on a continuous basis in the years to come.

INFORMATION AND COMMUNICATION TECHNOLOGY

The increasing use of information and communication technology (ICT) in transportation systems has been transforming the organisation and management of transportation services and the quality of the interface between users and providers. The use of ICT can help in integrating different transport systems with other systems resulting in reduced energy use and increased customer satisfaction. Through the use of Big Data, computing and analytics that match supply of and demand for various services, utilities, ICT can help in more efficient use of energy, thus enhancing the sustainability of transport and other infrastructure (Chapter 10, Volume II). The increasing use of logistics systems in freight transportation has been almost entirely due to the availability of ICT over the last 20 years or so. The seamless transfer of both passengers and goods across modes can be made possible through the use of ICT. The introduction of smart cards, for example, can allow for paying for the usage of different modes by consumers in an integrated fashion without having to buy tickets from different transport service providers. Similarly, from the supply side, such systems integration can take place across service providers so that consumers are better able to plan journeys across different modes and different providers in a seamless fashion. This can be particularly useful in urban transport systems where it is not unusual for people to use buses, trams, taxis or trains for the same journey on a daily basis. Similarly, ICT can also enable more efficient and connected scheduling between different modes so that consumers do not have to wait while using different modes in the same journey.

Issuance of e-tickets by airlines has greatly facilitated the planning of journeys by travellers across the

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world through the use of laptops or other Information Technology (IT) devices from the convenience of homes. A whole industry of travel websites has arisen wherein one can book airlines, car rentals, hotel and the use of other services on a very convenient basis. Within India, e-ticketing by the Indian Railways has transformed the rail booking procedure from having to wait in long lines for physical booking at railway stations to the convenience of making reservations from within one's home. State road transport organisations and private bus companies have also begun to issue e-tickets. What has not happened is the possibility of integrating these different ticket issuing agencies through a single website or the integration of multi-modal journeys through the issuance of a single ticket.

On the freight side, global logistic providers such as Fedex, UPS, DHL have transformed the freight business beyond recognition over the last two decades. Through the extensive use of ICT, they have greatly simplified the procedure that needs to be complied with by the despatcher of goods and that by the receiver, both within and across countries. Such logistics providers undertake to find the most efficient transportation route within or across modes and within or across countries, including customs procedures, etc. Prior to such integration the freight industry was characterised by high degrees of fragmentation that involved a number of intermediaries such as transportation companies themselves, freight forwarders, customs clearing agents, and others, each of which had to be arranged by the despatcher on the one hand and the receiver on the other. The consolidation provided now by logistics companies could not have taken place without the increasing use of ICT.

With the expected expansion of trade that has been projected within our macroeconomic modelling framework, cargo traffic can be expected to increase at both Indian ports and airports. Many of our ports are already stretched to capacity with capacity utilisation already close to 100 per cent or higher. Low productivity, congestion and delays are often the norm at some of our ports. Whereas there is no doubt that it is essential to undertake investment in capacity expansion as proposed by NTDPC, greater use of ICT can certainly help productivity and efficiency at ports. Trade facilitation through ICT can be greatly enhanced to reduce transaction costs involved in the movement of goods through our ports and airports and made more efficient in terms of the time taken for customs processes and otherwise.

In the road sector, with the increasing use of tolled highways, many delays are being experienced by both passengers and freight transport, who have to negotiate their way through different toll gates across the country. Once again, as recommended by the Nandan Nilekani report[10], the use of ICT can facilitate the use of smart cards and electronic toll collection so that passengers and freight can move seamlessly across the country through different jurisdictions and different toll roads without high-cost delays at toll gates.

Smart cards and electronic toll collection can make sure that both passengers and freight can move seamlessly across India through different jurisdictions and different toll roads without high-cost delays at toll gates.

In urban transport, apart from the use of cross-modal smart cards, ICT has already been used in different cities such as Singapore and London, among others, to introduce congestion pricing, to reduce the number of cars in the city and to encourage the people to use public transportation. The NTDPC approach to urban transport exhibits a similar orientation. The NTDPC, through its Report, emphasises greater coordination between modes for both passengers and freight transport; the increased use of ICT can indeed facilitate this.

This merely provides some examples for the use of ICT in transportation in the future. Many of these technologies are available elsewhere and some of which are already in use in India and others are in the process of being introduced in different places. Here also, what is needed is considerable capacity building of both professionals and institutions. *We have identified different initiatives in each of the sectoral chapters and also in Chapter 10, Volume II (on Potential of Information and Communication Technology to Enhance Transport Efficiency) which are designed to enhance efficiency, utilisation and safety of the transport systems.*

All such initiatives will require a strong institutional foundation for development and implementation. The key functional areas of focus include setting standards for technology in transportation and of processes which facilitate implementation of these technologies; the initiation of training and research and development so that available technologies can be adapted and standardised for use in India; provision of policy advice for government and providers of transport services; and the provision of consulting in project management services for implementation of ICT in different areas. As the prospect of use of information technology in banking began to manifest itself in India in the mid to late 1990s, the RBI set up the Institute for Development and Research in Banking Technology (IDRBT) in Hyderabad for the purpose of research and development as well as consultancy in the application of technology to the banking and financial sector of the country. The IDRBT has been instrumental in setting the relevant IT and communication standards and

10. Nilekani (2011).

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protocols in banking and across the financial sector in India, which enables those financial institutions to communicate with each other. IDRBT also does research and runs academic programmes for Masters and Doctorate degrees. *In an analogous fashion, NTDPC recommends the establishment of the Indian Institute of Information Technology in Transportation (IIITT).* Its function would be similar to RITA (Research in Technology Administration) which coordinates the US Department of Transportation Research programmes. The IIITT would develop the overall ICT framework in the Indian transport sector and coordinate with other proposed central-level and state-level institutions as necessary. It would also collaborate with international institutions to develop new technologies, adapt available technologies for deployment in India and facilitate research, development and training for ICT for transport professionals. The successful application of ICT in each of the different segments of transportation will need adequate institutional development at all levels, details of which have been outlined in the relevant chapters in this Report.

TRANSPORTATION OF ENERGY COMMODITIES

We need very significant and integrated planning of key transport corridors and execution on a timely basis so that the potential and prospects of Indian economic growth are not jeopardised.

Considerable stress has been laid in this Report on the growth in use of energy in transport over the coming years and its impact on the environment and on climate change. The NTDPC has also focused specifically on the impact of overall energy growth and its production on the transport system in the future (Chapter 8, Volume II). As is well known, the growth in demand for energy is essentially similar to that of overall economic growth. Thus, if the Indian economy grows by a factor of 4 over the next 20 years, the required production of energy will also have to increase by a similar proportion, in order to meet the increasing demand. Similarly, growth in the production of key commodities like steel will also be comparable or higher. Such growth will imply corresponding growth in the transportation of bulk commodities such as coal, iron ore and steel.

Coal already accounts for almost half the freight volume in Indian Railways and some of the current problems afflicting the power industry include the lack of adequate capacity in crucial links and corridors for the supply of coal to power stations consistent with the increase in power generation. The future poses profound challenges. Given the composition of energy resources in the country, coal is expected to remain the dominant fuel for the power sector, despite the various apprehensions that are being expressed globally on the environmental impact of coal use in energy projects. According to NTDPC projections, the production of domestic coal is expected to increase by about 2.5 times over the next two decades. At the same time, it is expected that imports will have to grow much faster by around five times over the same period. The intensity of steel use in the economy is expected to possibly go up by a factor of 8 resulting in a corresponding growth in the transport of raw materials, particularly iron ore for the production of steel. Similarly, the usage of Petroleum, Oils and Lubricants (POL) and natural gas will also grow by large volumes much of which will continue to be imported, but these, of course, will be carried out through pipelines and would not expected to have a significant impact on over-the-ground transport infrastructure.

These very large increases in the transport requirement of bulk commodities poses a great challenge because our transport system is barely able to cope with the traffic today: the trunk railway network is heavily congested; almost all the major rail routes over which coal and iron ore will be transported are operating at over 100 per cent capacity. The capacity utilisation of ports also averages over 85 per cent with some even over 100 per cent. International norms recommend capacity utilisation in ports below 70 per cent to avoid delays.

In recognition of these challenges facing the Indian economy and its transport system in particular, NTDPC emphasises the need for very significant and integrated planning of key transport corridors over the next 20 years and execution on a timely basis so that the potential and prospects of Indian economic growth are not jeopardised. The approach taken by NTDPC suggests the addition of appropriate port capacity for enabling integration for better investment in associated transport links along with similar coordination of links with the domestic sources of coal.

NTDPC conducted an elaborate technical exercise to make detailed projections of the optimal transport network that would enable efficient transport of domestic and imported coal to the expected location of power plants. As may be appreciated, many different solutions are possible for such an exercise. It is therefore necessary to build up institutional capacity that can enable adequate planning for these very segments of Indian transport systems, particularly railways, over the next 20 years. Once again, NTDPC recommends that the proposed OTS should be adequately equipped to carry out such exercise.

The result of our own work suggests that the key requirement is to concentrate investment in the railways for the transport of bulk commodities first on the feeder routes from the coal and iron ore mines located mostly in the tri-state area of Chhattisgarh,

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Odisha and Jharkhand for connecting them with the trunk routes. Second, among the DFCs, the highest priority may be given to the completion of the Eastern Freight Corridor. Third, adequate attention to be given to promoting coastal shipping from the coal producing areas on the eastern coast to avoid long over-the-land transportation of coal. Fourth, consistent with the NTDPC recommendation in the ports sector for the establishment of 4-6 mega ports, the increased imports of both petroleum and coal would suggest that the selection of sites for these mega ports should be significantly influenced by the transportation needs of these commodities. This is because mega ports provide very significant economies of scale which can dramatically reduce turnaround time. The need for mega ports is dictated by the fact that at present India is not able to receive large tankers and other cargo and container ships because of inadequate depth available even in its largest ports. The dredging and other engineering works required for creating the depth necessary is very resource intensive. Hence the need for investing in only select locations for mega ports.

As indicated, the planning for the transport of energy commodities which is essential for ensuring the projected high economic growth for the country requires considerable technical analysis and expertise. Furthermore, investment decisions will typically involve difficult choices involving trade-offs between different alternatives. The current system of decision making in different transport sectors such as railways, roads, ports, pipelines, coastal shipping on a segmented basis will not be adequate for the needs of the coming decades.

There has been an enormous increase in the movement of goods produced and distributed in the country. This has led to a growing need for transporting ever-increasing quantities and volumes. This explosion in scale has brought to the fore the critical importance of developing modern terminals—mineral depots, freight centres, dry ports, inland container depots, logistics parks, freight villages, industrial sidings, etc. Indeed, in many ways, the capacity on the transport columns is determined by the efficiency of these terminals.

The transport requirements of bulk commodities poses a great challenge. All major coal and iron ore train routes are operating at over 100 per cent capacity. Capacity utilisation of ports averages over 85 per cent.

SUMMARY

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

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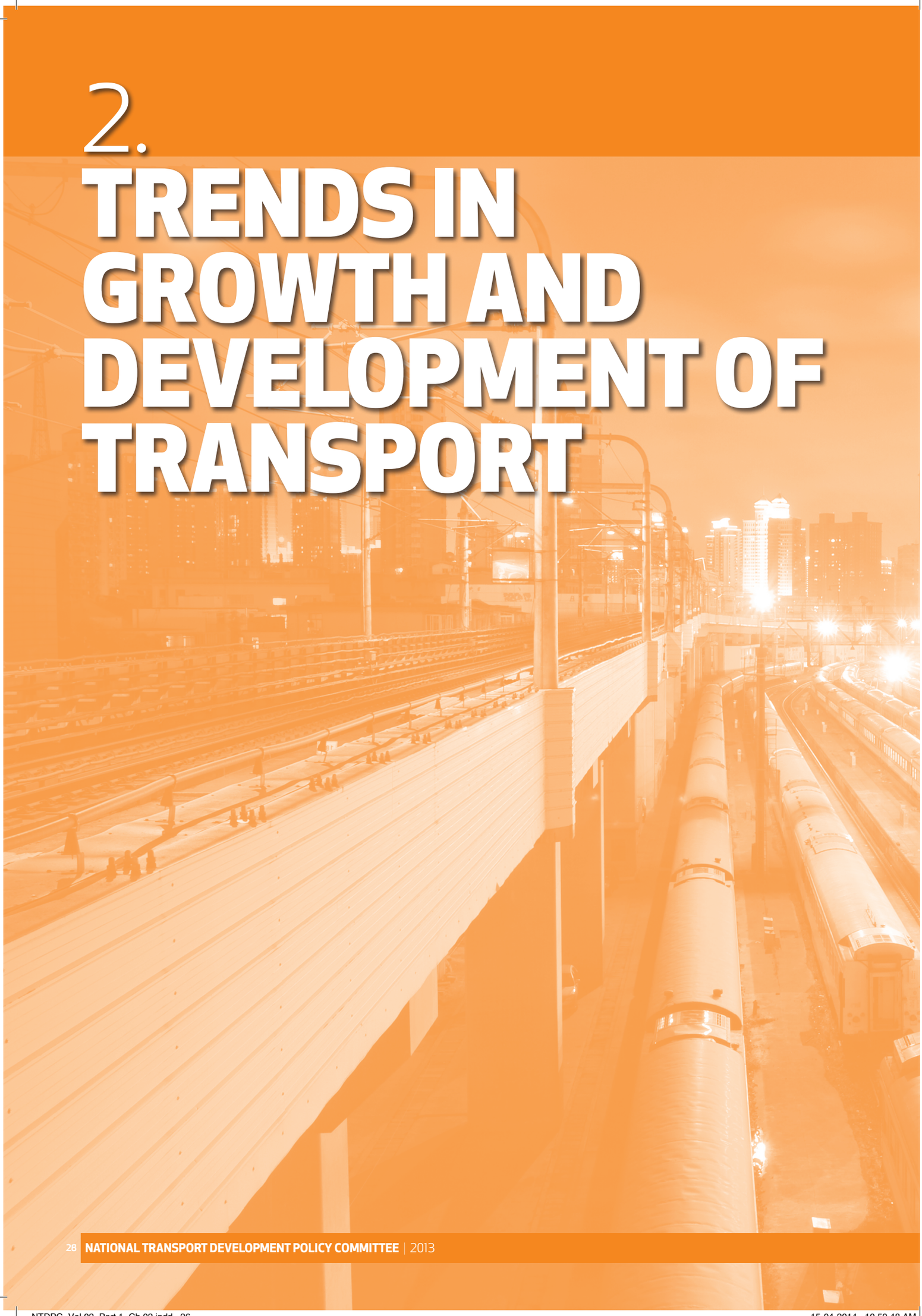
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2. TRENDS IN GROWTH AND DEVELOPMENT OF TRANSPORT



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2. TRENDS IN GROWTH AND DEVELOPMENT OF TRANSPORT

Transport plays a very vital role in the development of a country's economy; in determining overall productivity, quality of life of citizens, access to goods and services and the pattern for distribution of economic activity.

In a country of continental size like India where resources and markets are dispersed across long distances, the provision of efficient, low cost, reliable and safe transport infrastructure and services assumes additional significance.

Historically, large-scale investments in transport have kicked off phases of accelerated development and have led to large declines in transport costs on a global basis. Falling transport costs created large home markets for producers, allowing them to exploit larger market sizes and shape the economic landscape. For instance, canal construction and the surge of the railways boosted early US development in the 19th century[1]. Research clearly indicates increasing returns to scale: higher levels of demand reduce cost, allowing more efficient sharing of facilities and services. Recent analytic work in economic geography also points out that for activities that benefit from increasing returns to scale, a fall in transport costs is accompanied by higher geographic concentration of economic activities. With high transport costs, large economies of scale will remain unexploited, and production inefficient. When transport costs fall, spatial differences in production and economic growth will increase, both within and between countries[2].

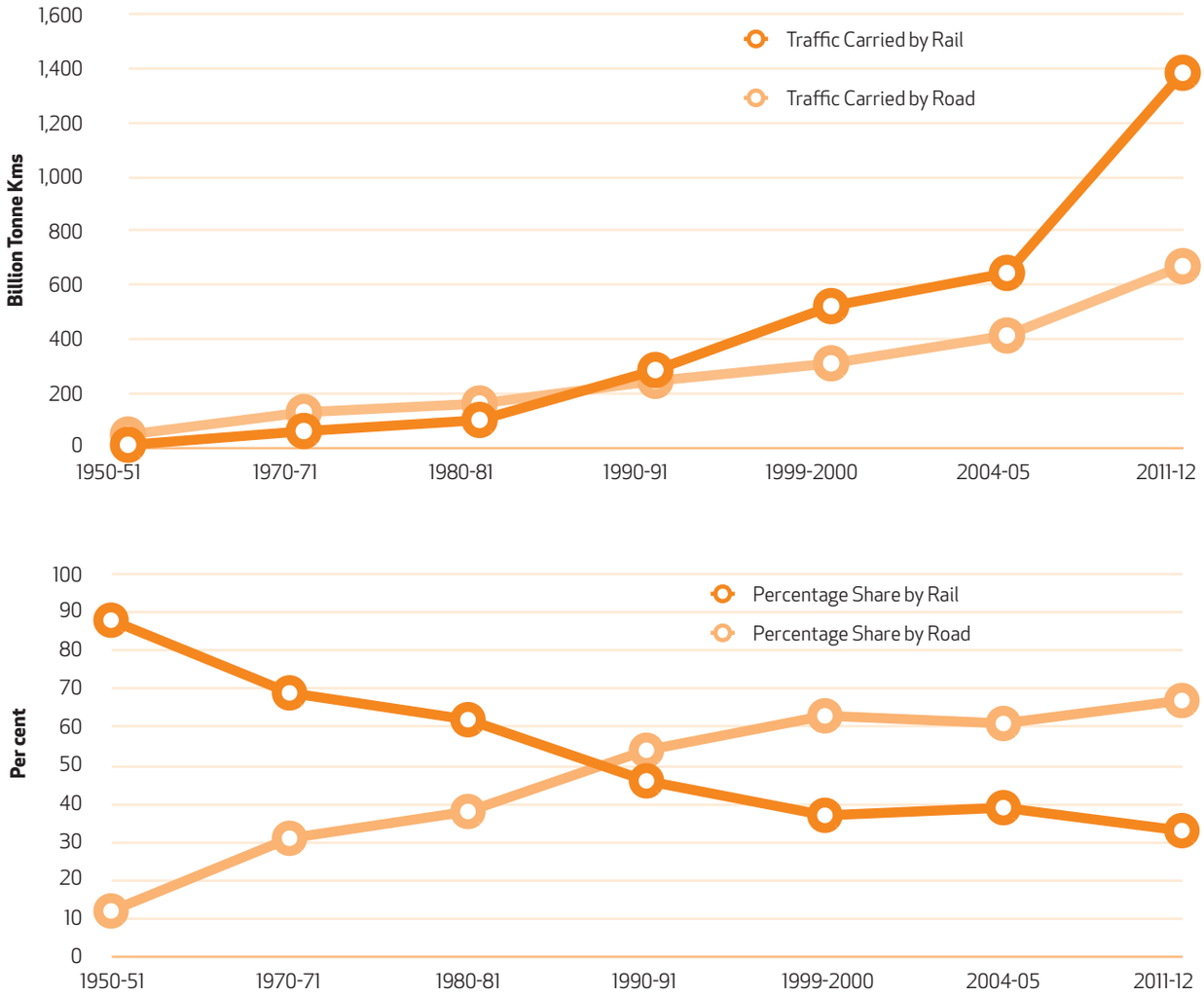
TRANSPORT DEMAND AND PROJECTIONS

The transport system in India comprises distinct modes such as rail, road transport, coastal shipping, civil aviation, inland water transport and pipelines. Rail and road dominate, carrying about 87 per cent of the total freight traffic in the country in 2007-08. Unfortunately, the rail-road mix in freight movement has developed rather sub-optimally over the years, as railways consistently lost out to roads, unable to install capacity or respond to market needs. The divide between the two modes became even more pronounced as roads expanded rapidly on the back of focused policy and investments, particularly during the last decade or so. The Total Transport System Study (TTSS) carried out by RITES for the Planning Commission in 2007-08 calculated that railways' share in total inter-regional freight traffic has come down from 89 per cent in 1951 to 65 per cent in 1978-79, 53 per cent in 1986-87 and 30 per cent in 2007-08. This consistent and unchecked fall in the share of railways through the years was estimated by RITES to have cost the Indian economy about Rs 385 billion (16 per cent of the total transport cost) in the year 2007-08[3].

1. The states of Illinois, Michigan and Ohio had marked increases in population, construction and manufacturing. Falling consumer prices of agricultural goods boosted the real income of the working population in rapidly growing cities. Price differences between Iowa and New York fell from 69 per cent to 19 per cent from 1870 to 1910. International trade relations in the first episode of globalisation were driven by the massive decrease in maritime transport costs following from the emergence of the steamboat (World Bank 2009).
2. World Bank (2009).
3. According to Planning Commission (2010) rail and road together carried about 1,287 BTKM (~87 per cent) of freight traffic (inter + intra regional) out of the total traffic of 1,482 BTKM carried by all modes in 2007-08.

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Figure 2.1
Freight Traffic: Roads Overtake Rail



Source: Rail Year Book, Planning Commission (1988); Various Plan documents, Planning Commission and NTDPC research.

For passenger traffic as well, rail and road continue to be the dominant modes in India. The traffic carried by air and water transport is negligible, though on certain routes, the former carries considerable volumes which continue to increase. Over time, roads have emerged as the predominant mode for passenger transport. The share of road in passenger traffic (billion passenger kilometre or bpkm) in total passenger traffic carried by rail and road together has increased from 32 per cent in 1951 to about 90 per cent in 2011-12[4] (Figure 2.5).

FREIGHT TRAFFIC

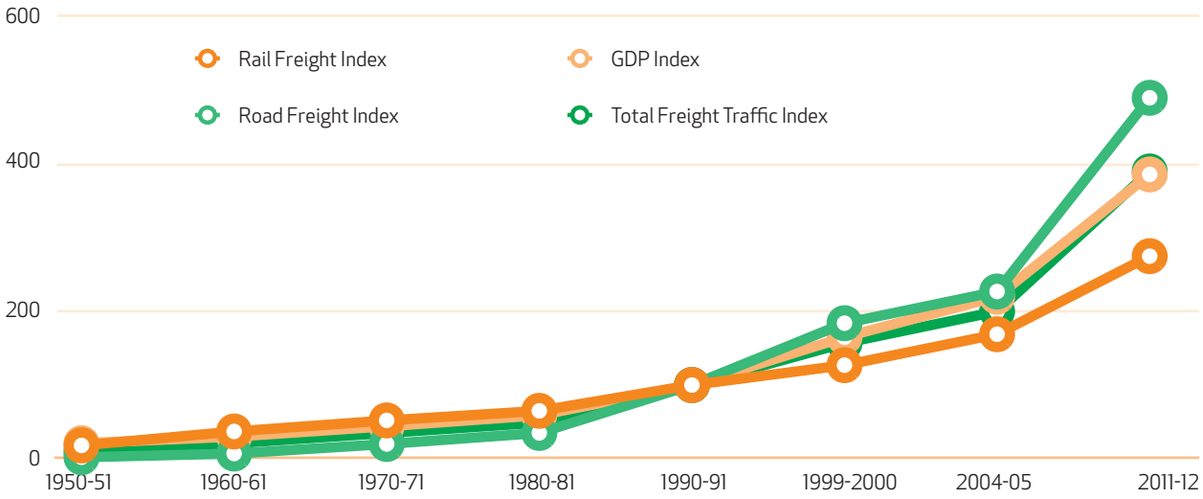
Freight traffic carried by road and rail increased from 257 billion tonne km in 1980-81 to 2053 billion tonne km in 2011-12[5]. While the increase in freight movement is impressive, more striking is the changing modal composition. Rail had historically dominated freight traffic, carrying about 60 per cent of freight in the early 1980s (Figure 2.1), but it came down to about 50 per cent by the late 1980s. Later, with economic liberalisation, with higher growth, as the demand for freight transport grew faster, market forces rapidly pushed for road transport. The share of rail further dropped to about 37 per cent at the end of 1990s. While overall freight movement almost doubled in the 1990s, freight traffic on roads increased over 2.5 times. Roads accounted for about 67 per cent[6] of freight movement in 2011-12 (Figure 2.1).

When analysing the performance of total freight traffic as well as traffic moved by rail and road with respect to GDP, it can be observed from Figure 2.2 that

4. NTDPC research (As far as NTDPC's analysis of freight and passenger traffic is concerned, it is confined only to the traffic carried by rail and road as these two modes together dominate the total freight and passenger traffic carried by all modes together).
5. Planning Commission (1988); NTDPC research.
6. As per the McKinsey & Company (2010), roads in China and US account for 22 per cent and 27 per cent of freight movements, while rail contributes to about 47 and 48 per cent, respectively.

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Figure 2.2
Indices of Freight Traffic and Economic Trends
[GDP]



Note: The road and rail traffic as well as GDP figures have been indexed to the year 1990-91.

in the decades before and after economic reforms, total freight traffic grew at a pace broadly comparable to GDP growth. Road freight traffic which grew at a slower rate than GDP prior to 1991, increased at a higher rate subsequently. The trend for rail traffic was exactly the opposite.

While freight movements have increased exponentially following liberalisation, the cost of transporting freight has remained fairly stable. For instance, freight cost between Delhi and Mumbai was Rs 1.03 per tonne km in 2001, and Rs 1.21 in 2011 (Figure 2.3). Freight prices would have been around Rs 1.8 per tonne km in 2011 had the cost followed the same trajectory as the Wholesale Price Index (WPI). Research on published freight rates carried out by the NTDPC shows similar trends on most road segments.

While overall road transport costs are low (relative to international experience) and have been stable, there has been a rapid increase in transport costs across relatively short distances across metropolitan areas and between cores and suburbs of the largest metropolitan areas. For instance, freight rates between Delhi and Chandigarh (a distance of 260 km) increased from Rs 1.2 per tonne km in 2001 to Rs 2.7 in 2011. The price escalation would have been to about Rs 2 per tonne km had it traced the WPI. Prices are even higher for shorter distances between cores and suburbs of metropolitan areas.

A recent survey of truckers and transport providers shows that freight rates for short distances (less than 100 km) are on average as high as Rs 5.2 per tonne km between large cities and their immediate hinterland (Figure 2.4). India's metropolitan freight costs are twice the national average and almost three times what it costs to move products in countries such as China.

The relatively high and rising metropolitan transport costs are likely to pose serious economic challenges as these areas provide the highest potential for trade and population movements (see market access map in Figure 2.4). The 2011 census reports that 377 million people now live in India's 7,935 towns—an increase of 91 million people and 2,774 towns since 2001. In fact, data from the 2001 census tell us that urban demand is more likely to emerge at the fringes of existing cities with more than one million people.

Also, 43 per cent of India's natural urban expansion—new towns—between 1991 and 2001 took place within 100 km of existing cities with a million or more people, and another 35 per cent between 100 and 200 km. While at this time, specific information on locations of the newly created 2,774 towns is not available, previous trends would point at metropolitan suburbanisation. Rising transport costs at this scale is likely to hamper economic efficiency.

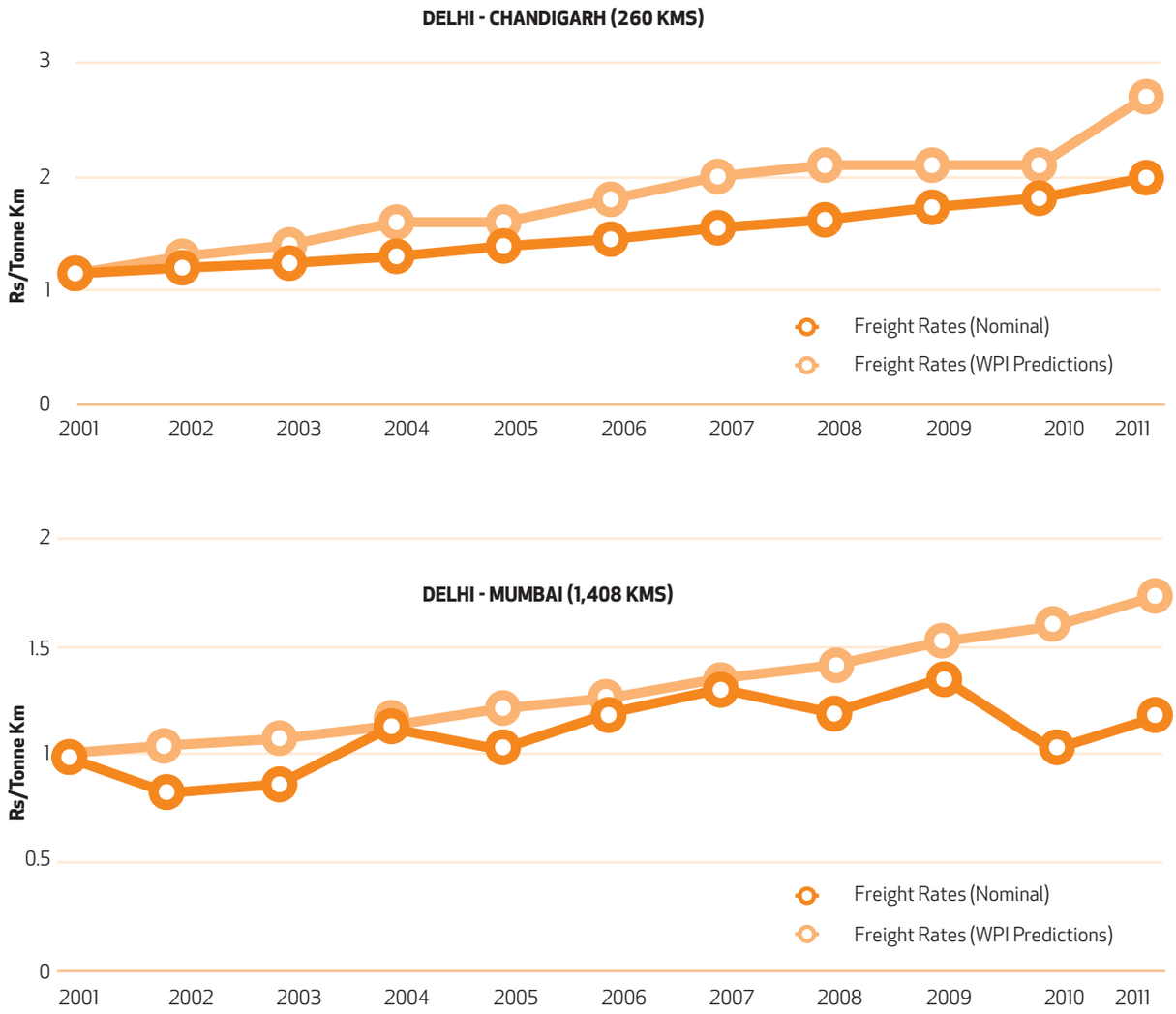
PASSENGER TRANSPORT

The demand for road-based transport services has dramatically accelerated following economic liberalization, and by 2011-12, roads provided for as high as about 90 per cent of the total passenger traffic, leaving a meager 10 per cent for rail[7] (Figure 2.5). This trend reflects the constraints experienced in capacity expansion of the railways. This sharp growth is expected to continue with increase in incomes and

7. Based on NTDPC research.

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Figure 2.3
Cost of Transporting Freight by Road
[Rs/Tonne Km]



Source: Freight rate data compiled from The Economic Times, Wholesale Price Index (WPI) – Base Year – 2004-05, from Economic Survey 2011-12.

the changing spatial footprint of suburbanising cities. While robust estimates on the income and price sensitivity of road use and automobile demand are not readily available, a proxy using gasoline demand shows a high, long-run income elasticity (2.68) and a low price elasticity (-0.32) of gasoline demand. This implies that demand for gasoline will increase at twice the pace of income/GDP growth while being less sensitive to price increases[8]. Related research has also shown that automobile demand increases rapidly with city population and changes in incomes (follows an 'S' shape). Such a pattern can lead to a number of problems as India has several small but rapidly growing suburbs and towns where demand for vehicles will increase with city growth. Vehicular increase dominated by personalised modes that are not energy-efficient and environmentally benign will have implications for sustainable development.

The performance of total passenger traffic as well the passenger traffic moved by rail and road with respect to GDP indicates that total passenger traffic grew at a slower pace than GDP before economic reforms in 1991, but subsequently surpassed the GDP growth rate (Figure 2.6). Thus, the movement of passenger traffic by rail and road shows similar trends as that of freight.

TRAFFIC IN 2032

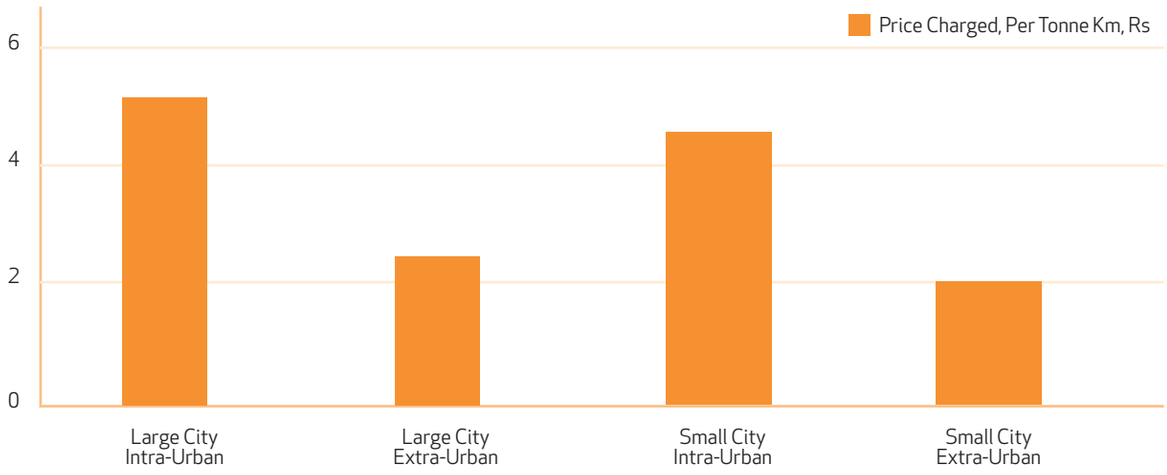
The NTDPC has estimated transport demand for the terminal years of the 12th Five Year Plan (2016-17), 13th Plan (2021-22), 14th Plan (2026-27) and 15th Plan (2031-32). Elasticity of traffic demand with respect to GDP has been taken as the underlying approach for assessment of traffic projections. Elasticities for different time periods from 1950 onwards have been

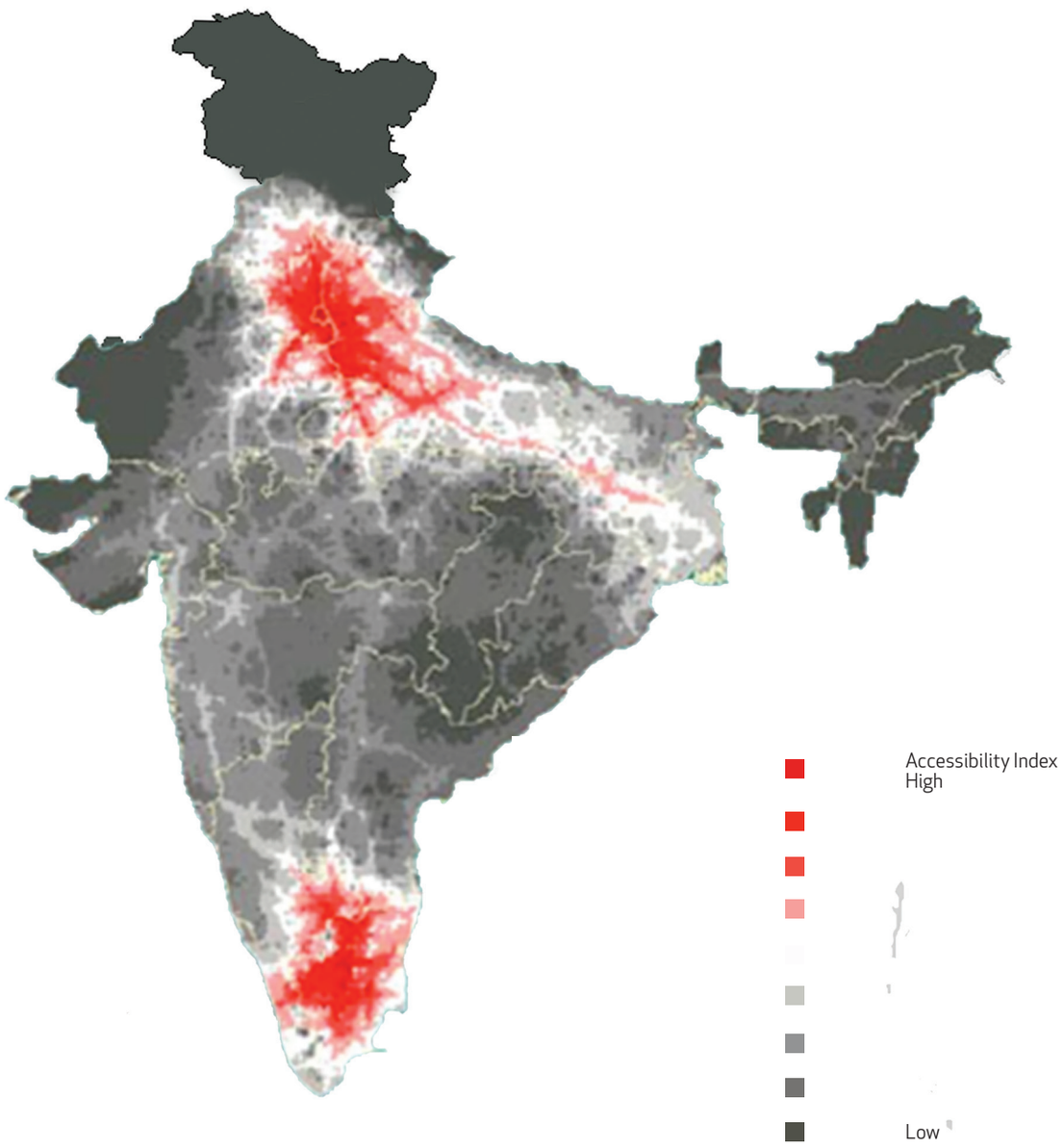
8. Ramanathan (1999).

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Figure 2.4

High Transport Costs Between Large Cities and Suburbs

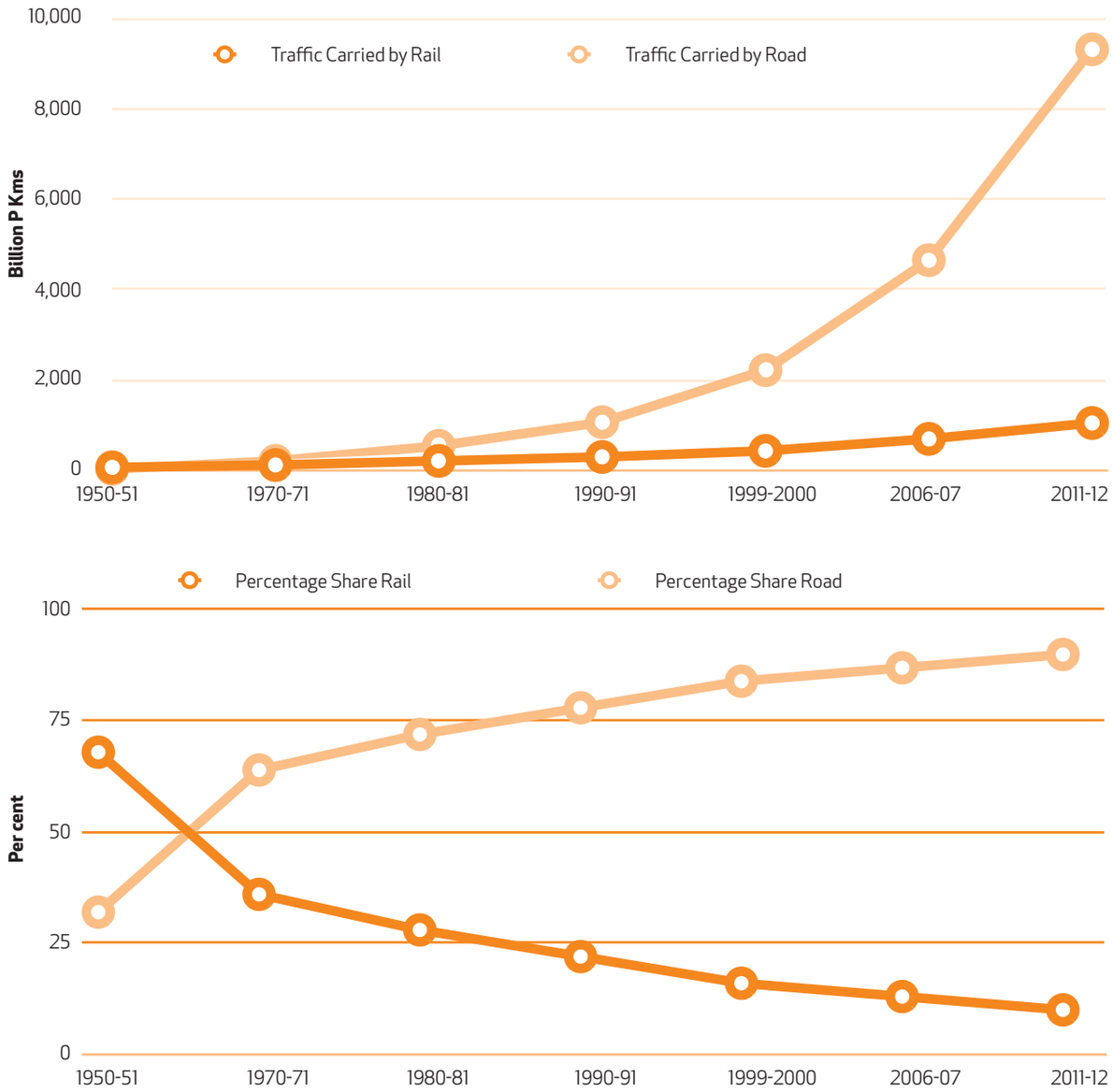




Source: Urbanisation Review, The World Bank (based on a survey of over 1,800 truckers and trucking companies).

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Figure 2.5
Passenger Traffic : Roads Dominate



Source: Rail Year Book, Planning Commission (1988); Planning Commission and NTDPC research.

calculated. Though transport demand depends upon a number of factors, GDP has been found to be the most dominant one for calculating elasticities for both freight and passenger traffic. On the basis of a general trend in the elasticities over different time periods, traffic projections have been made. Different GDP growth rates have been estimated for each Plan. The GDP growth rate estimates are as follows: 6.9 per cent for the 12th (2016-17)[9] Plan, 8 per cent for the 13th (2021-22) Plan, 8.5 per cent during 14th (2026-27) Plan and 9 per cent in the 15th (2031-32) Plan.

FREIGHT TRAFFIC

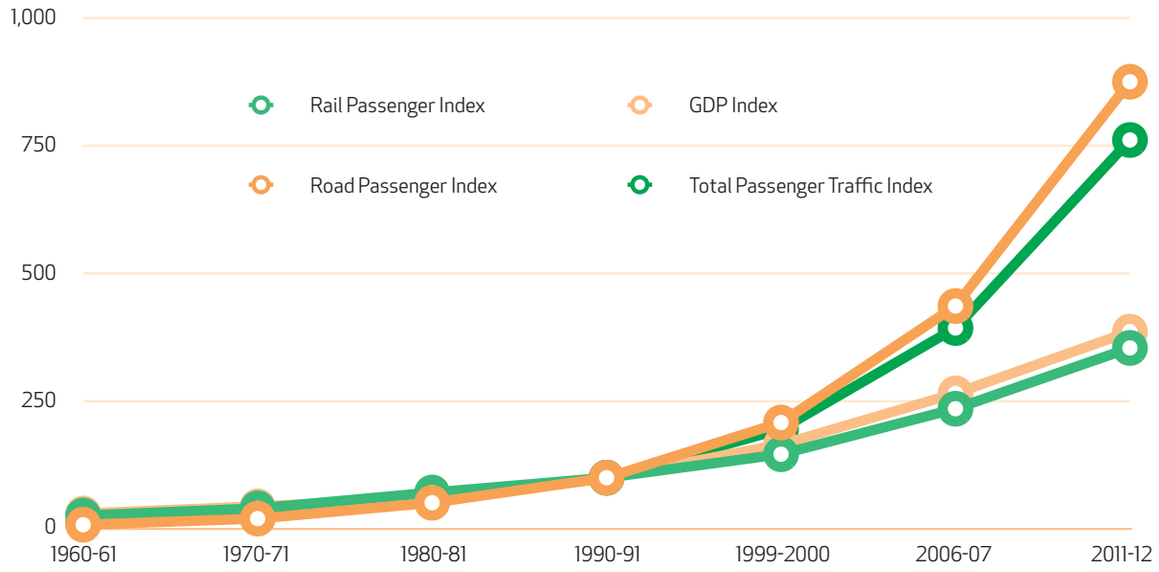
Elasticity of total freight with respect to GDP was calculated for different time periods from 1950-51 to 2004-05, which is considered as the base year (Table 2.1).

The total freight elasticity had been declining over time but may have increased in the recent period along with acceleration in economic growth. The overall elasticity for the period 1950-51 to 2004-05 is approximately 1.30. This appears reasonable as per *The Indian Railways Report 2001: Policy Imperatives for Reinvention and Growth (Expert Group on Indian Railways, July 2001)* which estimated Total Freight Traffic Elasticity at 1.25. The 12th Plan estimates road freight traffic at 1,337 billion net tonnes kilometer (BTKM) for the year 2012-13 using an elasticity of 1.2 and GDP growth rate at 8 per cent. It is discounted

9. Planning Commission (2013).

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Figure 2.6
Indices of Passenger Traffic and Economic Trends



Note: The road and rail traffic as well as GDP figures have been indexed to the year 1990-91.

Table 2.1
Freight Elasticities with Respect to GDP

YEARS	1950-51 TO 1970-71	1970-71 TO 1990-91	1990-91 TO 2004-05	1950-51 TO 2004-05	2004-05 TO 2011-12
Rail Freight Traffic Elasticity	1.43	0.8	0.64	0.9	0.9[A]
Road Freight Traffic Elasticity	3.13	1.98	1.05	2.0	1.4[E]
Total Freight Traffic Elasticity	1.77	1.29	0.87	1.3	1.2[E]

Source: NTDPC Research.
Note: The traffic figures for the years 1990-91 and 2011-12 are based on NTDPC research.
[A] Actual Elasticity.
[E] Estimated Elasticity.

back to provide the road freight traffic for the year 2011-12. The rail freight traffic estimated by the Planning Commission for 2011-12 stands at 640 BTKM. Accordingly, total freight traffic elasticity has been found to be 1. However, this appears to be low. It is expected that elasticity with respect to GDP will be about 1.2. An additional exercise assuming an elasticity of 1.1 has also been performed.

Based on this approach, rail and road freight traffic estimates for the 12th, 13th, 14th and 15th Plans have been projected for both elasticity figures (Tables 2.2 and 2.3). It is estimated that the modal share of rail and road in the total freight traffic will be 35:65 in the 12th Plan, 39:61 in the 13th, 45:55 in the 14th and 50:50 in the 15th Plan. With elasticity at 1.2, total freight traffic is expected to grow at 9.7 per cent per annum to reach over 13,000 BTKM in 2031-32 from about 2,000 BTKM in 2011-12. Rail and road freight traffic are expected to grow at about 12 per cent and 8 per cent per annum respectively to achieve a 50 per cent share each in the total freight traffic at the end of 15th Plan.

This assumes a significant change in transport strategy that tilts towards investment in railways as is assumed in this report. Such an increase in freight carried by rail will not take place without substantive expansion in rail freight capacity.

When the elasticity of total freight traffic with respect to GDP is assumed at 1.1, the total freight traffic is expected to grow at 8.9 per cent per annum to climb to 10,726 BTKM in 2031-32 from 1,947

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Table 2. 2

Scenario 1: Freight Traffic Estimates with Elasticity 1.2, Base Year 2004-05

	RAIL		ROAD		TOTAL
YEARS	TRAFFIC (BTKM)	PER CENT SHARE	TRAFFIC (BTKM)	PER CENT SHARE	TOTAL TRAFFIC (BTKM)
1950-51	44	88	6	12	50
1970-71	127	69	57	31	184
1990-91	247	47	283	53	530
2004-05	411	39	643	61	1,054
2011-12	668	33	1,385[E]	67	2,053[E]
2016-17 (GDP = 6.9 per cent)*	1,070	35	1,987	65	3,056
2021-22 (GDP = 8 per cent)*	1,885	39	2,949	61	4,834
2026-27 (GDP = 8.5 per cent)*	3,535	45	4,321	55	7,856
2031-32 (GDP = 9 per cent)*	6,559	50	6,559	50	13,118

Source: Rail Year Book, Planning Commission (1988); NTDPC Research.
Note: *NTDPC research.
[E] Estimated (based on NTDPC research).

Table 2. 3

Scenario 2: Freight Traffic Estimates with Elasticity 1.1, Base Year 2004-05

	RAIL		ROAD		TOTAL
YEARS	TRAFFIC (BTKM)	PER CENT SHARE	TRAFFIC (BTKM)	PER CENT SHARE	TOTAL TRAFFIC (BTKM)
1950-51	44	88	6	12	50
1970-71	127	69	57	31	184
1990-91	247	47	283	53	530
2004-05	411	39	643	61	1,054
2011-12	668	34	1,279[E]	66	1,947[E]
2016-17 (GDP = 6.9 per cent)*	982	35	1,824	65	2,807
2021-22 (GDP = 8 per cent)*	1,669	39	2,610	61	4,279
2026-27 (GDP = 8.5 per cent)*	3,011	45	3,680	55	6,691
2031-32 (GDP = 9 per cent)*	5,363	50	5,363	50	10,726

Source: Rail Year Book, Planning Commission (1988); NTDPC Research.
Note: *NTDPC Research.
[E] Estimated (based on NTDPC research).

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Table 2.4
Passenger Traffic Elasticities with Respect to GDP

YEARS	1950-51 TO 1970-71	1970-71 TO 1990-91	1990-91 TO 2006-07	1950-51 TO 2006-07	2006-07 TO 2011-12
Rail Passenger Elasticity	0.75	1.12	0.87	0.92	1.1[A]
Road Passenger Elasticity	2.64	2.01	1.54	2.0	1.9[E]
Total Passenger Elasticity	1.64	1.75	1.42	1.59	1.8[E]

Source: NTDPC Research.
Note: [A] Actual (from Planning Commission [2013]).
[E] Estimated (based on NTDPC research).

Table 2.5
Passenger Traffic Estimates with Base Year 2006-07

YEARS	RAIL		ROAD		TOTAL
	TRAFFIC (BPKM)	PER CENT SHARE	TRAFFIC (BPKM)	PER CENT SHARE	TOTAL TRAFFIC (BPKM)
1950-51	67	68	31	32	98
1970-71	118	36	210	64	328
1990-91	296	22	1,671	78	1363
2006-07	695	13	4,657	87	5,352
2011-12	1,047	10	9,329	90	10,375
2016-17 (GDP = 6.9 Per cent)*	1,509	8	17,272	92	18,780
2021-22 (GDP = 8 Per cent)*	2,300	6	35,043	94	37,343
2026-27 (GDP = 8.5 Per cent)*	3,596	4	74,079	96	77,675
2031-32 (GDP = 9 Per cent)*	5,765	3	163,109	97	168,875

Source: Rail Year Book, Planning Commission (1988); NTDPC Research.
Note: *NTDPC Research.
[E] Estimated (based on NTDPC research).
Passenger Traffic includes only Bus Traffic.

BTKM in 2011-12. Rail and road freight traffic are expected to grow at about 11 per cent and 7 per cent per annum respectively to achieve a 50 per cent share each in the total freight traffic at the end of 15th Plan.

PASSENGER TRAFFIC

In order to forecast passenger traffic for 2016-17, 2021-22, 2026-27 and 2031-32, elasticity of rail, road and total passenger traffic with respect to GDP was calculated for different time periods from 1950-51 to 2006-07, which is the base year (Table 2.4).

The long-term rail passenger elasticity for the period analysed is 0.92. However, between the 10th and 11th Five Year Plans (2006-07 to 2011-12) this increased to 1.1. On the basis of this trend as well as 12th Plan estimates, an elasticity of 1.1 for rail passenger traffic appears reasonable.

Long-term elasticity of road passenger traffic with respect to GDP is approximately 2.0. The 12th Plan estimate of the same appears to be very low. Thus, on the basis of NTDPC research, an elasticity of 1.9 with respect to GDP has been utilised for forecasting (Table 2.5).

Total passenger traffic is expected to grow at about 15 per cent per annum to reach 168,875 bpkm in 2031-32 from 10,375 bpkm in 2011-12. Growth in rail pas-

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Table 2.6
Comparative Overview of Originating Inter-Regional Freight Traffic

YEAR	TOTAL ORIGINATING INTER-REGIONAL TRAFFIC	MODE-WISE TRAFFIC AND PERCENTAGE SHARE IN TOTAL TRAFFIC					
		RAILWAYS	HIGHWAYS	COASTAL SHIPPING	AIRLINES	PIPELINES	INLAND WATER TRANSPORT
1950-51	82	73 (89)	9 (11)	NA	NA	NA	NA
1978-78	283	185 (65)	96 (34)	3 (1)	NA	NA	NA
1986-87	485	255 (53)	224 (46)	6 (1)	NA	NA	NA
2007-08	2,555	769 (30.08)	1,559 (61.01)	59 (2.31)	0.3 (0.01)	114 (4.44)	55 (2.15)

Source: Total Transport System Study by RITES.
Note: Figures in parentheses indicate percentage modal share.

Table 2.7
Comparative Overview of Inter-Regional Transport Output

YEAR	TOTAL INTER-REGIONAL TRAFFIC (BTKM)	BTKM							
		RAILWAYS		HIGHWAYS		COASTAL SHIPPING		AIRWAYS	
		TRAFFIC	AVERAGE LEAD (KM)	TRAFFIC	AVERAGE LEAD (KM)	TRAFFIC	AVERAGE LEAD (KM)	TRAFFIC	AVERAGE LEAD (KM)
1978-78	189	150 (79.2)	810	34 (17.8)	353	6 (3)	1,807	NA	NA
1986-87	299	199 (66.5)	778	91 (30.5)	406	9 (3)	1,655	NA	NA
2007-08	1,300	508 (39.1)	661	706 (54.3)	453	86 (6.6)	1,450	0.29 (0.02)	1,027

Source: Planning Commission (2010).
Note: Figures in parentheses indicate percentage modal share.

senger traffic is expected to be around 9 per cent per annum, and for road traffic, 15.4 per cent.

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

THE RITES STUDY

RITES has carried out three studies—in 1978-79, 1986-87 and 2007-08, to forecast transport demand. In the first two studies, RITES took into account only the inter-regional freight traffic, while the study conducted in 2007-08 also assessed intra-regional traffic[10]. It has estimated traffic in all modes including rail, road, coastal shipping, airways, inland water transport (IWT) and pipelines.

RITES identified 52 commodity groups and derived the total traffic on the basis of originating tonnage and their average leads. Table 2.6 shows the operational performance of different modes of transport in terms of originating inter-regional (long and medium lead) traffic between 1950-51 and 2007-08.

Out of the total originating freight traffic of 2,555 million tonnes during 2007-08, the shares of railways and road transport were around 30 and 61 per cent respectively. The balance 9 per cent was handled by the remaining four modes. Since 1986-87, while overall freight traffic grew over five times, rail traffic has grown three times, road traffic about seven times and coastal shipping over 10 times.
The total as well as mode-wise inter-regional traffic in terms of net tonne km, and the mode-wise average leads during the last three Total Transport System Studies conducted by RITES are shown in Table 2.7.

In terms of BTKM, the shares of rail and road are around 36 per cent and 50 per cent respectively. The other four modes make up the remaining 14 per cent. Since rail and road constitute 86 per cent of the total traffic in terms of BTKM, the estimates presented in Table 2.8 focus essentially on these two modes and include the inter-regional as well as intra-regional traffic. The share of road in the inter-regional freight

10. Intra-regional traffic means traffic within a district.

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Table 2.8
Inter- and Intra-Regional Traffic
[BTKM]

YEAR	INTER-REGIONAL TRAFFIC			INTRA-REGIONAL TRAFFIC			TOTAL TRAFFIC (INTER-REGIONAL +INTRA-REGIONAL)		
	RAIL	ROAD	TOTAL	RAIL	ROAD	TOTAL	RAIL	ROAD	TOTAL
1978-79	150 (81.6)	34 (18.4)	184	-	-	-	-	-	-
1986-87	199 (68.6)	91 (32.4)	290	-	-	-	-	-	-
2007-08	508 (41.8)	706 (58.2	1,214	5 (7.4)	67 (92.6)	73	514 (40)	773 (60)	1,287

Source: Planning Commission (2010).
Note: Figures in parentheses indicate percentage modal share.

Table 2.9
Average Freight Traffic Leads
[Km]

YEARS	RAIL	ROAD
1978-78	810	353
1986-87	778	406
2007-08	661	453

Source: Planning Commission (2010).

traffic increased from 18 per cent in 1978-79 to approximately 58 per cent in 2007-08 while the share of rail declined from about 82 per cent in 1978-79 to about 42 per cent in 2007-08. As for intra-regional traffic, majority of freight traffic is carried by road: 93 per cent was the road share in 2007-08.

AVERAGE LEADS

The average lead of freight traffic moved by rail and road are presented in Table 2.9. The average lead of freight traffic by rail has declined over time while it has increased for road. However, the average lead by rail is still higher than that of road; rail transport is preferred for long haulage.

RAIL-ROAD COMMODITY SHARE

RITES identified nine major commodities: coal, food grains, iron and steel, fertilisers, cement and cement structures, POL, iron ore, limestone and dolomite, and miscellaneous/other commodities—which constitute 63 per cent of the total volume of 52 commodities carried by all four modes—rail, road, coastal shipping, airways.

The shares of rail and road transport in movement of these commodities are about 47 and 50 per cent respectively. Of the nine major commodities, coal, iron ore, limestone and dolomite, and fertilisers are predominantly carried by rail, while cement is carried almost equally between the two modes. Road transport reflects a comparatively higher share in movement of POL, iron and steel, and foodgrains. As analysed by RITES, the average leads for the movement of POL, iron and steel, and cement by road are 272 km, 525 km and 358 km respectively, while corresponding leads by rail are much higher, at 658 km, 936 km and 557 km.

This trend indicates that over time, commodities that were historically moved by rail over long distances are now being moved by road as the average lead of road has increased over time, and railways have probably been affected by capacity constraints.

Table 2.11 shows the projections of total inter-regional freight traffic made by RITES for rail and road for the years 2012-13, 2017-18, 2022-23 and 2025-26.

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Table 2.10
Commodity-Wise Modal Performance During Base Year [2007-08]
[Million Tonnes]

COMMODITY	RAIL	ROAD	COASTAL SHIPPING	AIRWAYS	TOTAL
Coal	332 (80)	68 (16.4)	15 (3.6)	0 (0)	415
Food Grains	38 (23.8)	123 (76.9)	0 (0)	0 (0)	160
Iron and Steel	27 (20.2)	107 (79.9)	0 (0)	0 (0)	134
Iron Ore	122 (78.7)	23 (14.8)	10 (6.5)	0 (0)	155
POL Products (Liquid)	35 (18.4)	128 (67.4)	26 (13.7)	0 (0)	190
Limestone and Dolomite	14 (70)	6 (30)	0 (0)	0 (0)	20
Cement	79 (50)	76 (48.1)	3 (1.9)	0 (0)	158
Fertilisers	36 (65.5)	18 (32.7)	0 (0)	0 (0)	55
Miscellaneous/ Others	22 (9.7)	202 (88.9)	3.2 (1.4)	0.3 (0.13)	227
Total of 9 Commodities	705 (46.6)	751 (49.6)	57 (3.8)	0.3 (0.02)	1,514
Total of 52 Commodities	769 (32.2)	1,559 (65.3)	59 (2.5)	0.3 (0.01)	2,387

Source: Planning Commission (2010).
Note: Figures in parentheses indicate percentage modal share.

Table 2.11
Freight Traffic Projection
[BTKM]

YEARS	TOTAL INTER-REGIONAL TRAFFIC FOR RAIL & ROAD (BTKM)
2007-08 (Base Year)	1,214
2012-13	1,924
2017-18	2,952
2022-23	4,316
2025-26	5,345

Source: Planning Commission (2010).

Total inter-regional freight traffic carried by rail and road for the year 2025-26 has been estimated at 5,345 BTKM. The compound annual growth rate (CAGR) during the period 2007-08 to 2025-26 is 8.58 per cent and if these projections are extrapolated to 2031-32, the total freight traffic is estimated at 8,756 BTKM. This is lower than the Committee's estimates as these exclude intra-regional freight traffic. According to the NTDPC, total freight traffic (Inter + Intra Regional) with an elasticity of 1.2 is 15,289 BTKM in 2031-32, and 12,356 BTKM when the elasticity is 1.1.

PUBLIC SECTOR INVESTMENT

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

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Table 2.12
Share of Transport in Public Sector Expenditure: Five-Year Plans
[Per cent]

S. No.	SECTOR	1ST - 6TH PLAN (1951-85)	7TH PLAN (1985-90)	8TH PLAN (1992-97)	9TH PLAN (1997-2002)	10TH PLAN (2002-07)	11TH PLAN (2007-12)
		EXPENDITURE					
1	Railways	46.4	56.1	49.1	38.2	35.7	29.7
2	Roads	28.5	21.5	24.4	39.9	45.6	39.9
3	Road Transport	7.6	7.3	5.9	5.0	2.4	2.3
4	Ports	6.3	5.1	3.5	4.2	1.4	3.0
5	Shipping	4.7	2.4	5.0	2.5	1.3	1.3
7	Light House and Light Ships	0.1	-	NEG	NEG	NEG	0.02
6	Inland Water Transport (IWT)	0.4	0.6	0.2	0.3	0.2	0.4
8	Civil Aviation	6.1	6.6	11.4	5.8	3.6	7.9
7	Pradhan Mantri Gram Sadak Yojana (PMGSY)	-	-	-	4.1	7.5	13.4
8	Other Transport Sector	-	0.2	0.4	-	2.1	2.1
9	**Total Transport Sector** (At Current Prices in Rs Billion)	**255 (100.0)**	**295 (100.0)**	**656 (100.0)**	**1,196 (100.0)**	**2,422 (100.0)**	**6,472 (100.0)**
10	**Total Public Sector Expenditure** (At Current Prices in Rs Billion)	**1,797**	**2,187**	**4,855**	**8,140**	**16,185**	**37,510**
11	Transport Sector as Per cent Of Total Public Sector Expenditure	14.2	13.5	13.5	14.7	14.5	17.3

Source: Planning Commission (2013).
Note: The total transport sector expenditure does not include expenditure on urban transport.
Neg: Negligible.

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

It is not that private players have not been involved in transport. The private sector has always provided the bulk of trucking transportation; it now also has a majority share of passenger road transport services, international and coastal shipping and all non-motorised transport. More recently, it has become a dominant player in providing air transport services. The private sector, during the last 10-15 years, has also made its presence felt in areas like ports, roads (national highways) and airports. Its contribution in the provision of transport infrastructure, particularly rail and waterways, though, has been rather limited and needs to be encouraged.

However, despite the emerging role of the private sector, the State has to continue playing the role of both provider and facilitator through appropriate policy interventions, regulations and supporting investment. Table 2.12 presents Plan-wise expenditure in various sectors of transport.

From the very beginning, the planners realised the significance of the development of the transportation sector in both promoting economic development, and fulfilling the aspirations of the people. During the 1st Five Year Plan, agricultural production, irrigation and power were the main focus areas. Despite this, about 22 per cent of the total expenditure was incurred on the transport sector. The expenditure share was the highest in the 2nd Plan at about 23.5 per cent. However, over the years, the percentage has declined. It hovered around 12.8 to 13.5 per cent from the 6th to the 8th Plans. During the 10th and 11th Plans, infrastructure, including transport, received special attention with the share of transport in total expenditure increasing from 14.5 in the 10th Plan to 17.3 per cent in the 11th.

Railways and roads constitute the major chunk in the total transport spending. Analysis reveals that spending on railways saw a cyclical movement from the 1st to the 7th Plan, followed by a decline from

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Table 2.13
Investment in Infrastructure During 10TH and 11TH Plans
[Rs Billion at Current Prices]

PARTICULARS	10TH PLAN	11TH PLAN	12TH PLAN*
GDP at Market Prices	165,988	336,045	681,632
Public Investment	6,511 (78.3)	15,368 (63.3)	28,908 (51.8)
Private Investment	1,860 (21.7)	8,875 (36.7)	26,838 (48.2)
Total Investment	**8,371**	**24,243**	**55,746**
Investment as Percentage of GDP			
Public Investment	3.92	4.57	4.24
Private Investment	1.12	2.64	3.94
Total Investment	5.04	7.21	8.18

Source: Planning Commission (2013).
Note: Figures in parenthesis are percentage shares.

the 8th Plan onwards. The railways share increased from 50 per cent in the 1st Plan to a peak of 67 per cent in the 3rd, with a drastic fall in the 4th and 5th Plan onwards, followed by a rise till the 7th. From the 8th Plan onwards, the share has constantly declined while expenditure on highways increased. The railways share stood at a dismal low of about 30 per cent in the 11th Plan.

Roads saw a major impetus in spending to reach a significant 42 per cent in the 11th Plan, from a meagre 22 per cent in the 2nd Plan. Railways capacity in both freight and passenger traffic has not increased enough simply due to inadequate investment. Meanwhile, the capacity of the national highway system has grown considerably with the initiation of the National Highway Development Project (NHDP). Further, the explosion in airline capacity is providing increasing competition to the upper-class railway segment.

The share of modes other than railways and roads, which was around 15 per cent of total expenditure on transport in the first three Plans, escalated to 30 per cent in the 4th and 5th Plans, only to settle down at about 28 per cent in the 10th plan and 11th Plan.

THRUST ON INFRASTRUCTURE

The infrastructure sector in India is currently at an inflexion point. The Government has shown an increasing commitment to accelerate infrastructure development, as indicated by augmented spending during the 11th Plan (2007 to 2012) and now in the 12th (2012-2017).

The total investment in infrastructure sectors is estimated to be Rs 55,746 billion[11] in the 12th Plan, which is roughly 8.2 per cent of GDP, as compared to about 7 per cent during the 11th Plan period. Table 2.13 reveals that the contribution of the private sector in total investments towards infrastructure development has progressively increased over the Plans.

Public sector investment showed a growth of 344 per cent between the 10th and the 12th Plans. But private investment grew by 1,343 per cent. The total investment increased by about 566 per cent, at current prices. A large part of this growth can be attributed to the increasing private participation. In sectors like roads, ports and airports, where traditionally the public sector has been almost exclusively responsible for their development, the private sector is rapidly becoming a reliable partner. As a result of investments made during the last 60 years of planned development, the transport sector has expanded manifold in terms of capacity and spread (Annex). A total expenditure of Rs 14,793 billion towards the sector is projected in the 12th Plan. Table 2.15 gives the sectoral break-up.

TRANSPORT DEVELOPMENT IN INDIA

RAILWAYS

The Indian Railways had a modest beginning in 1853 when the first train journeyed from Mumbai to Thane, covering a distance of 34 km. In the next 50 years, the railway network expanded rapidly, and by 1900, the total length of the network (route kilometres) increased to 39,835 km. The rate of growth declined during the next 50 years, reaching 53,596 km in 1950-51. In the next 60 years, since the beginning of the Plan era, the route length increased to

11. This is roughly $930 billion at current exchange rates.

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Table 2.14

Infrastructure Investment Mix Between Public and the Private Sector, 10TH and 11TH Plan Periods

[Rs Billion at Current Prices]

PARTICULARS	10TH PLAN	11TH PLAN	12TH PLAN*
Roads and Bridges	1,393	4,531	9,145
• Public Sector	1,274 (91.4)	3,606 (79.6)	6,105 (66.8)
• Private Sector	119 (8.6)	925 (20.4)	3,040 (33.2)
Ports	206	445	1,978
• Public Sector	33 (16.1)	82 (18.5)	262 (13.5)
• Private Sector	173 (83.9)	363 (81.5)	1,715 (86.8)
Airports	68	363	877
• Public Sector	42 (61.9)	129 (35.5)	175 (19.9)
• Private Sector	26 (38.1)	234 (64.5)	702 (80.1)
Railways (including MRTS)	944	2,429	6,434
• Public Sector	938 (99.3)	2,284 (94.0)	4,908 (76.2)
• Private Sector	6 (0.7)	145 (6.0)	1,526 (23.8)
Total Infrastructure Investment	**8,372**	**24,243**	**55,746**
Public Investment	6,511 (77.8)	15,368 (63.3)	28,908 (51.8)
Private Investment	1,860 (22.2)	8,875 (36.7)	26,838 (48.2)
Total Transport Sector Investment (Per cent Share in Infrastructure)	**2,609 (31.3)**	**7,769 (32.6)**	**18,434 (33.8)**
Public Investment	2,285 (87.6)	6,101 (78.5)	11,450 (62.1)
Private Investment	324 (12.4)	1,668 (21.5)	6,984 (37.9)

Source: Planning Commission (2013).
Note: Figures in parentheses are percentage shares.
*The 10th Plan numbers have been arrived at by dividing the 10th Plan numbers at 2006-07 prices in the following ratio—Public Sector: Divided by 1.0965 and Private Sector: Divided by 1.0856.

64,600 km by 2011-12 an overall growth of about 20.53 per cent.

Today, Indian Railways (IR) occupies a unique and crucial place in the country's transport infrastructure. IR, managed directly by the Ministry of Railways, is the third largest railway network in the world under a single management with 7,500 railway stations, 9,549 locomotives, 55,339 passenger coaches, 2,39,321 freight cars and 64,600 route km. IR operates 12,000 passenger trains every day and 7,000 freight trains. It transports 2.8 million tonnes of freight traffic and 25 million passengers every day (Figure 2.7).

GAUGE

Indian railways run on three gauges, though it is proposed to make the entire network single gauge. The size of the network (gauge-wise) as on 31 March 2012 is shown in Table 2.16. Currently, broad gauge (BG) contributes about 91 per cent of total track km, while it forms about 86.62 per cent of total route km. The rest of the network, barring hill/heritage railways, is progressively getting converted to BG. The BG network accounts for 97.9 per cent of passenger and almost 100 per cent of the freight traffic. Almost all double/multiple track sections and electrified routes are broad gauge (Figure 2.8). Meter and narrow gauges

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Table 2.15
Proposed Public Expenditure on Transport, 12TH Plan [2012-17]
[Rs Billion]

S. NO.	SECTOR	CENTRE			STATES	TOTAL OUTLAYS
		GBS	IEBR	TOTAL		
1	Roads and Road Transport*	2,713	648	**3,361**	6,524	**9,885**
2	Railways	1,942	2,250	**4,192**	-	**4,192**
3	Ports and Shipping	70	220	**290**	43	**333**
4	Civil Aviation	170	162	**332**	51	**383**
Total		**4,894**	**3,280**	**8,175**	**6,618**	**14,793**

Source: Planning Commission (2013).
Notes: * Includes Rural Roads (Rs 1,265 billion).
1) GBS - Gross Budgetary Support.
IEBR - Internal and Extra Budgetary Resources.
2) The State Outlays for 12th Five Year Plan have been estimated on the basis of their shares in the sectoral outlays in 11th Plan.
3) The proposed expenditure on Urban Transport are not included.

Table 2.16
Gauge-Wise Indian Railways Network
[Per cent Shares]

GAUGE	ROUTE KM	RUNNING TRACK KM	TOTAL TRACK KM
Broad Gauge (1676 mm)	86.62	89.96	90.99
Metre Gauge (1000 mm)	9.83	7.49	6.78
Narrow Gauge (762 mm and 610 mm)	3.56	2.56	2.23
Total (km)	**64,600**	**89,801**	**115,062**

Source: Ministry of Railways (2012).
Note: 'Route kilometre' is a unit of distance, measuring the distance by rail between two points on the railway network whereas 'Running track km' is the sum of all running lines (counting each line of doubled, tripled, etc. lines separately) between two points.

are mostly single line and non-electrified. Between 1950-51 and 2010-11, traffic density (million gtkm per running track km) increased from 4.29 to 23.17 on BG.

INDIAN RAILWAY ZONES

Whether it is a remote village or developed metropolis, Indian Railways serves and connects rail users in every part of the country. IR is administered through 17 zonal railways. However, almost half of the route kilometres fall under five railway zones while the rest 12 together constitute 54 per cent (Table 2.17). The newly included zone (Metro Railway, Kolkata) comprises only 25 km, while the Northern Zone has the highest coverage of 6,990 km.

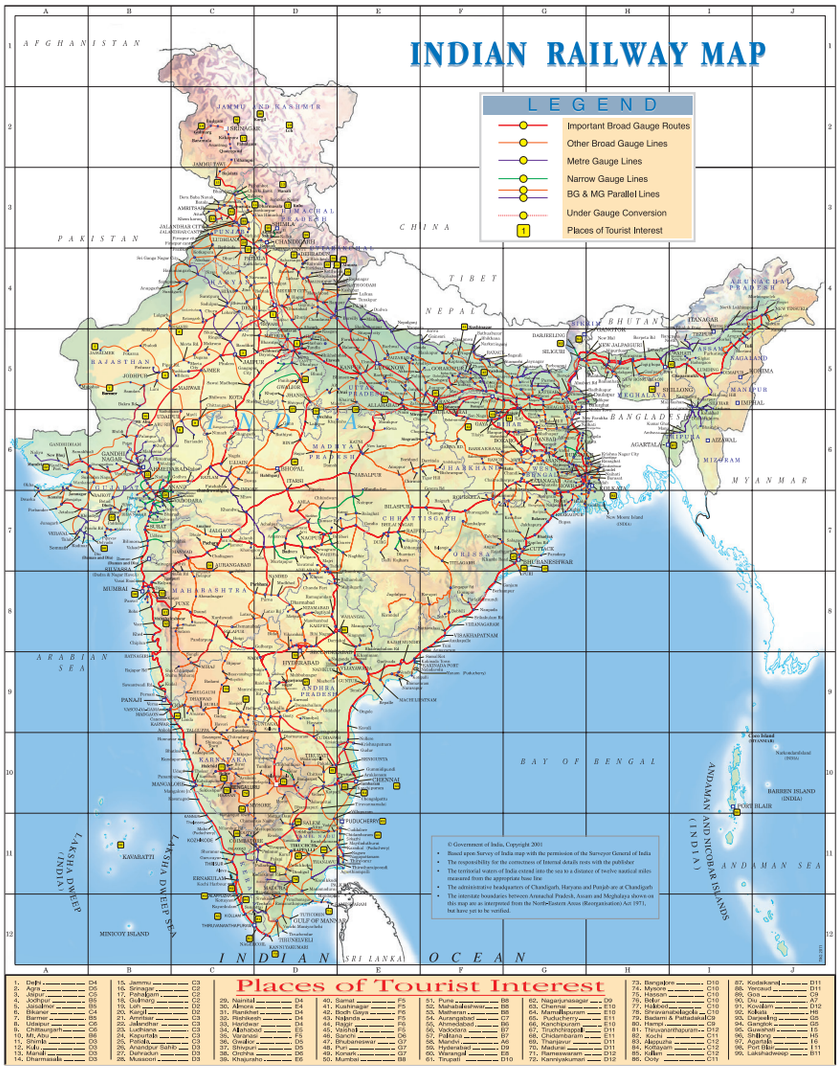
The zonal railways are further divided into smaller operating units called divisions. There are 68 operating divisions at present.

TRACTION

The Indian railways run mainly on electric and diesel traction. Steam traction was almost phased out by the late 1990s. The shift from steam to diesel for passenger transport started in early 1960s, whereas the transition for freight movement had begun in mid-1950s. Diesel traction reached its

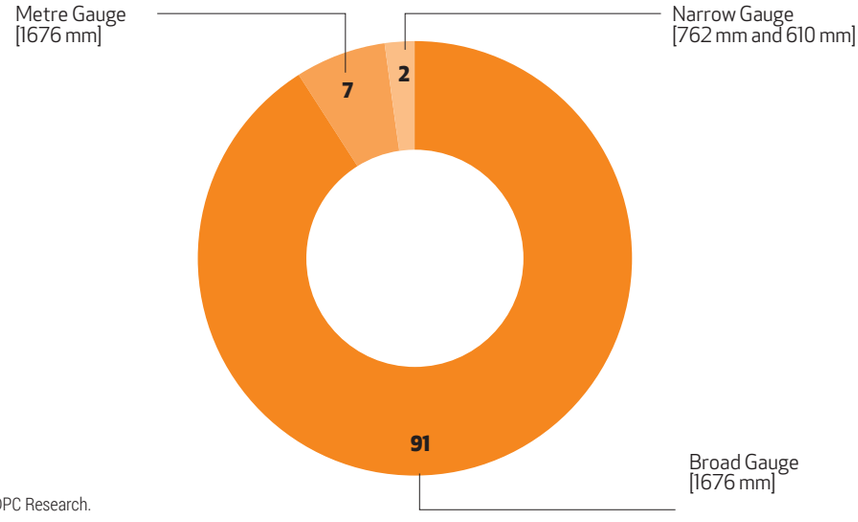
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Figure 2.7
Indian Railways Network



Source: Ministry of Railways.

Figure 2.8
Percentage Gauge Share in Total Track Kilometres



Source: NTDPC Research.

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Table 2.17
Distribution of Route Kilometres by Railway Zone

ZONES	ROUTE KILOMETRES
Northern, New Delhi	6,990
North Western, Jaipur	5,502
Southern, Chennai	4,994
South Central,Secunderabad	5,810
Western, Mumbai	6,440
Balance (12 zones)	34,864
Total Route Km	**64,600**

Source: Ministry of Railways (2012).

highest share (56 per cent) for passenger movement in 2000-01, while in case of freight, it comprised 62 per cent in 1980-81.

Gradually, electric traction was introduced, particularly on high density routes. The share of electric traction, which was 2 per cent for passengers (loco) and 5 per cent for passenger (EMU), and 1 per cent for freight in 1950-51, increased to 38.2 per cent, 13.3 per cent and 63.5 per cent respectively in 2011-12 (Figures 2.9 and 2.10).

ROLLING STOCK

Over the years, there has been improvement in design and capacity of locomotives, wagons and coaches through introduction of new technology. While the number of wagons has come down, total capacity has gone up. Similarly, seating capacity per coach has risen (Figure 2.11).

Passenger traffic increased by about 1,460 per cent, from 67 billion in 1950-51 to 1,047 bpkm in 2011-12. Freight traffic grew by about 1,400 per cent, from 44 to 668 BTKM during the same period[12]. During the 11th Plan period, CAGR for freight traffic was about 6.8 per cent as against the long-term CAGR of 4.6 per cent. However, the achievement of the railways in freight movement would have been more impressive had it not faced capacity constraints. In the 12th Plan, the rate of growth is anticipated to be about 11.5 per cent.[13].

The bulk of freight traffic is accounted for by 11 commodities. These include coal, foodgrains, iron and steel, iron ore, cement, POL, fertilisers, limestone and dolomite, stone (including gypsum) other than marble, salt and sugar. These commodities together accounted for 91.1 per cent of total freight traffic in 2011-12.

RECENT INITIATIVES FOR CAPACITY AUGMENTATION

Two important developments that have taken place in recent years need special mention. These are:

- Special Railways Safety Fund (SRSF) in the 9th Plan to be utilised to rehabilitate the railway network and other assets.
- Dedicated Freight Corridors (DFCs), which have been envisaged to augment rail freight transportation capacity, particularly on the Eastern and Western Corridors. The existing trunk routes of Howrah-Delhi on the Eastern Corridor and Mumbai-Delhi on the Western Corridor are currently saturated with line capacity utilisation varying between 115 per cent and 150 per cent [14].

While the former initiative helped the railways meet increased traffic demand in the short and medium terms, a DFC is expected to ensure that long run traffic demand is met adequately and efficiently. Railways need several such DFCs.

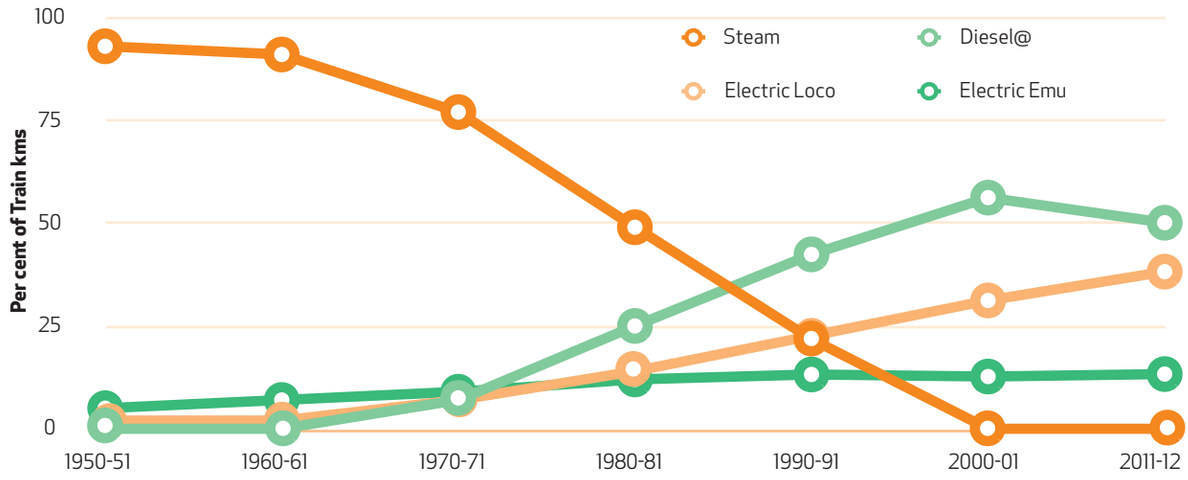
ROADS AND ROAD TRANSPORT

Along with railways, road transport caters to the bulk of domestic transport demand. In some areas, this is the only means of transport. Public investment over six decades has produced a massive road network. The total road length increased from about

12. Ministry of Railways (2012); Planning Commission (2013).
13. NTDPC Research.
14. Dedicated Freight Corridor Corporation of India Ltd (DFCCIL).

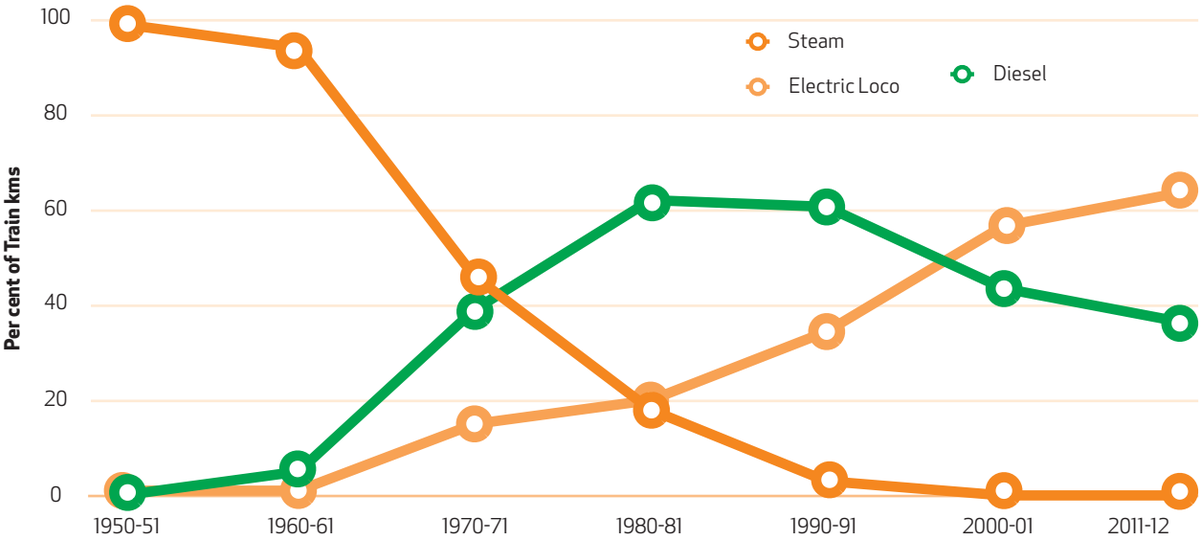
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Figure 2.9
Percentage of Passenger Movement Kilometres by Traction Mode



Source: Ministry of Railways (2012).
Note: @ Includes DHMU & DEMU.

Figure 2.10
Percentage of Freight Movement Kilometres by Traction Mode



Source: Ministry of Railways (2012).

400,000 km to 4.7 million km between 1951 and 2011. Surfaced roads increased from 157,000 km to around 2.5 million km. Road density in India is now nearly 1.42 km per sq km, which compares favourably with many countries. The share of the surfaced road length in the total road length also reflects healthy improvement. Surfaced road length accounted for 54 per cent of total road length in 2011, compared with 39 per cent in 1951 (Figure 2.12).

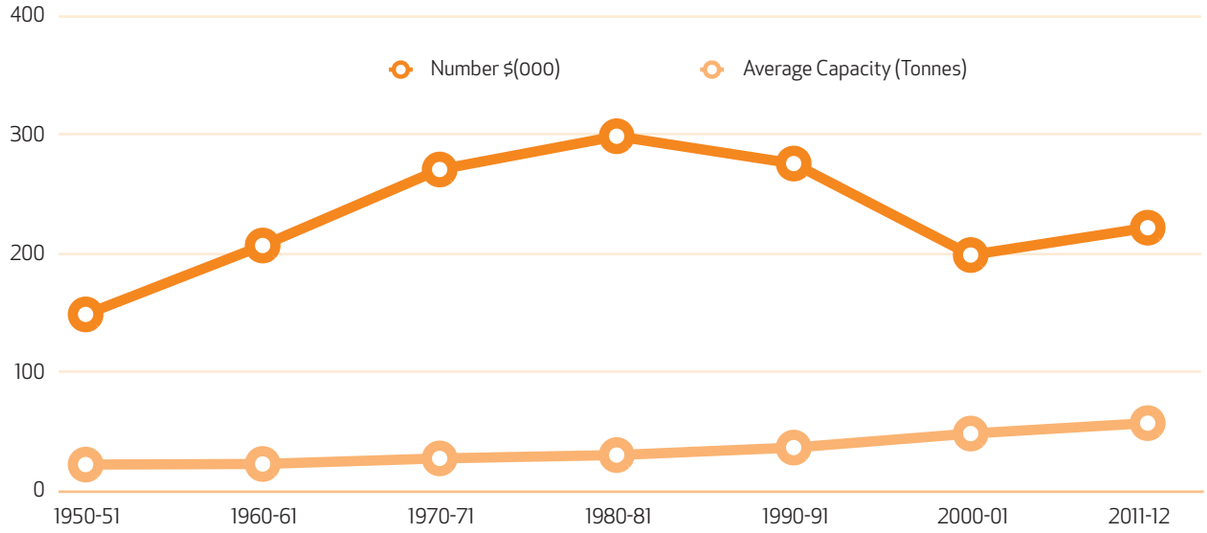
The Indian road network can be divided into three main categories:

- National Highways, with an aggregate length of 70,934 km in 2010-11 and which constitute about 1.5 per cent of network, carrying about 40 per cent of road-based traffic;
- State Highways and other Public Works Department (PWD) roads which constitute the secondary system of road transportation, with an aggregate length of about 1.2 million km, about 25 per cent of the total road network;
- The rural road network, almost 60 per cent of the total network.

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

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Figure 2.11
Carrying Capacity Per Wagon on Broad Gauge



Source: Ministry of Railways (2012).
Note: $: Excludes departmental service wagons and brake vans.

Highways and rural roads received special attention of the planners. However, similar attention was not assigned to State Highways and Major District Roads.

Table 2.18 presents the growth of the road network, category-wise.

The length of National Highways (NH) reported a CAGR of 2.2 per cent between 1951 and 2011. NHDP has contributed largely towards improving the capacity and road quality of NHs. The length of NHs with two lanes increased from 25,395 km in 1996 to 41,518 km in 2012, and those with four lanes and above from 1,170 km to 17,774 km. During the same period, the combined network of State Highways and other PWD roads posted a sevenfold expansion in length with a CAGR of 3.2 per cent.

The highest CAGR of 4.4 per cent from 1951 to 2011 was registered by rural roads comprising Panchayati roads, and roads constructed under the Jawahar Rozgar Yojana (JRY) and PMGSY. Till the advent of PMGSY, rural roads were being constructed under various programmes. These included Minimum Needs Programmes, state sector programmes, National Rural Employment Programme (NREP), Rural Landless Employment Guarantee Programme (RLEGP) and JRY. After assessing the requirement of connectivity to habitations, the PMGSY was launched in December 2000 with the objective of providing connectivity in phases, depending upon the population of a habitation. In the first phase, habitations with a minimum population of 1,000 in plain areas and 500 in tribal, hilly and desert areas were taken up. The second phase envisages providing all-weather road connectivity to habitations with populations of 500 in plain areas and 250 in tribal and hilly areas. As a result of PMGSY and other non-PMGSY programmes, the accessibility to habitations has improved considerably (Table 2.19).

Despite the steady growth rate, the development of the rural road network has not been balanced. While certain states provide 100 per cent connectivity, some others still have a large number of habitations with poor accessibility.

Both freight and passenger traffic continue to increase. While in 1950-51, freight and passenger traffic was 6 BTKM and 31 bpkm respectively, freight traffic increased to 1,385 BTKM while passenger traffic reached 9,329 bpkm in 2011-12[15]. Percentage share of road freight has increased from 12 per cent in 1950-51 to 67 per cent in 2011-12 and passenger traffic from 32 per cent to 90 per cent.

CIVIL AVIATION

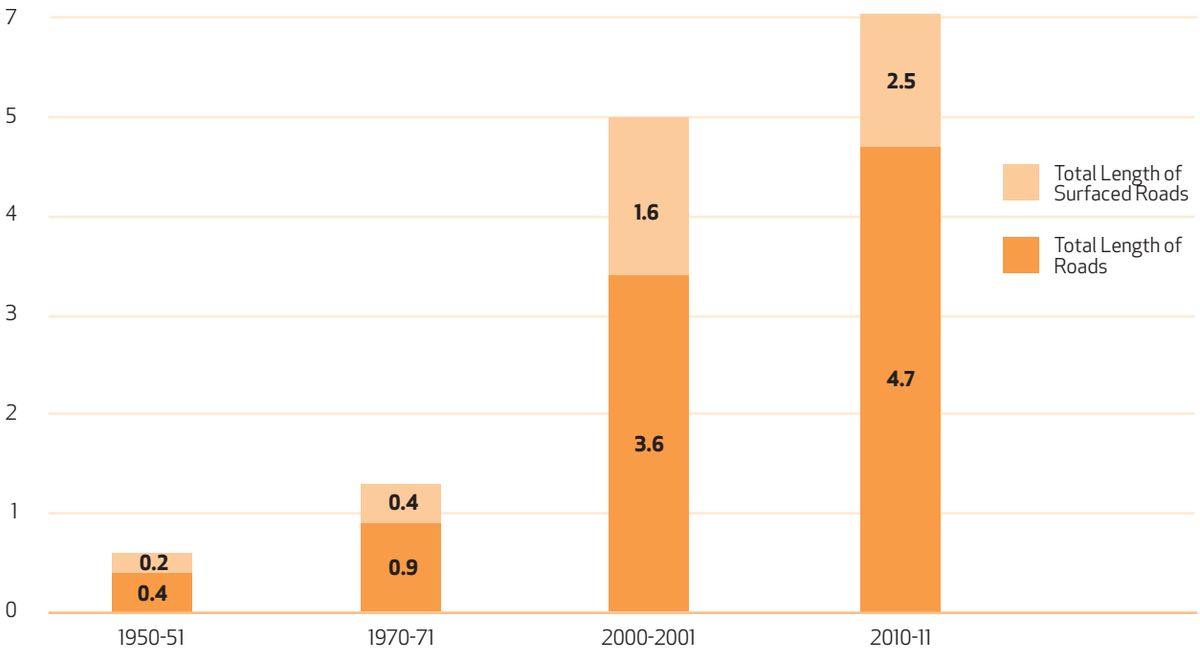
Civil aviation arrived in India in 1911 when an aircraft flew from Allahabad to Naini, covering a short distance of 10 km. The two World Wars provided a stimulus to the sector. A number of airlines were established after World War II. However, significant development started only in 1953 when Indian Airlines and Air India were set up.

The annual growth in domestic passenger traffic from 1960-61 to 1985-86 was around 10 per cent per annum. The 7th Plan (1985-90) observed that 'domestic traffic has registered an average increase of 10 per cent and by all indications this trend is likely to

15. NTDPC Research.

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Figure 2.12
Total Road Length vis-à-vis Surfaced Road Length
[Million Km]



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

Table 2.18
Growth of Road Network

ROAD NETWORK BY CATEGORIES (IN KM): 1951 TO 2011							
ROAD CATEGORY	**1951**	**1961**	**1971**	**1981**	**1991**	**2001**	**2011**
National Highways	19,811	23,798	23,838	31,671	33,650	57,737	70,934*
Per cent Share	**5.0**	**4.5**	**2.6**	**2.1**	**1.4**	**1.7**	**1.5**
State Highways and Other PWD Roads	173,273	257,125	333,598	516,254	636,746	868,101	1,169,225
Per cent Share	**43.4**	**49.0**	**36.5**	**34.8**	**27.4**	**25.7**	**24.9**
Rural Roads	206,408	197,194	354,530	628,865	1,260,430	1,972,016	2,749,805
Per cent Share	**51.7**	**37.6**	**38.7**	**42.3**	**54.2**	**58.5**	**58.6**
Urban Roads	--	46,361	72,120	123,120	186,799	252,001	411,840
Per cent Share	**0.0**	**8.8**	**7.9**	**8.3**	**8.0**	**7.5**	**8.8**
Project Roads	--	--	130,893	185,511	209,737	223,665	288,539
Per cent Share	**0.0**	**0.0**	**14.3**	**12.5**	**9.0**	**6.6**	**6.2**
Total	**399,492**	**524,478**	**914,979**	**1,485,421**	**2,327,362**	**3,373,520**	**4,690,343**

Source: Ministry of Road Transport and Highways (2012a).
Note: *76,818 kilometres as on 31 March 2012.

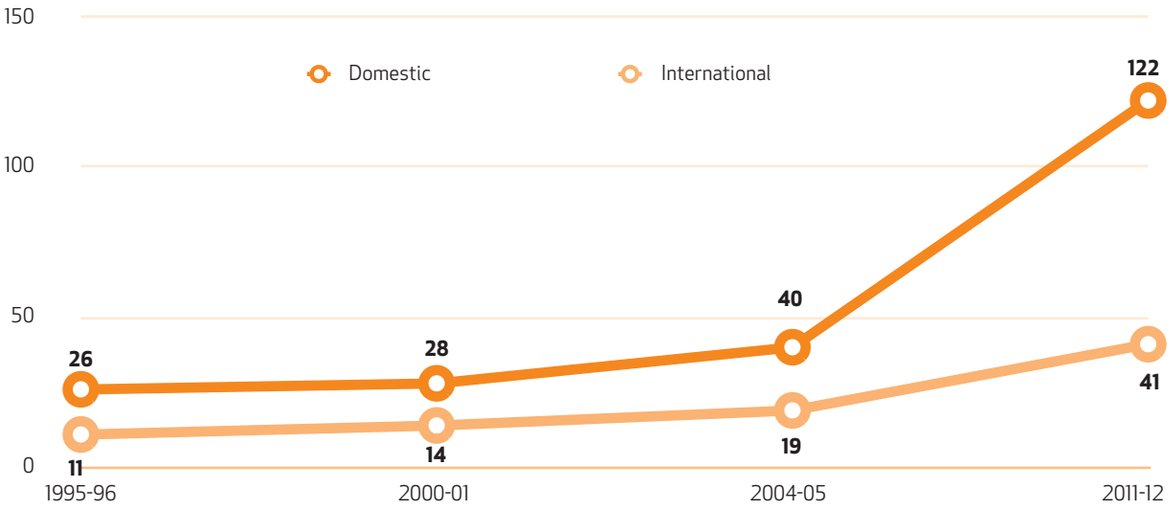
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Table 2.19
Village Connectivity to All-Weather Roads

PARTICULARS	1950-51	1960-61	1970-71	1980-81	1990-91	2000-01	2010-11
Per cent Villages with 1000+ Population Connected with All- Weather Roads	32	36	40	46	73	90	95
Overall Per cent Village Connectivity	20	22	25	28	44	54	68

Source: NTDPC Research; Planning Commission (2011).

Figure 2.13
Passenger Throughput at Indian Airports
[Millions]



Source: Ministry of Civil Aviation (2012).

continue, unless otherwise restrained'. Efforts were made to peg the growth rate, since the sector is heavy on fuel consumption and foreign exchange. In fact, the last decade of the 20th century witnessed stagnant growth.

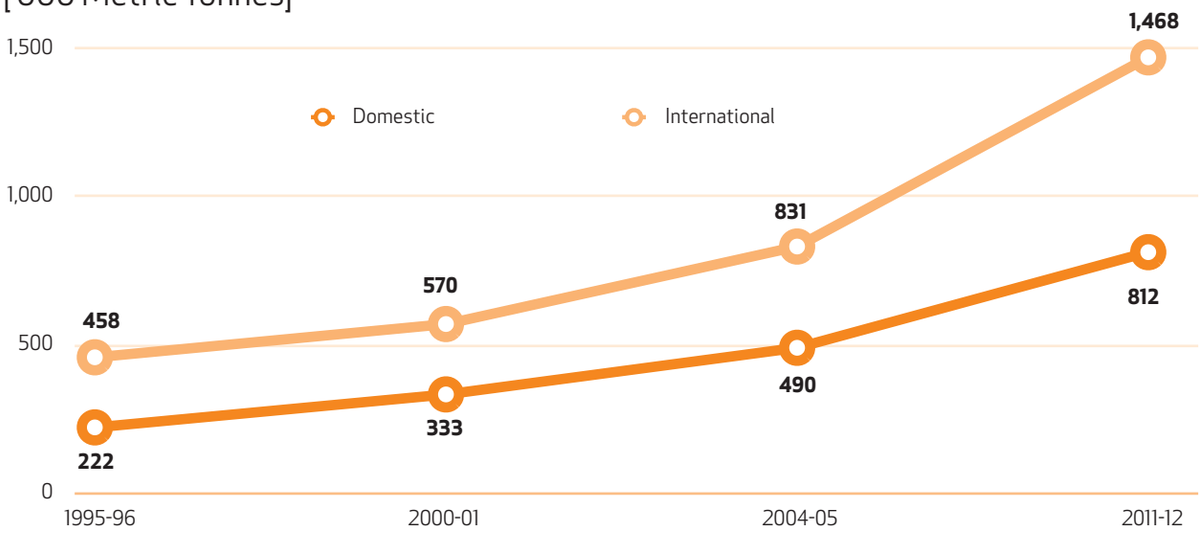
The Air Corporations Act, 1953, was repealed in 1994, paving the way for entry of private airlines. A large number entered the market, and some perished. The overall seat capacity increased dramatically, which led to a fall in fares, which further stimulated the growth of air traffic. The private sector also contributed towards provision of airport infrastructure facilities. In the last five years, the private sector has invested about Rs 300 billion (at 2011-12 prices) in airport modernisation, mainly in development of greenfield airports at Hyderabad and Bengaluru, and modernisation of Delhi and Mumbai airports.

In the last decade, the sector has grown at a phenomenal pace, and India has emerged as the world's ninth largest civil aviation market. There has been enhanced national and international connectivity with 74 foreign airlines operating to/from various destinations. The number of scheduled aircraft departures per day for domestic and international segments has increased from 503 and 79 respectively in 2001-02 to 1,538 and 236 in 2012[16]. In 2001-02, there were only five Indian airlines in operation with 132 aircraft. By 2010-11, the number of scheduled operators had increased to 13 with a total fleet size of 340. India has also witnessed significant growth in the number of non-scheduled airline operators, from 36 in 2000 to 146 in 2012. The number of aircraft with non-scheduled operators increased from 106 in 2000 to 409 in 2010. Similar expansion has been witnessed in airport infrastructure; the number of operational airports increased from 50 in 2000 to 84 in 2012.

16. Air Transport Statistics, 2001-02 and ICAO ATR form as furnished by all airlines.

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Figure 2.14
Cargo Throughput at Indian Airports
['000 Metric Tonnes]



Source: Ministry of Civil Aviation (2012).

Passenger throughput at Indian airports during 2011-2012 was 162.3 million (Figure 2.13), of which 121.51 million or about 75 per cent were domestic passengers and the rest international. The percentage of domestic passengers to the total passenger throughput has gone up from about 67 per cent in 2000-01 to about 75 per cent in 2011-12, implying faster growth of domestic compared to international passenger throughput. In the last 11 years, the domestic segment has grown at a Compound Annual Growth Rate (CAGR) of about 14.3 per cent vis-à-vis 10.2 per cent for the international segment.

Cargo throughput at Indian airports during 2011-12 was 2.28 million metric tonnes. The Indian government adopted an 'Open Skies' policy for air cargo traffic in the early 1990s, under which Indian and foreign carriers were allowed to operate scheduled and non-scheduled cargo services to/from any airport in India. As a result, international air cargo traffic increased from about 0.9 million metric tonnes (MMT) in 2000-01 to 2.28 MMT in 2011-12. Total freight traffic handled by Indian airports has increased at a CAGR of about 9.2 per cent in the last 11 years to reach 2.28 MMT by 2012. Domestic cargo, buoyed by increasing domestic trade, has grown at a pace of 8.4 per cent, while international cargo grew at nearly 9.
In spite of this high growth, India continues to be a small player in the international arena. The air traffic density (1,000 passengers per million urban population[17]) in India is very low at 72. China (282) is four times higher, Brazil (231) three times, Malaysia (1,225) 17 times, US (2,896) 40 times and Sri Lanka (530) more than seven times higher. China's domestic traffic is five times that of India's. Moreover, India has an aircraft for every 2.89 million people in comparison to 1.14 million in China. In terms of freight carriers, out of 15,750 freight carriers globally, India has just 13 scheduled and 149 non-scheduled operators.

These data—as also the traffic densities of countries such as China and Indonesia—indicate the kind of growth that can be expected as Indian incomes rise in the next couple of decades and beyond.

PORTS, SHIPPING AND IWT

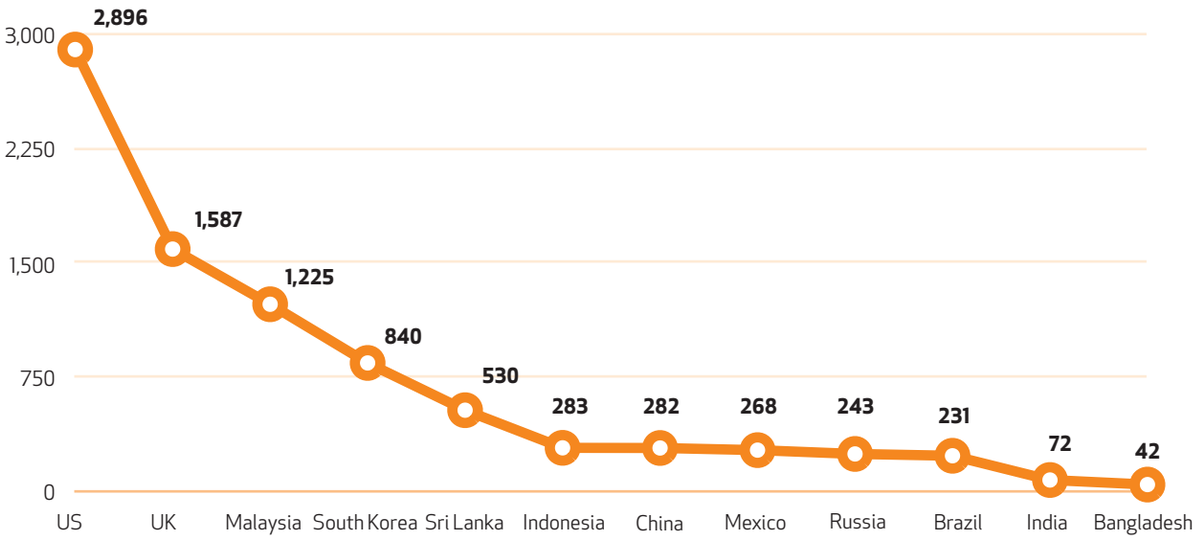
Global economic integration relies heavily upon efficient maritime transport due to its unparalleled physical capacity and ability to carry freight over long distances and at low costs. Seaborne trade represents more than 80 per cent of international trade. As high as about 95 per cent of India's trade volume (around 70 per cent in terms of value) is moved by sea. India's maritime sector comprises ports, shipping, shipbuilding and ship repair, as well as inland water transport systems.

The Indian peninsula is also strategically located between the Atlantic Ocean in the west and the Pacific Ocean in the east, with a 7,517 km-long coastline. But in spite of its significance and low cost of operation, the share of water transport in domestic freight traffic is just about 6 per cent[18] compared to that of other large economies such as China (47 per cent), USA (12.4 per cent) and Japan (34 per cent)[19].

17. FICCI (2011).
18. NTDPC Research.
19. European Commission (2012).

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Figure 2.15
Comparison of Air Traffic Density Across Select Countries
[1,000 Passengers Per Million Urban Population]



Source: Ministry of Civil Aviation (2012).
Note: Traffic data pertains to 2010 for India and 2008-09 for other economies.

Table 2.20
Composition of Traffic at Major Ports
[Per cent]

YEAR	POL	IRON ORE	CONTAINER
1960-61	28	16	--
1990-91	42	21	13
2011-12	31	11	21

Source: Ministry of Shipping (2012).

PORTS

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

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

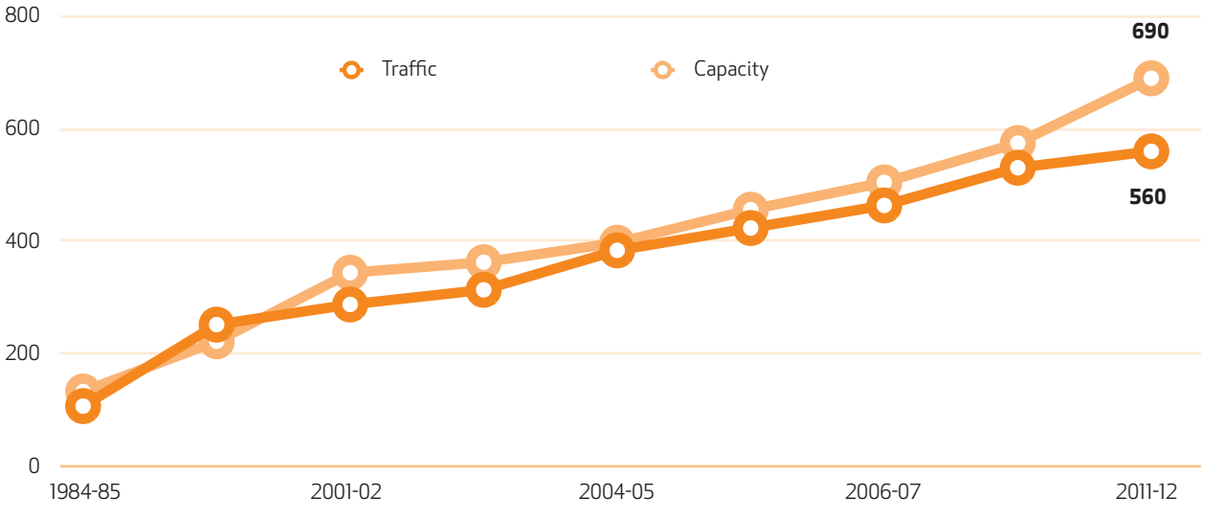
TRAFFIC In 1950-51, there were six Major Ports in India: Kolkata, Mumbai, Chennai, Cochin, Mormugao (Goa) and Vishakhapatnam. Subsequently, Kandla, New Mangalore, Paradip, Haldia and Tuticorin were declared Major Ports. In 1989, another major port, Jawaharlal Nehru Port Trust (JNPT), Mumbai came into existence, followed by Ennore in 2001.

During 2011-12, total cargo handled by Major and Non-Major ports was 914 million tonnes with the 13 Major Ports handling nearly 61 per cent of it—560 million tonnes.

Between 1960-61 and 1990-91, total traffic grew at a CAGR of 4.9 per cent, with traffic at Major and Non-Major Ports growing at 5.2 per cent and 2.4 per cent

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Figure 2.16
Growth in Capacity and Traffic at Major Ports
[Million Tonnes]



Source: Ministry of Shipping (2012).

respectively. The period from 1990-91 to 2011-12 witnessed an overall traffic CAGR of 8.6 per cent with traffic at the Major Ports and Non-Major Ports growing at 6.4 per cent and at about 18 per cent respectively. The increased throughput of Non-Major Ports has been the effect, to a large extent, of capacity saturation at the Major Ports. Encouraging initiatives by many maritime states for the development of Non-Major Ports through the participation of the private sector also contributed to this shift.

The increase in quantity of cargo handled at Non-Major Ports from 2000-01 to 2011-12 was mainly driven by traffic growth in Gujarat, Andhra Pradesh, Goa and Maharashtra. In 2000-01, Gujarat accounted for more than 80 per cent of the total traffic handled at the Non-Major Ports and continued to hold more than 73 per cent share in 2011-12, followed by Andhra Pradesh (13 per cent), Maharashtra (5.6 per cent), Goa (4.1 per cent), Odisha (1.4 per cent) and Tamil Nadu (0.3 per cent). The remaining 2.4 per cent was handled by all the other maritime states/union territories (UTs).

COMPOSITION OF TRAFFIC The composition of cargo traffic at Major Ports has changed significantly over the years (Table 2.20). The cargo composition at Non-Major ports did not show any pronounced shift with POL and its products being the single largest commodity with about 55 per cent and about 44 per cent in 2001-02 and 2011-12 respectively.

CAPACITY Over the years, cargo handling capacity of Major Ports has steadily increased. However, traffic demand clearly outpaced capacity additions, resulting in port congestion. In 1984-85, total capacity utilisation was 81 per cent which increased to 95 per cent in 1990-91, indicating high stress on the available port infrastructure. Capacity utilisation remained very high during the 1990s. Due to recent capacity additions, utilisation at Major Ports came down to about 80 per cent in 2011-12. Similarly, Non-Major Ports, which had a capacity utilisation of 81 per cent in 2006-07, saw a decline to about 64.5 per cent in 2011-12.

Despite this, capacity utilisation at both Major and Non-Major Ports have been way above the identified optimum capacity utilisation of 70 per cent, implying that the cargo evacuation facilities are under great strain.

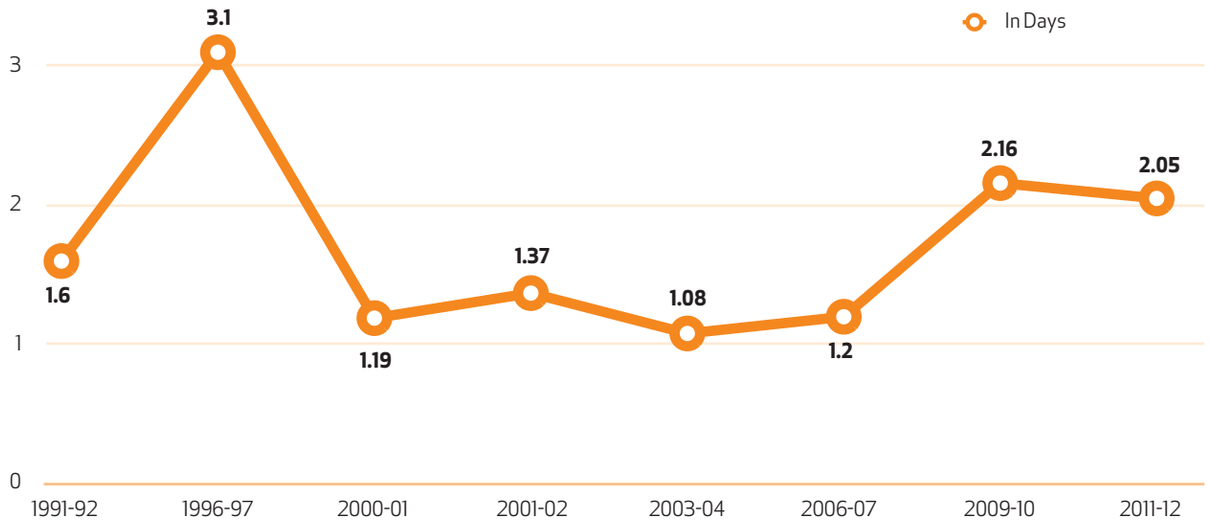
EFFICIENCY PARAMETERS The performance of Indian ports has generally deteriorated over the years except for a brief period from the late 1990s to the mid 2000s.

- Average pre-berthing detention (PBD) of vessels rose from 1.6 days in 1991-92 to 3.1 days in 1996-97, then saw a decline till 2004-05, reaching an encouraging level of around one day. However, port efficiency subsequently saw a dip as the detention time again started increasing and then gradually declined to 2.05 days in 2011-12.
- Average turn round time (TRT) increased from 6.7 days in 1991-92 to 7.8 days in 1996-97, after which it declined till 2003-04 when it was 3.3 days. It then increased gradually to 4.63 days in 2009-10. However, in 2011-12, average TRT dropped to 4.56 days.

The gap between the growth in traffic and growth of port capacity is apparently widening. Port traffic is expected to grow by about 40 per cent, from 914 million tonnes at the end of 11th Plan to 1,278 million tonnes by the end of the 12th Plan. Rapid upscaling of port capacities, particularly in terms of deeper drafts for bigger vessels, modern cargo handling facilities, swift cargo evacuation, and commensurate

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Figure 2.17
Average Pre-Berthing Detention for All Major Ports



Source: Ministry of Shipping (2012).

Table 2.21
Break-Up of Traffic and Capacity at Indian Ports at the End of 12TH Plan
[Million Tonnes]

PARTICULARS	END OF 11TH PLAN 2011-12	END OF 12TH PLAN 2016-17
Traffic	914	1,278
Capacity	1,147	1,662

Source: NTDPC (2011).

financing shall be required in the 12th. An expansion in total capacity by about 7.7 per cent by the end of the 12th Plan from 2011-12 levels is suggested.

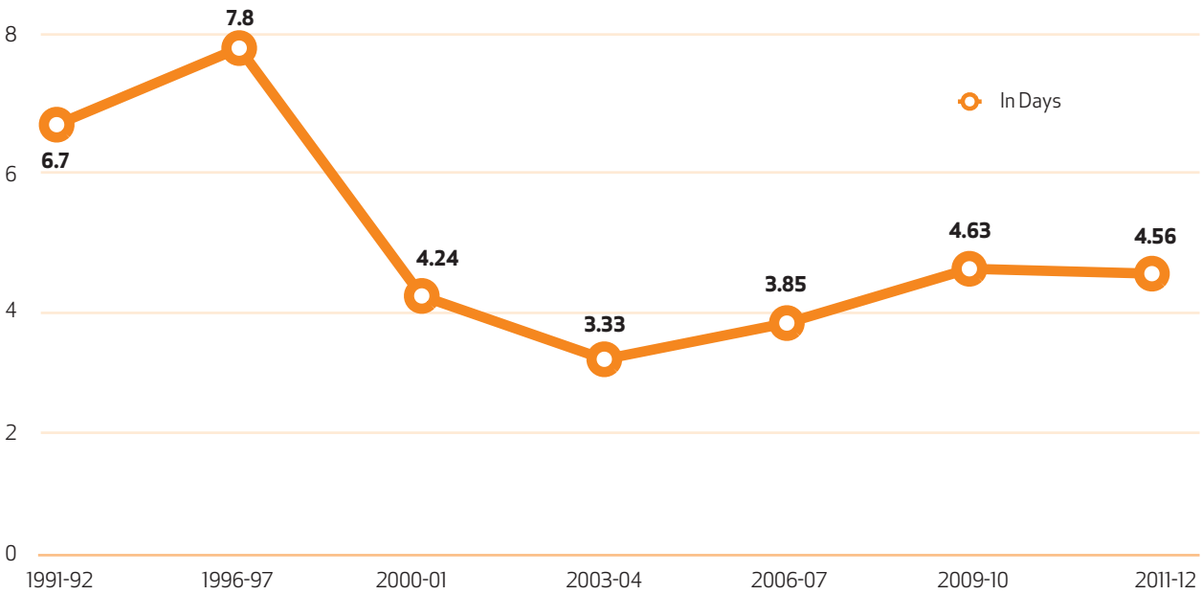
SHIPPING

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. However, the share of coastal shipping in India's domestic transport is miniscule, despite the various benefits it offers. Coastal shipping provides an energy-efficient, environment-friendly and economical mode of transport, and is a crucial component for the development of domestic industry and trade. It has been estimated by the Working Group on the 12th Plan that the potential cost of carriage by coastal shipping is Rs 0.25 per tonne km, as compared to Rs 1.20 by road and Rs 0.60 by rail. However, the cost efficiency is not realised due to insignificant volumes and inefficiencies of first/last mile connectivity.

INDIAN SHIPPING TONNAGE The Indian shipping fleet, which possessed 94 ships with a total tonnage of about 0.37 million Gross Tonnage (GT) in 1950-51, at the beginning of the 1st Plan, grew significantly till the end of the 6th Plan, registering a CAGR of 4.6 per cent and 9 per cent for Indian fleet and Indian tonnage respectively. However, in subsequent years, there have been fluctuations in growth, with number of ships and total tonnage declining and then again showing improvement in the post-liberalisation period. In 1992, the shipping fleet possessed 441 ships with a total tonnage of 6.3 million GT which increased to 1,154 ships and 10.4 million GT in 2012, indicating a CAGR of 4.9 per cent and 2.6 per cent respectively.

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Figure 2.18
Average Turnaround Time for Major Ports



Source: Ministry of Shipping (2012).

In 1950, the share of coastal shipping tonnage in the total tonnage was as high as 57 per cent, but it showed a steep decline to reach a mere 8.7 per cent in 1990. In 2012, the share of coastal shipping tonnage increased marginally over the previous year to 10.4 per cent, while overseas tonnage constituted 89.6 per cent.

The average tonnage per vessel for coastal shipping in 1950 was 2,900 GT. This increased slightly to 3,220 GT by 1990, but it declined considerably to just 1,390 GT by 2012. In the case of overseas shipping, the average tonnage per vessel, which was 7,260 GT in 1950, increased significantly to 21,500 GT in 1990, and further to 26.700 GT in 2012.

However, the share of the Indian fleet in the carriage of the country's overseas trade has declined steeply in the last seven years. In 1990, the Indian fleet's share was as high as 35.5 per cent of the overseas trade, and the balance was carried by foreign vessels. But by 2011-12, the Indian flag share was only 10.9 per cent.

AGE STRUCTURE OF INDIAN TONNAGE In 1993, the age of around 12 per cent of the Indian fleet was below five years, 49 per cent between six and 15 years, and only 15 per cent above 20 years. But by 2012, about 39 per cent of the fleet was above 20 years of age, and only 25.6 per cent below five years. In 2011, 50 per cent of the world tonnage was less than nine years of age.

INLAND WATER TRANSPORT (IWT)

Inland waterways in India are underdeveloped as a mode of transportation, despite their inherent advantages of fuel efficiency, environment friendliness, hinterland connectivity to less-developed rural regions, and its capacity to shift large volumes of cargo from congested roads. Development of IWT can substantially reduce accidents as well as address the growing carbon footprint. India has 14,500 km of navigable waterways, including rivers, backwaters and canals. A significant proportion of this, stretching over 5,200 km of rivers and 485 km of canals, are suitable for mechanised transportation.

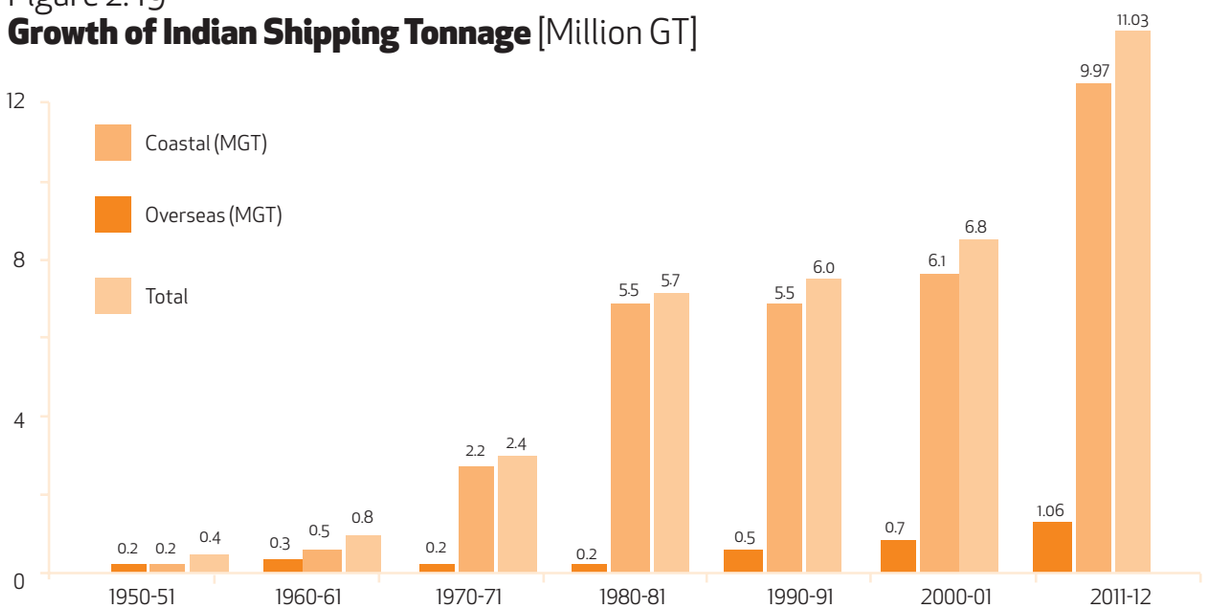
IWT did not receive adequate focus till the 6th Plan when the National Transport Policy Committee (1980) recommended setting up of the Inland Waterways Authority of India (IWAI). The Authority, set up in 1986, was charged with the responsibility of the development of National Waterways and provided the much required boost to IWT.

At present, there are five National Waterways, NW1—River Ganga (1,620 km), NW2—River Brahmaputra (891 km), NW3—West Coast Canal (205 km), NW4—Kakinada to Puducherry Canal System along with Rover Godavari and River Krishna (1,095 km), and NW5—the Brahmani and Mahanadi delta along with the East Coast Canal (623 km). River Barak is likely to be declared as the sixth NW. Besides National Waterways, several other waterways are extensively used for IWT; this includes Goa Waterways for transportation of iron ore for export, and Mumbai Waterways for coal, steel, etc.

CARGO MOVEMENT The total cargo traffic handled by IWT rose from 1.5 BTKM in 1999-2000 to 2.82 BTKM in 2005-06, a CAGR of 11.1 per cent. Traffic further increased to 4.77 BTKM in 2011-12. Bulk of this traffic is moved through Goa and Mumbai

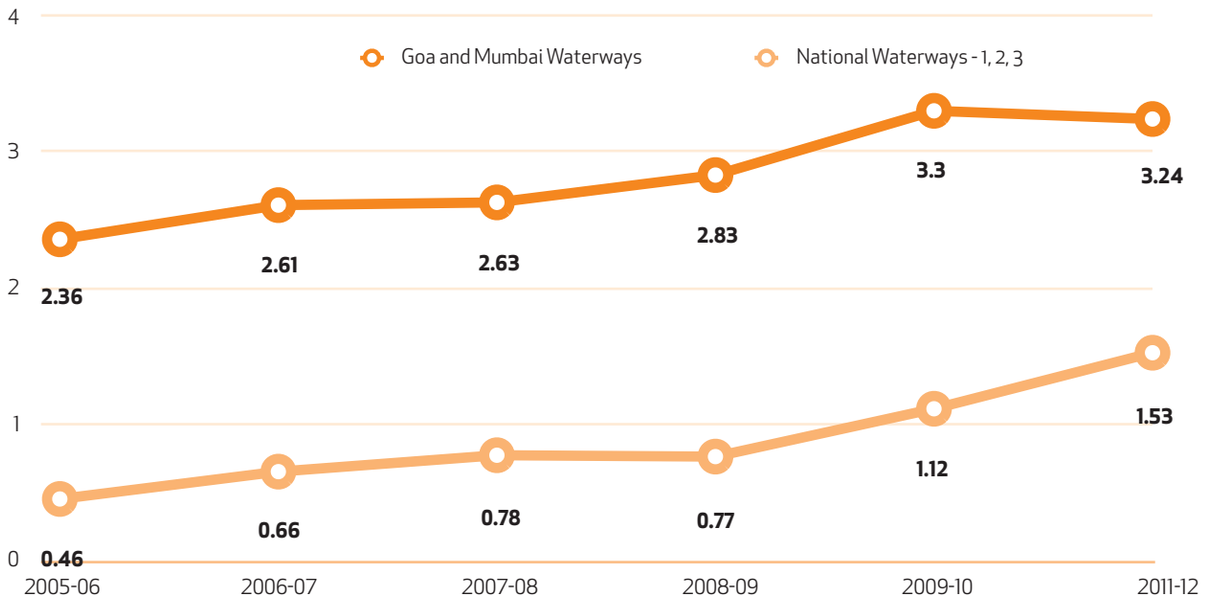
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Figure 2.19
Growth of Indian Shipping Tonnage [Million GT]



Source: Indian Shipping Statistics, 2012.

Figure 2.20
Cargo Movement On Goa and Mumbai Waterways vis-à-vis National Waterways [BTKM]



Source: NTDPC (2011).

Waterways which together contributed as high as about 84 per cent of the total IWT traffic in 2005-06. The combined share of the two waterways showed a modest decline to around 68 per cent in 2011-12. Meanwhile, cargo movement on National Waterways 1, 2 and 3 exhibited a high CAGR of about 22 per cent, from 0.46 BTKM in 2005-06 to 1.53 BTKM in 2011-12. Waterways in the North East are potential sources to focus on; this will also facilitate establishing strategic linkages in the region.

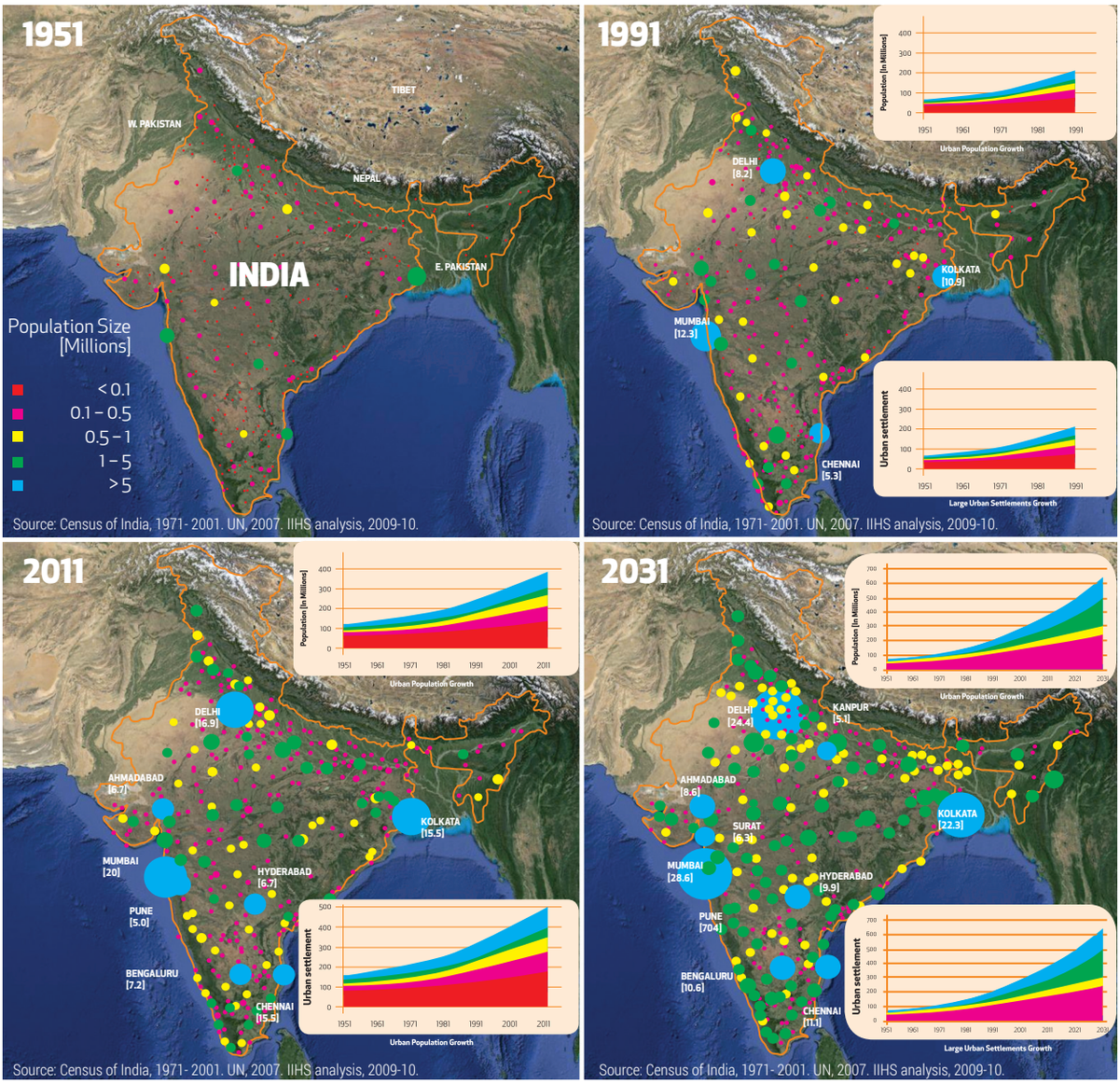
URBAN TRANSPORT

The development of cities largely depends upon their physical, social, and institutional infrastructure. In this context, the importance of urban transportation is paramount. However, this has been a victim of ignorance, neglect and confusion. As far as the public transport system is concerned, dedicated city bus services operate in only a few cities.

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Figure 2. 21

Geographical Dispersion of Urban Growth Areas and Projections for 2031



Source: IIHS (2011).

India has been slow to urbanise. As of 2011, 32 per cent of India's population is conservatively classified as 'urban'. This is much lower than in other major developing countries for example, 45 per cent in China, 54 per cent in Indonesia, 78 per cent in Mexico, and 87 per cent in Brazil. However, all these countries have much higher per capita incomes.

Still, India's urban population concentration in larger Class 1 (100,000+) and million-plus cities has been steadily increasing, leading to greater challenges in urban transport. As presented in Table 2.22, the percentage of the urban population living in Class I towns has steadily increased from 26 per cent in 1901 to 69 per cent in 2001.

According to the 2011 census, a total of 468 Class I urban agglomerations/cities are believed to constitute more than 70 per cent of the urban population. Given that the issues of urban transport and private vehicle use are essentially concentrated in larger cities, this is an important base trend for projecting urban transport requirements.

Cities have witnessed increasing usage of private vehicles because they are yet to develop adequate public transport systems to meet increased travel requirements. Since 1991, the total number of registered motor vehicles has gone up from 21.4 million to 141.8 million, a more than sixfold increase. Two-wheeler private transport has gone up from 14.2 million to 101.8 million, a rise of more than 13 times (Figure 2.22).

Among the 53 million-plus cities as on March 31, 2011, Delhi had the largest number of registered

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Table 2. 22
Trends in Urban Population Concentration

CENSUS YEARS	NO. OF TOWNS BY SIZE CLASS							PERCENTAGE OF URBAN POPULATION BY SIZE CLASS						
	I	II	III	IV	V	VI		I	II	III	IV	V	VI	VI
1901	24	43	130	391	744	479		26.0	11.2	15.6	20.8	20.1	6.1	6.1
1911	23	40	135	364	707	485		27.4	10.5	16.4	19.7	19.3	6.5	6.5
1921	29	45	145	370	734	571		29.7	10.3	15.9	18.2	18.6	7.0	7.0
1931	35	56	183	434	800	509		31.2	11.6	16.8	18.0	17.1	5.2	5.2
1941	49	74	242	498	920	407		38.2	11.4	16.3	15.7	15.0	3.1	3.1
1951	76	91	327	608	1124	569		44.6	9.9	15.7	13.6	12.9	3.1	3.1
1961	102	129	437	719	711	172		51.4	11.2	16.9	12.7	6.8	0.7	0.7
1971	148	173	558	827	623	147		57.2	10.9	16.0	10.9	4.4	0.4	0.4
1981	218	270	743	1,059	758	253		60.3	11.6	14.3	9.5	3.5	0.5	0.5
1991	200	345	947	1,167	740	197		65.2	10.9	13.1	7.7	2.6	0.3	0.3
2001	293	401	1,151	1,344	888	191		68.6	9.67	12.2	6.8	2.3	0.2	0.2
2011*	495	NA	NA	NA	NA	NA		58.9	NA	NA	NA	NA	NA	NA

Class I: Greater than 1,00,000 population
Class II: 50,000 – 100,000 population
Class III: 20,000 – 50,000 population
Class IV: 10,000 – 20,000 population
Class V: 5,000 – 10,000 population
Class VI: less than 5000 population

Source: Various Census Reports.
Note: * Provisional.

motor vehicles (7.2 million), followed by Bengaluru (3.8 million), Chennai (3.5 million), Hyderabad (3 million) and Pune (2.1 million). The five largest cities accounted for 49.3 per cent of the total registered motor vehicles of these 53 cities. Delhi's registered motor vehicle population exceeded the combined vehicle population in Chennai, Kolkata, Lucknow and Mumbai.

Over the last decade or so, the vehicle ownership rate (number of vehicles per 1,000 people) in metropolitan cities has seen a significant rise. Five cities have rates in excess of 500 as per the Road Transport Yearbook 2009-10 and 2010-11. Nearly 28 per cent (39.7 million) of the total vehicles in the country (141.8 million), are in million-plus cities alone. In 2011, with nearly 17 million vehicles, four big cities—Delhi, Bengaluru, Chennai and Hyderabad—alone constituted 12.3 per cent. Delhi, which has around 1.4 per cent of the Indian population, accounts for nearly 5 per cent of all motor vehicles. According to the statistics provided by the Ministry of Road Transport and Highways, the annual growth rate of motor vehicle population in India has been around 10 per cent during the last decade.

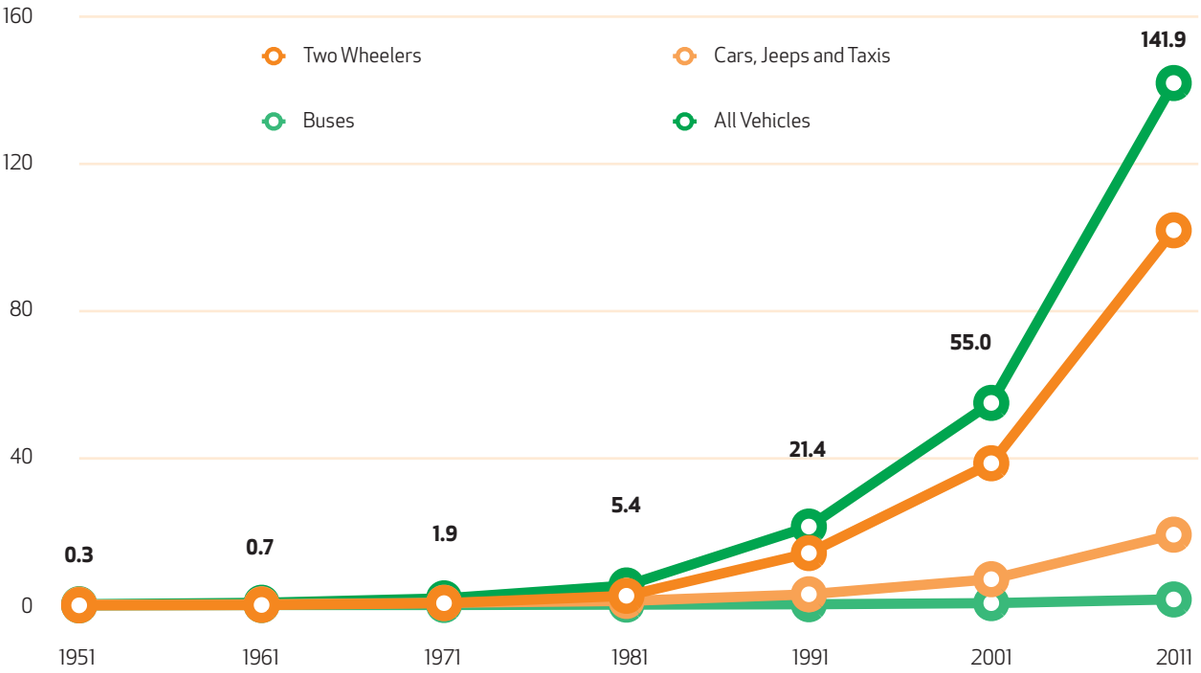
Analysis of data on vehicles registered in India reveals that the share of buses has declined to 1.1 per cent of all registered vehicles in 2011 from 11.1 per cent in 1951. The decline has been particularly rapid in the last decade from 2000 to 2011, when the growth in two wheelers and cars was significantly higher across metropolitan cities. As a case in point, the number of cars in Delhi increased at an annual rate of 9 per cent whereas number of buses grew at only 1 per cent during 2000-09.

RECENT INITIATIVES

Urban transport essentially is a state and local government responsibility. Except for the national capital, and a few metro rail projects—Kolkata, Delhi, Bengaluru, Jaipur, etc.—most urban transport sys-

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Figure 2. 22
Growth of Registered Vehicles In India
[Millions]



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

tems and interventions are funded and owned by state governments. National intervention in the sector has been quite recent with a particular fillip provided through the JnNURM programme launched in 2005 and the National Urban Transport Policy announced in 2006.

The JnNURM programme attempted to improve the public transport system in larger cities through funding of public transport buses, development of comprehensive city mobility plans and supporting city transport infrastructure projects. As of December 2012, 15,388 buses at a cost of more than Rs 47 billion in 64 cities had been funded under the programme. This has led cities to develop new bus services. Bus rapid transit projects have been initiated in 10 large cities. Some cities have also used central funding to improve traffic management. However, in the medium and long term, public transport in cities will have to remain a local body responsibility and new ways to develop self-financing and sustainable public transport systems have to be developed.

KEY ISSUES

The NTDPC has been charged with identifying a set of policy strategies for developing transport infrastructure over the next 20 years. The aim is to ensure that adoption of these strategies results in infrastructure that supports the desired pace of India's economic transition, social and economic development, and other goals as articulated in greater detail in subsequent chapters. Consequently, it is useful to conclude this chapter on the historical trends in Indian transport by drawing together the lessons apparent from the manner in which infrastructure has developed in the past. Though grounded in history, most of these lessons will continue to hold major import for the future of transport in India.

Rather than address modal-specific issues that are dealt in greater detail in relevant chapters later, the focus here is on overall planning, institutional arrangements, governance and execution issues that are universally applicable across sectors, and are critical contributors to a well-functioning transport system. The record of issues and lessons drawn below is essentially an upshot of a broader and deeper analysis of what went wrong rather than right. However, with every issue stemming from multiple causes, and with complex dynamics between the issues, there is some natural and unavoidable overlap.

INTERCONNECTED, HIERARCHICAL TRANSPORT NETWORK

The existing Indian transport network is a natural consequence of the somewhat disjointed executive decision making process that has been characteristic of our transport planning approach over the years. The result is a far-from-optimal modal mix.

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In general, the importance of intermodal connectivity has not influenced the development of India's transport network enough. Examples are imports lying in ports due to inadequate trucking and rail capacities, and the serious lack of 'last mile connectivity'.

What is desirable is an integrated network that facilitates seamless transport of passengers and freight alike, across modes, while also allowing natural mapping of freight/commodity types with appropriate modes of transport. What is needed is an efficient network with interchange points that receive short-haul smaller cargo volume from roads from the hinterland for aggregation and then provide longer-haul rail transport of vehicle loads forward to ports, industries and the like and vice versa from ports into urban centres through disaggregation. Similarly, movement of medium- and long-haul coal should necessarily be through more suitable rail rather than road. This puts things in perspective when the need to match cargo category with right transport mode is emphasised.

Clear and stable network standards reduce operational uncertainty and transaction costs, and raise the productive efficiencies of transport services deployed on the network. Similarly, networks that span various geographies—local, regional, national and international—should also be mutually coherent. It is of little use having efficient cars built for smooth roads and stringent fuel standards in a city, when they must also contend with vicious pavement and poor fuel outside city limits.

Having noted the broad existing deficiency of the Indian transport network and certain desirable traits, a greater inquiry into what has gone wrong in the evolution of India's transport system is useful. Network enhancements have been all too frequently driven by political rather than business or even social welfare considerations, resulting in haphazard and inefficient route expansion. Underused and uneconomic railway spurs in favoured political constituencies have diverted much needed resources from capacity augmentation projects on key trunk rail routes. These have often been misleadingly motivated on 'equity' rather than socio-economic basis. These are honourable and essential considerations for inclusive growth. However, a much more efficient overall transport network could have resulted if holistic planning led to universal connectivity via roads that link villages to bigger towns that are in turn are situated on economically viable railway lines.

So far, little emphasis seems to have been paid to the idea that throughput of a network is only as strong as its weaker links. Capacity augmentation has sometimes only resulted in pushing bottlenecks to elsewhere in the network. New road and rail links have been attached to existing highways and rail routes without increasing capacity on the existing trunk infrastructure. In cities, flyovers and road widening programmes result in urban highways that carry vast flows of traffic capably, but also create choked intersections where highways meet other urban roads. Moreover, encouraging fast intra-city traffic also results in safety hazards.

Perhaps the biggest example of the lack of holistic planning is seen in the volume of goods and passengers that have been wrested away from the railways by road-based alternatives. Given the better economic and environmental value proposition of the railways, this decline in market share has not been the result of direct policy action. If anything, responsibility may be assigned to policy inaction over the years, as rail capacity has not been installed fast enough to keep pace with the growing economy and its structural changes. Whereas the unprecedented policy focus towards expansion of the national highway system during the last decade was on the right track, a more holistic network approach that would consider road and rail networks concurrently would have been more helpful.

In general, the importance of intermodal connectivity has not influenced the development of India's transport network to the degree it should have. Imports languish at ports for want of adequate trucking and rail capacities to assist in their removal to the hinterland. The oft-quoted 'last mile connectivity' issue is one manifestation of this problem. And the usability of mass rapid transit systems is reduced when the walk along vehicle-friendly streets from home, office, school or shopping centre to metro station or bus stop is inconvenient, arduous or dangerous.

Conscious choices will need to be made on the priorities to be placed on investments across transport modes. This calls for some judgment on the normative modal shares desired. Any transport network strategy will have to be necessarily embedded in the planning process at all levels, so that naturally sensible plans result for prioritising allocation and spending of limited resources. The fundamental idea is synchronisation and not modal competition, as the desired end state would be an integrated system where transport modes efficiently complement one another, resulting in reduced overall cost of transport.

Fortunately for India, a significant part of the logistics network is still to be built. So the country can make up for past inadequacies and use the opportunity to shape its future transport infrastructure network to an increasingly desirable state.

BOTTOM LINE India must adopt a holistic approach in designing integrated transport networks. Hierar-

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chical connectivity, intermodal access and fit-for-purpose network standards should be emphasised. Network expansions and capacity enhancements must be assessed for their impact on the existing network, and within and across networks. With substantial logistics infrastructure yet to be built, India can still make amends to reach a more desirable and efficient state for its transport system.

CAUSALITY AND TIMELINESS

It is frequently noted that the demand for transport services is 'derived' from the demand for other goods and services. The demand for food in cities creates need for trucking services to haul in grain from the hinterland. However, the derived nature of the demand for transport does not mean that the causal relationship is one-way. Causality flows the other way too: the creation of transport infrastructure and services opens up new vistas and opportunities, and creates and strengthens markets for other goods and services.

As noted at the beginning of this chapter, American railway and canal investments gave rise to entire cities and revitalised life in others. The Interstate highway network that criss-crosses America was an infrastructure idea conceived for other purposes and well before its time had come. These roads are now the pulsing arteries that knit together a vast country and effortlessly support the logistics of the world's largest economy. Closer home, the Western DFC and the piggybacking Delhi-Mumbai industrial corridor will give rise to new industrial areas, inland ports, logistics parks, and rewire the economic landscape—from agricultural to industrial—of a catchment area that is expected to extend 100 km on either side of the corridor. Similarly, the construction or improvement of a rural road can significantly change the educational, healthcare and economic opportunities available to the village's inhabitants. The ambitious PMGSY launched in 2000 to provide all-weather access to unconnected habitations in rural areas has achieved considerable success.

However, we have largely tended to see only one side of the coin, creating transport infrastructure to service existing markets, perhaps allowing for a measure of growth. As a general rule, infrastructure investment has been reactionary rather than anticipatory. Roads have been widened when existing lanes are stretched to capacity. New ports have been built when ships wait at sea for days to berth at existing ones. Mass rapid transit arrived after population and economic growth had slowed intra-city movement to a crawl. Roads receive maintenance after they are already flooded or potholed. The point here is that India's approach to transport infrastructure has been narrowly focused on fixing problems at the margin rather than on defining and executing a grand comprehensive vision for the future where transport clears and paves new routes to opportunity and prosperity.

India has been creating transport infrastructure to service existing markets. As a general rule, investments have been reactionary rather than anticipatory.

Causality's cousin is timeliness. It is true that India has devoted less effort than it should have to maintenance relative to new construction. Rehabilitation requires far more substantial financial resources than preventive measures do. Importantly, preventive maintenance also imposes lower indirect and opportunity costs since the citizenry and government are less likely to have to contend with catastrophic failure, or with the decommissioning of important links in the network for lengthy periods of time.

It is not just maintenance that benefits from timely action. Anticipatory construction can often be easier, cheaper and faster to accomplish than the reactive kind. If it is known with reasonable certitude that an Indian city will grow rapidly over the next generation, action to plan appropriate urban transport options should be taken well in advance. By forming a cornerstone element of a city's master development plan, attempts can be made to match pro-active plans for transport infrastructure consistent with planned land use. In contrast, the reactive Indian method forces new transport infrastructure to conform to sub-optimal alignments, demands the deployment of expensive tools to avoid inconveniencing or displacing people, and requires costly programmes to re-engineer existing ill-planned land use.

Of course, it is essential to acknowledge the dangers of excessive stargazing. In the absence of market signals, governments are notoriously bad at ultra-long-range planning exercises. There are no guarantees that pre-emptive construction of transport infrastructure will actually lead to a subsequent boom in economic activity, or that the anticipated motivating factors will actually materialise. There are several examples of infrastructure white elephants around the world that attest to this. Building it and hoping that they will come is also a recipe for unproductive and wasteful over-investment, as has been the Chinese experience in certain areas. Fixed infrastructure, once created, is essentially irreversible and can lock cities and countries into unsuitable or undesired growth straitjackets. Finally, it is almost certain that today's technologies will be superseded by better options and that hindsight will prove today's choices to be less than optimal.

However, these caveats should not serve to circumscribe or abandon the advance planning process. Instead, when set against the advantages noted above, they highlight the inherent difficulties of

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Infrastructure should be programmed in anticipation of future demand. It is frequently easier, cheaper and faster to do so than post hoc construction that increases capacity in the margins. Maintenance should be pre-emptive, not rehabilitative, and the system capable of dynamic responses to changing situations.

long-range planning, and underscore the importance of building human capital and institutions that can appropriately account for these pitfalls when devising long-term anticipatory transport infrastructure plans. It is essential to build into the planning process choices that need to be made as conditions change in the future.

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

REBALANCING AND CAPACITY

As mentioned before, certain issues which might otherwise need separate enunciation could still present some natural overlap with others. Rebalancing of the modal share of Indian Railways is one such conundrum that needs to be discussed along with the need for intermodal access and holistic planning. The share of railways in freight transport which forms the backbone of railway revenues (tonne km) is estimated to be about 33 per cent as against 67 per cent share of road transport. The railways' share of freight traffic is close to 50 per cent in large economies like US and China. Trunk rail routes which form just about 16 per cent of the network are dangerously oversaturated, with the bulk running at 80 per cent, and several in excess of 120 per cent of their design capacity. Other operating challenges for the railways are today typically characterised by deficient availability of rolling stock and the power to haul, mismatch between capable speeds of locomotive and the wagons, heavy terminal detention of rolling stock, and empty haulage of rakes due to scarce maintenance.

Indian Railways still has a huge throw forward of projects. The various initiatives envisaged such as for capacity augmentation, throughput enhancement, port connectivity works and upgradation of permanent way, are plagued by procedural delays; a majority of them are running behind schedule. A recent measure that allowed intensive asset utilisation through enhanced axle loading has only helped overstretch the current infrastructure, bringing into focus its long-term sustainability. Apart from difficulties arising from the current organisational structure of the railways, and political exigencies, the railways establishment has been less than agile in responding to the challenges arising from higher economic growth.

Attempts to harness private investment through Public-Private Partnership arrangements have not materialised as envisaged. Setting up of locomotive manufacturing facilities, and initiatives to recapture the road traffic such as development of multimodal parks and roll-on-roll-off facility to provide door-to-door multimodal service are in preliminary stages and yet to manifest any measurable advantage.

There is a pressing need for a strategic long-term decision in favour of investment in railways over the next 20 years for desired capacity augmentation and modernisation of the rolling stock while achieving a certain balance between the two dominant modes. Importantly, any effort for railways to reclaim their lost business share should be viewed as an attempt to enhance the productivity of the transport network itself and not as a competitive onslaught. The rebalancing should be based on closely coordinated investment decision making which should aim for a more efficient modal mix that provides for a sustainable, economical and regionally-balanced transportation system.

Infrastructure, and within it transport as a sub-category, has witnessed a high-funding priority in the last few years. Despite this, commensurate increases in the capacity of physical transport infrastructure have not yet fructified. Infrastructure is also often built for reasons other than to enhance capacity, such as to improve connectivity, for national security, nation-building, and so on. While this is important, another relevant dimension of infrastructure investment is that new transport infrastructure or capacity additions needed to meet growing demand, are often indivisible, entailing lumpy investment.

In such situations, capacity cannot be gradually increased pari passu with demand, but only in large amounts at considerable intervals. Because they are typically lumpy, these decisions to invest or otherwise can have a significant impact on the economy as opportunity loss in the short run, and in determining how the competitive environment evolves in the long run. Concurrently, mistakes in the form of overly aggressive or poorly sequenced capacity additions can result in excess capacity resulting in irre-

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versible sunk investment as well as opportunity cost to the public exchequer.

At the present time, significant capacity constraints exist across sectors. The processing of cargo at India's ports is amongst the slowest in the world. The grim situation in the railways has already been discussed. Notwithstanding the NHDP-sponsored improvements in highway infrastructure, a truck travelling the 1,400 km between Delhi and Mumbai spends four days on the road, at an average operational speed of under 30 kmph. However, private participation in several major metro airports has dramatically improved aviation capacity.

The situation is less clear-cut with respect to urban transport. Capacity limitations vary from city to city, and from one transport mode to another. The absence of good data is also a problem. Rising car ownership and declining rates of walking and cycling have placed severe pressure on urban roads. Municipal bus services are often in short supply or entirely missing from urban areas where they are much needed. Private shared taxis, vans and other para-transit modes often effectively substitute for a more organised public transport system. This is interesting in that the capacity considerations have more to do with operational and service delivery issues rather than with the underlying physical infrastructure. For example, expensive investment in mass rapid transit projects in the larger cities is often made without adequate examination of much cheaper alternatives.

The immediate consequence of constrained capacity is delay. This translates into strangled economic activity, attended by pointless congestion and environmental pollution. Capacity shortages can also be self-reinforcing, and costly in themselves. Over-used fixed infrastructure is more prone to wear and tear, requires more diligent maintenance, and more frequent rehabilitation. These activities can intermittently remove some pieces of infrastructure from service, exacerbating the capacity problem.

Despite the recent government focus on transport investment, there is a disconnect between the funding applied and capacity improvements achieved. Easy answers may lie in the observation that execution has been wanting, with funding leakages, tardy construction, quality compromises and missed maintenance. There is undoubtedly some truth to each of these, but they explain only a part of the disconnect. The bigger and more direct answer lies with the fact that capacity augmentation, particularly where it was needed, has not received the needed investment. Whatever additions to infrastructure took place essentially helped increase the transport footprint, not necessarily resulting in capacity improvement.

The capacity of a transport network is the product of three factors: the installed physical infrastructure itself; the intensity of use of the infrastructure; and the topology or 'shape' of the network in the context of the demographic, economic and physical geography of the nation. The first item on the list is uncomplicated: more is better. However, the kind of 'more' that is installed is important. Track-kilometres can boost rail network capacity more than route-kilometres, as can lane additions when compared with new roads.

Intensity of use increases with operating, commissioning or permitting a higher frequency or speed of transport service on the fixed infrastructure, and from improvements in technology or operational management. For example, there has been only around 20 per cent growth in rail route kilometres over the past 60 years, to which we can add a significant amount of track doubling. With gauge standardisation, more trains, longer and heavier ones, and better signalling and scheduling, passenger and freight traffic has increased 1,400 and 1,300 per cent respectively over the same period. (But even this increase has not been enough to stem the slide of traffic mode share to road-based alternatives.) Similarly, the port sector has been able to achieve higher cargo throughputs both by building new infrastructure, and by achieving higher throughputs per berth-hour. On both fronts, however, there is substantial room for improvement.

Cargo processing at India's ports is among the slowest in the world. The situation in the railways is grim. A truck travelling 1,400 km between Delhi and Mumbai, spends four days on the road, at an average operational speed of 30 kmph.

Institutional factors also influence the intensity of use of physical infrastructure. Slow customs clearances can dramatically decrease capacity at ports. Internal borders can be just as unforgiving as international ones. By some estimates, the languid four-day sojourn of the Delhi-Mumbai truck is because considerable time is spent at inter-state borders having cargo inspected, permits verified, papers stamped and taxes collected.

Finally, the capacity of a network is contingent on the capacities of all the individual links and nodes within the network to process passengers and freight. For example, the capacity of an air link depends on the throughput of airports at both ends of the link. The capacity of a highway system is derived both from the trunk routes on the network, as well as the efficiency of junctions and bridges, and the capacity of feeder roads. And from the inter-modal network perspective, the capacity of shipping infrastructure also depends on rail and road links.

This is not to say that the capacities of all links and nodes within a network are equally important. Clear-

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Railways, though a more reliable and energy-efficient mode, have been losing out to roads for long want of capacity augmentation. Investment focus has largely been on new and sometimes unhelpful infrastructure creation.

ly, capacities on trunk routes are more meaningful for overall network capacity. Second, the gross capacity of a network is not concomitant with its size. The major lesson from this reasoning is that not enough funding and effort has been devoted to those critical pieces of infrastructure—such as trunk routes, junctions and intermodal nodes—that have maximal impact on capacity.

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

FUNDING

Transport conforms to the classic characteristics of a public good to a large degree. Subject to capacity, it is non-rivalrous. On the flip side, positive consumption externalities mean that, conditional on a (usually subsidised) price, it is Pareto-inefficient to exclude any would-be consumers even if it is possible to do so. It naturally follows that government spending has historically accounted for the bulk of investment in transport.

ROADS

At the simplest level, roads provide basic accessibility to the rest of the world. No other piece of transport infrastructure can replace the street outside one's home. Consequently, it is sensible that sources for road funding are principally commitments from gross budgetary outlays, though these may stem from earmarked revenue streams, taxes and cesses, dedicated road funds, or special development programmes such as the PMGSY. The desirability of universal accessibility on developmental and nation-building grounds motivates budgetary funding for roads as a redistributive tool. However, to a significant degree, the benefits from road use accrue to private agents, be it from the transport of goods to market or the movement of people for work or leisure. As such, after accounting for all positive consumption externalities, this offers good economic support for more direct funding of road infrastructure from fuel taxes, vehicle registration fees, and the like.

AVIATION

Small numbers of people and quantities of valuable freight can be whisked across the world rapidly via air. Aviation has long featured a user-pays model. Passenger, fuel, service and luxury taxes are used to pay for the lion's share of fixed infrastructure and ancillary services like air navigation. In an increasingly globalised economy, however, spillover benefits from better air links with the rest of the world, and the importance of aviation in connecting remote locations both constitute excellent rationale for greater funding from the public purse.

PORTS

Finance for port infrastructure for Major Ports is essentially from their internal resources and user charges, though some budgetary support from the government helps in creating essential common infrastructure. In recent years, in the case of minor ports that are directly under the state governments, the infrastructure has been largely funded by the private sector. Though India has a long coastline, it has relatively few suitable natural harbours. The scarcity of options and the critical importance of ports in an increasingly globalised world indicate that future investment in ports requires a strategic approach that better accounts for the corresponding investment required for efficient hinterland connectivity. A progressive shift to the landlord model of port governance would help induce greater private capital, but significant investments, particularly in common infrastructure such as drafts and hinterland connectivity, will have to continue to be funded through public resources.

URBAN TRANSPORT

Urban transport suffers from having too many and too few parents. Barring central funding under a few dedicated schemes such as JnNURM, urban transport is largely a state prerogative, and is funded from state budgets and farebox collections that are not always earmarked. Some states have devolved responsibilities to local authorities; others generate master plans for all urban areas in state capitals. The lack of clear funding lines, and matched spending and revenue authorities, leaves some aspects of urban transport entirely neglected and others subject to unnecessary duplication.

RAILWAYS

The overwhelming historical dominance of the railways in fiscal affairs led to the unique distinction of the railways' financial statements being presented separately from those of the general government. This is an idea of the past. Railway plans have, since the late 1950s, been essentially financed by a mix of internal and gross budgetary resources, with GBS consistently growing from 34 per cent during the 1st Plan (1957-62) to 75 per cent by the 5th Plan, as share of internal resources declined proportionately. Beyond the 5th Plan, the financing pattern reversed, with greater allocation through internal resources, reach-

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ing close to 60 per cent by the 8th Plan, while market borrowings additionally contributed about 18 per cent. Since the 9th Plan, the GBS in railway Plan funding has again grown to dominate, as internal resources struggle to meet mounting operating expenses, a trend which needs to be reversed. The generation of internal resources is today seriously affected by the limitation of railways to rationalise fares and freights due to political constraints.

Modern rail budgets further cloud matters. Important strategies for modernising the railways, such as statements of action on expanding capacity and skilling staff are lost amidst the detail of the announcements on new trains, stations and routes. The separate budget presents a curious situation. On the one hand, it is subject to extreme visibility and scrutiny. On the other, little or no progress has been achieved towards modernising the accounts to present a true picture of the multitude of subsidies that riddle the system, and the operational investment criteria. It has become difficult to compare spending on the railways with other government priorities, much less with funding for other transport modes.

The popular romantic view of the railways in India is that rail is somehow 'different'. The vast network is accessible physically and financially by nearly everyone and constitutes democracy itself. From this lens, Indian Railways is a nation-building social service that should not be held accountable to business criteria. This is fallacious. As things stand, the railways' funding model of cross-subsiding passenger fares from freight revenue is not sustainable. It has led to the steady erosion of freight traffic share to the roads, at substantial environmental cost. Shaky finances have left little for sustained programmes of capacity or safety enhancements, or improvements in service delivery, at substantial social cost.

THE LESSONS

While transport infrastructure should remain a priority for public finances, there is as much a need for boosting private investment to fill the gap. There has always been tension between the private and public funding of infrastructure projects. Indeed, new transport networks that initially accompanied the industrialisation process around the world were often a product of private enterprise. Private companies built much of the first railway, canal and urban transport networks around the world, including in India. However, many private infrastructure projects often had to be later bailed out by governments later.

For most of the 20th century, much of the transport infrastructure around the world was built in the public sector. However, beginning in the 1980s and 1990s, there was a new trend towards private investment in infrastructure. In the economic liberalisation of the past two decades, India has followed this trend and allowed private participation in air and maritime

India has allowed private participation in transport, sometimes even inviting full private funding. However, areas like the tendering process, land acquisition, project monitoring and service pricing need strengthening.

ports, and roads that are made 'private' through price excludability. Attempts are even being made to invite full private funding for mass rapid transit projects. However, there are areas such as the tendering process, land acquisition, project monitoring and service delivery pricing, that need further strengthening.

Further, for most of the period in question in India, the government has been involved in service delivery. Strong economic arguments exist for the government to provide the underlying infrastructure network, but less for the public sector to be involved in the operation of transport services.

Free from competitive forces or the discipline of market pricing, public sector-supplied transport services have often been inefficient and wasteful. Natural price discovery through healthy market competition is typically known to result in greater operational efficiencies and improved service delivery, and this needs to be encouraged. At absolute levels, perhaps the most that can be said is that the private sector's resources must be harnessed even more than they have.

The big lesson to draw from the snapshots of funding models presented for each mode is that the sourcing of public funds can be improved substantially to provide a better match between incidence of costs and benefits. Conditional on externalities and redistributive goals, matching cost and benefit is a sound economic principle in ensuring that the price, quantity, and quality of infrastructure are optimised.

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

PRICING

The market for transport services is characterised by externalities, natural monopolies, bi-directional causality with the wider economy, and a neces-

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sary role for government as investor and regulator. 'Correct' pricing in the context of these market failures is difficult. Yet, given transport's large, unique, and both direct and indirect roles in the economy, setting good pricing policy is of the utmost importance. Good pricing is simple, clear, prevents market distortions, guides consumption and investment decisions appropriately, and is sustainable over the long run.

Better attempts must be made at establishing the true nature and extent of transport externalities, and the relative incidence of cost and benefit. Importantly, pricing of services must be depoliticised and set by independent regulatory authorities.

A complex web of subsidies, tariffs and taxation policies applies to transport in India. Adjusting the pricing of transportation is a standard tool for redistribution policy. Fuel is subsidised, ostensibly for agricultural relief, but has many unintended beneficiaries. More vehicle-kilometres are driven than would be if fuel was priced according to market forces. Demand has skyrocketed for diesel vehicles, with severe environmental implications, given the generally high-sulphur diesel fuel available in India.

Worse, the method and practice of setting the subsidy has become so beset by politics, that required adjustments are delayed until the fiscal implications become untenable, at which point they are made in large jumps, causing more pain at the pump as consumers struggle to adjust to hugely increased fuel outlays. Meanwhile, vehicle registration and parking fees are disconnected from the economic value of public resources that are used up. Freight tariffs cross-subsidise rail passenger fares, distorting both markets. Fare subsidies are available to a bewildering variety of passengers. Besides the child, senior citizen and military concessions found elsewhere, discounted rail travel is available to poor people, exam-takers, doctors and mountaineers.

Economic theory proposes that optimal economic efficiency occurs when costs and benefits are aligned and consequently considers cross-subsidisation to be a symptom of economic inefficiency that should be avoided. Such rate setting is accepted out of the belief that the social benefits created by such subsidisation outweigh the resulting economic inefficiency. Therefore, one cannot logically claim that cross-subsidies are uniformly good or bad. They are introduced to achieve certain economic, social and political ends. The argument against the application of a particular cross-subsidy is not an opposition to cross-subsidy per se, but rather on the judgment about the worthiness of those socio-political goals.

Taxes on aviation fuel and services are only loosely tied to economic fundamentals or any market characteristics that they are intended to correct. Indeed, aviation is taxed so highly that taxes and government charges comprise the major share of an airfare.
It is apparent that despite the important allocative role that prices play in transport markets, they are highly managed by government and are not informative for making market decisions. Better attempts must be made at establishing the true nature and extent of transport externalities, the relative incidence of cost and benefit, and how these fit in with the government's wider agenda. This understanding will result in sound economic reasoning for setting prices at particular levels. Importantly, pricing must be depoliticised and set by independent regulatory authorities. They should also be responsive to changing economic fundamentals in a timely fashion to minimise adjustment costs.

Beyond these basic changes, there is much room for pricing reform. Just as with airfares, dynamic pricing based on the time and date of travel and other market conditions could be suitable for the railways. Similar logic applies to higher pricing for car parking during busier times of the day. International experience suggests that the take-up of public transport is greatly enhanced when different transport modes within a city subscribe to a shared pricing structure and fare collection method. Further, consideration should be given to innovative pricing regimes such as congestion charges, even if these are not deemed immediately suitable for India.

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

URBAN TRANSPORT

Urban transport in India presents a significant challenge as India's urban population will continue to grow in the foreseeable future, as will the number of large cities. Since independence, a slow, steady urbanisation of India's population has taken place. Hundreds of villages have become market towns and centres of agricultural commerce for their hinterlands. Several small towns of the 1950s and 1960s have become large enough to qualify as prosperous cities in their own right. Meanwhile, the great metropolitan cities of yesteryear have become greater yet: vast urban conurbations, usually spanning multiple municipal or state jurisdictions.

At 62 million people, India's urban population was around 17 per cent of the total in 1951. Growing at

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about 2.7 per cent each year—a full percentage point faster than the rural population—the share of urban population is now just over 30 per cent, at 380 million. In 1951, there were 76 cities with a population exceeding 100,000 and only five large enough to be home to more than one million people. By 2011, 53 cities had a population larger than a million. Urban travel requirements have escalated significantly, leading to rapid rise in private vehicle ownership, given the inadequate development of public transport. Over the last decade, the vehicle ownership rate in metropolitan cities has grown by over 100 per cent.

While gauging the magnitude of the growing urban populace that needs to be served for its specific urban transport requirement is important, it is more worthy from a policy standpoint to build an overarching philosophy that guides a practical and sensible direction of urban transport development that is sustainable, rather than purely advocating arbitrary capacity creation or widespread pursuit of popular, yet not always effective urban transport projects. In this context, a policy framework that suggests better utilisation and maintenance of the existing urban infrastructure, building on current strengths, and regulation enforcement is needed.

Walking as a natural and effective commuting habit needs to be encouraged through safer and convenient walkways, particularly around congested hotspots. Most modern cities of the world are great walking cities. A clear framework of supply-side policy measures—such as one-way traffic system, infrastructure improvement, repair of footpaths and roads, reliable public transport and passenger information system—on one hand, and equally importantly, a demand-side gradualist approach of progressively introducing restraints on private modes and inefficient road use through organised feeder services, congestion pricing, parking fee, fuel tax and so on, on the other hand, are desirable.

Most cities have not adequately catered to or fully absorbed the consequences of the surge in their size and population. In briefly recounting the litany of issues that blight our cities, and the resultant impact on transport, it is useful to begin at the top of the pyramid with the absence of planned growth. Indian cities have lacked modern planning systems that make vital choices about where people of all incomes live, work and spend their leisure time. Planning is necessary to help link land use with urban flows.

A point that perhaps demands greater emphasis is the need to make better informed decisions while fostering specific public transport options so as to enable judicious use of limited resources. Provision of metros and other rail-based transit systems typically cost much higher as compared to other modes such as city bus/bus rapid transit system, and the current emphasis on it appears rather excessive. As

In urban transport, we need a clear framework of supply-side measures and an equally important demand-side gradual approach of progressively introducing restraints on personalised modes of transport, while strengthening public transport.

a comparison, a total expenditure of about Rs 43 billion was budgeted for procurement of buses under the JnNURM in the 11th Plan, while a single Delhi airport metro line cost about Rs 57 billion. A careful analysis is needed for efficient resource allocation.

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

GOVERNANCE AND INSTITUTIONS

We should examine how existing governance structures have failed to yield the desired 'network of networks': one that is extensive, robust, economically viable in the first instance, and offers seamless intermodal and hierarchical connectivity.

India's transport networks are governed by a multitude of institutions at all levels. There is a preference for the now internationally rare model of mode-based governance. At the central level, separate government ministries hold decision authority over separate transport modes. Within the purview of these ministries, there is a non-standardised delineation of responsibilities over various functional areas, such as investment, regulation, operations, maintenance and so on. Independent decision making at these mode-based ministries and then across the various functional areas results in uncoordinated policy, replication, inefficiencies and waste. The blurring of administrative lines under the multitude of authorities makes accountability exceptionally difficult.

State-level institutional authority primarily extends to roads that are not national highways, minor ports and urban transport. Given the close links essential between urban transport, land use regulations, and city planning and development, it is in this sphere that the absence of strong and clear institutional authority is most keenly felt. For example, there is duplication of municipal bus services in many cities where several agencies have operational mandates

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India's unique and dated system of institutional governance has resulted in a transport sector that favours silo decisions with litle intermodal coordination, beset by unclear responsibilities, politicisation of investment and weak accountability.

from various authorities. Urban and rural roads and other infrastructure are often constructed and maintained under any number of authorities to varying standards, sometimes within the same municipal or local area. Wide variations in institutional arrangements, and subsequently in policies, from state to state, impose large and unnecessary transaction costs. Incomplete execution of central policy at the state level creates uncertainty and has similar effects.

At all levels, institutions that make investments in transport infrastructure, or monitor and regulate transport services, are vulnerable to the politicisation of their budgets and agendas. Conflicts of interest result when an institution is both regulator and service operator in a competitive environment. This further contributes to lower levels of private investment. In other instances, multiple overlapping regulatory authorities create both compliance uncertainty and opportunities for gaming the regulatory system.

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

SKILLS AND HUMAN RESOURCES

To develop a transport network commensurate with India's economic aspirations, three enabling factors must be in place: funding, institutions, and professionals with the necessary skills to staff these institutions. Indeed, the depth and variety of human resources is perhaps the single biggest limiting factor in delivering a transport system that is well-designed, efficient, safe, environmentally-friendly, harmonised with land use, economically sensible and financially viable. India urgently requires people adept at the following with respect to infrastructure development: planning, project identification and development, efficient and transparent contract procurement, administration, and operation and management.

There is an enormous shortage of skilled transport professionals at all levels, and across all disciplines and all institutions, including academia, government and construction. Shortages at the academic level are self-reinforcing. There are few courses, degrees and higher education institutes with a dedicated focus on transport planning, and on various aspects of related infrastructure delivery. As a result, there are few graduates who have the necessary skills to become research professionals and academics.

In government, most jobs relating to transport are staffed by a mix of rotating civil service officials, rather than by transport professionals who can have the opportunities to acquire the deep experience necessary to make decisions and implement plans over the long term. More jobs in government with defined career advancement will dramatically increase the popularity of transport-related higher education. Finally, construction skills are sorely lacking and many private contractors must rely on unskilled labour, the net result being with slow, inefficient and unsafe construction.
Amongst the major recommendations of this committee is that the severe shortage of skilled transport professionals must be addressed forthwith. Moreover, it will be essential for these professionals to acquire the expertise necessary to plan and engineer increasingly complex infrastructure. A common pitfall of expertise is, however, an inability to engage constructively with specialists in other fields. This is the case today when there is little inter-agency cooperation, knowledge sharing, data dissemination, and joint planning that is so essential in developing a complete transport system. Consequently, the cadre of experts must also be capable of taking a holistic view on transport infrastructure, and new institutional decision frameworks must be developed to aid inter-agency cooperation and action
With this background, the implications for an integrated transport policy is to address critical questions on capacity augmentation and the types and magnitudes of transport investments required to support rapid economic growth. The policy also needs to focus on suggesting growth directions and building the institutional and informational foundations that will help in meeting specific challenges as they emerge over time. This is particularly important as transport investments typically have long lives of 25 to 100 years.

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ANNEX

PROFILE OF TRANSPORT SECTOR								
ITEMS	**UNIT**	**1950-51**	**1960-61**	**1970-71**	**1980-81**	**1990-91**	**2000-01**	**2010-11**
RAILWAYS								
Route Length	Km	53,596	56,247	59,790	61,240	62,367	63,028	64,460
Electrified Route Length	Km	388	748	3,706	5,345	9,968	14,856	19,607
Throughput								
Freight Traffic (Total)	M. Tonnes	93	156	197	220	341	504	926
Net Tonne (Kms)	BT Km	44	88	127	159	243	316	627
Passengers Originating	Million	1,284	1,594	2,431	3,613	3,858	4,833	7,651
Passenger Kms	Million	66,517	77,665	118,120	208,558	296,544	457,022	978,508
Average Lead: Passenger Lead	Km	52	49	49	58	77	95	128
Average Lead: All Goods Traffic	Km	470	561	648	720	711	626	676
ROADS								
Total	000 Km	400	525	915	1,485	2,350	3,373	4,690
Of Which National Highways	000 Km	22	24	24	32	34	58	71
Percentage of Village with 1000+ Population Connected with All Weather Roads	Percent	32	36	40	46	73	90	95
Overall Village Connectivity	Percent	20	22	25	28	44	54	68
Surface Length	000 Km	156	234	398	684	1,113	1,573	2,524
ROAD TRANSPORT								
No. of Goods Vehicles	In '000	82	168	343	554	1,356	2,948	
No. of Passenger Buses	In '000	34	57	94	162	331	634	
MAJOR PORTS								
Traffic Handled	M. Tonnes	NA	NA	7	7	11	87	315
CIVIL AVIATION								
Total Fleet Strength								
NACIL								106
Private Airlines		NA	NA	NA	NA	NA	37	234
Number of Passengers Carried	Million							
Air India		NA	0.1	0.5	1.4	2.2	3.3	0
Indian Airlines		NA	0.8	2.1	5.4	7.9	6.0	0
NACIL								12.8

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Passengers Handled at								
AAI Airports	Million	NA	NA	NA	10.7	17.7		59.6
Joint Venture International Airports		NA						83.8
Total at Indian Airports								143.4
Cargo handled at								
AAI Airports	'000 Tonnes	NA	NA	NA	179	377		727
Joint Venture International Airports								1,622
Total at Indian Airports								2,348
Revenue Tonne Kms	Million							
Air India		NA	NA	275	980	1,381	1,501	0
Indian Airlines		NA	83	161	420	669	775	0
NACIL								3,677
No. of Airports and Civil Enclaves	Numbers	NA	NA	NA	84	117		126
INLAND WATER TRANSPORT								
Length of Navigable Waterways	Km	14,544	14,544	14,544	14,544	14,544	14,544	14,544

Source: NTDPC Research.

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3. MACROECONOMIC GROWTH BACKDROP: TRANSPORT INVESTMENT REQUIREMENTS 2012-32

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3. MACROECONOMIC GROWTH BACKDROP: TRANSPORT INVESTMENT REQUIREMENTS 2012-32

India reached a per capita GDP of Rs 75,000 ($1,550) and overall GDP of Rs 90 trillion ($1.9 trillion) in 2011-12, the terminal year of the 12th Five Year Plan. It took 60 years (at constant 2004-05 prices) to move from a per capita GDP of about Rs 8,200 in 1950-51 to about Rs 47,000 in 2011-12, and during this period, GDP grew by a factor of almost 20 from less than Rs 3 trillion to Rs 56 trillion.

If we double per capita GDP in each of the next two decades at an average growth rate of 7 per cent per year, India will move from the current per capita GDP of $1,550 to about $6,000 by 2031-32 (at 2011-12 prices); and GDP will increase from $1.9 trillion to $8.7 trillion (at 2011-12 prices). Thus, even if India grows at a growth rate in excess of 8 per cent per year over the next 20 years, India's GDP will be just over a half of the current US GDP of $16 trillion and per capita GDP will be only about 12 per cent of current US per capita GDP of $50,000. Apart from the challenge of achieving such a sustained growth rate over a long period, the pace of change in actual level of GDP will be of an order of magnitude different from our historical experience, and even of our more recent experience over the last couple of decades. With such an increase expected in GDP, the demand for transport services, from both passengers and freight, will grow commensurately. Thus, the task of making investments in transport also poses challenges that are vastly greater than anything experienced in the past.

Whereas this report is largely devoted to a consideration of policies that will be needed to facilitate the transport investment necessary for achieving consistent economic growth of such an order, it is important to also derive the corresponding broad orders of magnitude of the required investments. The challenge is to arrive at estimates of such investments that are adequate to achieve the aspirations for high growth, but which are also consistent with the expected and feasible movement of overall mac-

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roeconomic magnitudes. It is important to keep in mind the feasible and sustainable domestic resource balances along with developments in external balances that will be needed for the availability of adequate resources for transport.

In projecting transport investment requirements, we need to arrive at numbers consistent with India's evolving macroeconomic situation.

As can be seen from the exercises underlying the Five Year planning process, it is difficult enough to conduct such an exercise for a projected Five Year Plan perspective: doing such an exercise with a 20-year horizon is that much more complex and heroic. Moreover, with the pace of change having accelerated, along with the volatility experienced in the global economy in recent years, making 20-year projections is even more fraught with difficulty. Second, we are also aware that global changes in both technology, and in oil and commodity prices over time, can render such long-term estimates in fructuous. Third, since in previous times, most of infrastructure and transport investment was in the public sector, the task of projecting resource availability and application was simpler. Now, with the increased level of participation of the private sector, and increased commercialisation in the public sector as well, projection of both demand and supply is also likely to be more price-sensitive. Thus, estimation of likely investment is more market-related and complex, relative to need-based estimates.

Finally, our task has been rendered even more difficult with the recent slowdown in the Indian economy, along with that in the global economy. Whereas we have taken account of the current slowdown, we have continued to assume a reasonably rapid recovery in the years to come. This is based on the expectation that Government will continue to take appropriate measures in both macroeconomic and structural policies so that India can return to a high growth path. We are aware that this may seem unreal at the present time. But we make no apologies for making this assumption: if the current aspirations of people in India are not to be dashed by the current economic slowdown, there is no choice for policy makers but to respond positively to the new challenges.

We are, therefore, very cognizant of all these dangers inherent in making such long-term estimates and hence this exercise has been undertaken with a sense of humility, trepidation and realism. We have made a best practice attempt in making these projections according to the best information available at the current time. The aim is to provide information on the broad shape of things to come so that expectations of the different players, both private and public, are influenced in the desired direction. It is hoped that all the players in this exercise government, public sector entities, suppliers of funds in the capital market, private sector entities in the transport sector, foreign investors and the general public will find this exercise of interest.

This report focuses on transport. The task is to arrive at reasonable targets for transport investment, which are consistent with the expectation of increased demands for transport that have been documented in Chapter 2, Volume III. Having experienced very significant economic growth over the past couple of decades, and particularly in the last 10 years, the overall needs and aspirations of the Indian public are now very high. These aspirations are also reflected in people's expectations with respect to transport developments. We have witnessed a revolution in air travel in the country over the past decade, as also in the ownership of private vehicles. Similarly, the demand from industry for efficient transportation of goods across modes has also grown tremendously. Moreover, with constantly increasing competition in the global economy, the future competitiveness of the Indian economy will be heavily dependent on efficiency in the transport sector. Thus, any estimates that are made with respect to perceptions of increased demand for transport over the next two decades are consistently very high, and usually higher than what may be feasible from the point of view of availability of resources. In projecting transport investment requirements in this challenging environment, however, we need to arrive at investment levels that are consistent with the evolving macroeconomic situation of the country.

This is what this chapter attempts to do.

Very heavy investment will have to be made overall in infrastructure, which includes transport, if the country is to maintain a sustained and sustainable high-growth path over the next 20 years and beyond. We need to respond to the binding constraint that infrastructure has posed on growth in India. The fastest growing countries in Asia, particularly China, have consistently invested around 8-10 per cent of their GDP in infrastructure, during their high-growth period.

The experience of countries in East Asia such as Japan, South Korea, Malaysia and Taiwan also illustrates that large investments in infrastructure, along with other supportive policies, have been associated with economic growth that has outpaced other world regions. Between 1975 and 2005, East Asia's GDP increased tenfold; South Asia's GDP increased fivefold; and all other regions' economies grew by factors of between two and three[1]. To sustain high rates of economic growth, it is essential for India to strengthen its infrastructure and derived services,

1. Difference in GDP purchasing power parity (PPP) in constant 2000 dollars between 1975 and 2005.

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Table 3.1
India: Gross Domestic Product, 2000-01 to 2011-12

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Current Prices (Per cent of GDP Share)												
GDP at Factor Cost	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Agriculture & Allied Activities	23.1	23.0	20.7	20.8	19.0	18.8	18.3	18.3	17.8	17.7	18.0	17.5
Agriculture	19.5	19.4	17.3	17.5	16.0	15.8	15.3	15.6	15.2	15.2	15.6	15.2
Industry	26.1	25.2	26.2	26.0	27.9	28.1	28.8	29.0	28.3	27.8	27.6	26.7
Mining & Quarrying	2.3	2.2	2.7	2.4	2.9	2.8	2.7	2.7	2.6	2.6	2.7	2.4
Manufacturing	15.4	14.7	14.9	14.9	15.3	15.4	16.1	16.0	15.4	15.1	14.9	14.4
Electricity, Gas & Water Supply	2.4	2.3	2.4	2.3	2.1	2.0	1.9	1.8	1.7	1.9	1.8	1.7
Construction	6.0	6.0	6.2	6.4	7.7	7.9	8.2	8.5	8.5	8.2	8.2	8.2
Services	50.8	51.8	53.0	53.2	53.0	53.1	52.9	52.7	53.9	54.5	54.4	55.7
Trade, Hotel, Transport and Communications	22.2	22.6	23.2	23.8	24.5	25.0	25.3	25.1	24.7	24.3	24.4	25.2
Railways	1.1	1.0	1.0	1.0	1.0	0.9	0.9	1.0	0.9	0.9	0.8	0.7
Transport by Other Means	5.0	5.0	5.3	5.5	5.7	5.7	5.7	5.6	5.5	5.3	5.3	5.4
Communications	1.5	1.7	1.5	1.6	1.7	1.6	1.5	1.4	1.4	1.4	1.1	0.9
Storage	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Trade and Hotels	14.6	14.9	15.4	15.6	16.1	16.7	17.1	17.1	16.9	16.5	17.2	18.0
Finance, Insurance, Real Estate & Business Services	13.8	14.6	15.2	15.3	14.7	14.5	14.8	15.1	15.9	15.8	16.0	16.6
Community, Social & Personal Services	14.8	14.6	14.6	14.2	13.8	13.5	12.8	12.5	13.3	14.5	14.0	14.0
(2004-05 Prices) (Annual Per cent Change)												
GDP at Market Prices	4.0	4.9	3.9	7.9	7.8	9.3	9.3	9.8	3.9	8.5	10.5	6.3
GDP at Factor Cost	4.3	5.5	4.0	8.1	7.0	9.5	9.6	9.3	6.7	8.6	9.3	6.2
Agriculture & Allied Activities	0.0	6.0	-6.6	9.0	0.2	5.1	4.2	5.8	0.1	0.8	7.9	3.6
Agriculture	-0.6	6.5	-8.1	10.8	0.1	5.5	4.1	6.3	-0.3	0.4	8.8	3.9
Industry	6.0	2.6	7.2	7.3	9.8	9.7	12.2	9.7	4.4	9.2	9.2	3.5
Mining & Quarrying	2.3	1.9	8.4	2.7	7.9	1.3	7.5	3.7	2.1	5.9	4.9	-0.6
Manufacturing	7.3	2.3	6.9	6.3	7.4	10.1	14.3	10.3	4.3	11.3	9.7	2.7
Electricity, Gas & Water Supply	2.2	1.8	4.7	4.6	7.9	7.1	9.3	8.3	4.6	6.2	5.2	6.5
Construction	6.1	4.0	8.3	12.4	16.3	12.8	10.3	10.8	5.3	6.7	10.2	5.6
Services	5.4	6.9	7.0	8.1	8.1	10.9	10.1	10.3	10.0	10.5	9.8	8.2
Trade, Hotel, Transport and Communications	6.4	8.6	8.5	11.1	9.7	12.0	11.6	10.9	7.5	10.4	12.3	7.0
Railways	4.1	7.0	5.6	5.9	7.3	7.5	11.1	9.8	7.7	8.8	5.9	7.5
Transport by Other Means	7.7	4.1	10.2	12.0	12.1	9.3	9.0	8.7	5.3	7.3	8.2	8.6
Communications	25.0	19.4	23.2	25.8	21.0	23.5	24.3	24.1	25.1	31.5	25.4	8.3
Storage	6.1	0.6	-6.7	5.1	13.6	4.7	10.9	3.4	14.1	19.3	2.2	9.4
Trade and Hotels	5.2	9.6	6.9	10.1	7.7	12.2	11.1	10.1	5.7	7.9	11.5	6.2
Finance, Insurance, Real Estate & Business Services	4.5	7.1	7.7	5.8	8.7	12.6	14.0	12.0	12.0	9.7	10.1	11.7
Community, Social & Personal Services	4.6	4.1	3.9	5.4	4.9	7.1	2.8	6.9	12.5	11.7	4.3	6.0

(Contd...)

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	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Memo Items												
Population (Million)	1,019	1,040	1,056	1,072	1,089	1,106	1,122	1,138	1,154	1,170	1,186	1,202
Current Prices (Rs Billion)												
GDP at Market Prices	21,687	23,483	25,307	28,379	32,422	36,934	42,947	49,871	56,301	64,778	77,953	89,749
GDP at Factor Cost	19,920	21,677	23,382	26,222	29,715	40,168	39,533	45,821	53,036	61,089	72,670	83,535
Constant (2004-05) Prices (Rs Billion)												
GDP at Market Prices	25,540	26,803	27,850	30,063	32,422	35,432	38,715	42,509	44,164	47,908	52,961	56,314
GDP at Factor Cost	23,428	24,721	25,707	27,778	29,715	32,531	35,644	38,966	41,587	45,161	49,370	52,436
Current Prices (US$ Billion)												
GDP at Market Prices	475	492	523	618	722	834	948	1,239	1,226	1,366	1,711	1,873
GDP at Factor Cost	436	455	483	571	661	874	873	1,139	1,155	1,288	1,595	1,743
Per Capita GDPmp (Rupees in Current Prices)	21,282	22,580	23,965	26,473	29,772	33,394	38,277	43,823	48,787	55,366	65,728	74,667
Per Capita GDPmp (Ruees in 2004-05 Prices)	5,064	25,772	26,373	28,043	29,772	32,037	34,505	37,355	38,270	40,947	44,655	46,850
Exchange Rate (Rs/US$) (Per cent Change)	5.4	4.4	1.5	-5.0	-2.2	-1.5	2.3	-11.1	14.1	3.3	-3.9	5.2
Population (Per cent Change)	1.8	2.1	1.5	1.5	1.6	1.6	1.4	1.4	1.4	1.4	1.4	1.3
Per Capita GDPmp (Current Prices, Per cent Change)	5.9	6.1	6.1	10.5	12.5	12.2	14.6	14.5	11.3	13.5	18.7	13.6
Per Capita GDPmp (2004-05 Prices, Per cent Change)	2.1	2.8	2.3	6.3	6.2	7.6	7.7	8.3	2.5	7.0	9.1	4.9

Source: Government Of India, Central Statistical Office, National Account Statistics.

such as roads and highways, energy production, telecommunications, etc. The Indian government is already engaged in providing or facilitating investment in such infrastructure from both public and private sources. The 11th Five Year Plan (2007-2012) proposed an investment of about Rs 27,750 billion (at 2011-12 prices) ($500 billion) in infrastructure sectors including electric power, roads, railways, ports, airports, telecommunications, irrigation, drinking water, sanitation, storage and warehousing, and based on currently available data, 95 per cent of projected investments are likely to have been realised (High Level Committee on Financing Infrastructure (HLCFI[2]). Going forward, the HLCFI has projected investments of about Rs 51,500 billion, (at 2011-12 prices) ($1 trillion) for the 12th Five Year Plan period (2012-17) accounting for an average investment of 9.15 per cent of GDP at market prices compared with 7.2 per cent during the 11th Plan period[3]. The key sectors are electricity, roads and bridges, telecommunications and railways, respectively accounting for 34 per cent, 18 per cent, 17 per cent, and 11 per cent of total infrastructure investment.

Thus, there is broad consensus among policy makers that infrastructure investments are important ingredients for accelerating economic growth, poverty alleviation, and environmental sustainability but these benefits accrue only when the supply of infrastructure services responds to effective demand and does so efficiently. Policy makers in India, as in many other parts of the world, are facing a major challenge to develop mechanisms for efficient and responsive delivery of infrastructure services. However, the jury is out on how much infrastructure is needed to maximise growth and how long it takes before the benefits of these investments are realised. Implementing large infrastructure programmes requires considerable resources, and identifying ways to close the gap between infrastructure needs and realistic financing options is a recurrent challenge.

2. Interim Report of the High Level Committee on Financing Infrastructure, Planning Commission, August 2012.
3. These estimates are for gross investment in infrastructure and differ from the gross domestic capital formation (GDCF) concept in National Accounts. The difference in the two concepts may amount to between 1 and 1.5 per cent of GDP.

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This chapter addresses this issue by identifying *how much* India should be spending on infrastructure, particularly transport infrastructure, given competing needs for public spending, and in the light of fiscal constraints and macro stability objectives. The chapter also addresses how these investments will be financed and how much of financing needs can be met domestically and what would be a sustainable level of financing from external savings.

The approach taken here is fairly straightforward: relying on first principles, the analytical framework allows policy makers to think through alternative financing options. It would have been ideal to develop a general equilibrium model that explicitly incorporates public investment costs, and identify an optimal (growth maximising) level of infrastructure spending[4]. However, such an approach would have needed estimation of detailed parameters of elasticity of growth with respect to infrastructure sectors and across regions, a time and data-intensive exercise beyond the scope of this Committee's mandate.

Our analytical framework makes it possible to develop broad magnitudes of infrastructure and transport investment that are compatible with the country's prospects for economic growth over the next 20 years. Although we base the estimations on a macro-consistency framework so that the sums are kept consistent, the approach taken here is subjective in fact aspirational with the assumption that growth can take place if both macro and sectoral policy constraints are relaxed. In essence, this is a top down approach. A similar approach was adopted in the work related to the *India Infrastructure Report, 1996*.

The main objective of this approach is to place the required infrastructure investment, particularly in transport, within the broad macroeconomic context and trends. A simple macroeconomic model, RMSM-X, is used to capture the main variables such as savings, investments and sectoral outputs, giving particular attention to the balance of payments both current and capital accounts. An advantage of the RMSM-X model is that it allows the introduction of multiple economic agents in a consistent flow-of-funds framework to explore alternative policy options. The RMSM-X model relies on the fundamental accounting identity of standard national income accounts, and includes detailed information such as investment and consumption disaggregated into public and private components. In this framework, the economy can grow while ensuring adherence to the various standard macroeconomic identities.

Even though the projections provided here are point estimates, they should be interpreted as ranges in each case as the projections are mainly intended to give an idea of the broad magnitudes derived from the growth scenario modeled in this framework. A number of simulations could be analysed, but these would be difficult to discuss and present. Thus, only a preferred scenario is being discussed in this Report, which has been picked following consultations with a broad range of stakeholders in government and in the private sector.

The model is calibrated using data from the National Accounts spanning the 1980s through 2012. This makes it possible to suggest a plausible macroeconomic framework for the next two decades (spanning the 12th, 13th, 14th and 15th 5 Year Plans). By building projections on GDP growth, current account balance, and financing needs, among others, it is possible to assess the feasible magnitude of infrastructure and transport investments, which can help shape the expectations of different actors of infrastructure policy: the government, suppliers of funds in the capital market, local companies planning to invest in the infrastructure sector, foreign investors, and the general public. These estimates give an idea of the possible demand on the capital market in India in terms of equity and debt, providing pointers for capital market reforms and institutional development that would be necessary if such magnitudes of funds are to be mobilised.

> While infrastructure investments are vital for faster economic growth, poverty alleviation and environmental sustainability, these benefits accrue only when the supply responds to effective demand and does so efficiently

The broad magnitudes from this macro approach are complemented with a 'bottom up' approach aggregating the investment requirements from estimates in each sector. The focus of this approach, provided at the end of the chapter, is limited to the transport sectors. These sectoral estimates are also judgmental, based on what sectoral experts are projecting in terms of needs in each sector. They are somewhat normative since they reflect current perceptions of what should be invested to provide reasonable quality and quantity of services for satisfying the people's perceived needs.

In practice, the two approaches provide considerably different results and this chapter does not attempt to reconcile these approaches. On the other hand, the macro-model-based projections provide a sense of what is feasible in the aggregate. The bottom-up estimates are slightly in excess or comparable to the macro-consistent projections during the 12th and 13th Plans. Interestingly, however, the bottom-up estimates for the 14th and 15th Plans, from 2022 to 2032,

4. Examples of the general equilibrium approach include Rioja (2001) for Brazil, Peru and Mexico, and Cavalcanti Ferreira and Gonçalves do Nascimento (2005) and Estache and Munoz (2007) for Senegal and Uganda.

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seem to underestimate both what the investment needs may be during that period, and what may be feasible from the macro point of view. This suggests that people might find it difficult to envision numbers that are of an order of magnitude higher beyond 10 years in the future. This exercise therefore provides a degree of optimism with regard to the feasibility of improving and expanding Indian transport infrastructure over the next couple of decades. For example, rural roads are still not of a quality that makes them passable in all weather conditions. The projections in this report suggesting higher levels of feasible investments in roads than projected by our Working Group indicate that it will be feasible to upgrade significantly the quality of our road infrastructure once the basics are done in the next decade or so.

PROJECTING ECONOMIC GROWTH: 2012-32

What are the prospects for India's economic growth over the next two decades? What growth targets are feasible? India has emerged as a dynamic economic power over the last three decades, recording GDP growth of about 6.3 per cent between 1980-81 and 2012-13[5]. This has been accompanied by dramatic progress in poverty reduction, with the national poverty head count ratio dropping from 45 per cent in 1993-94 to 22 per cent in 2011-12[6] . Exports of goods and services have surged from 5 per cent of GDP in 1990 to 24 per cent in 2012 and contrary to popular perceptions, ICT services accounted for just 18 per cent of total exports. Manufactured goods, constituting 87.6 per cent of merchandise exports, earned $240 billion in 2012, almost five times as much as ICT services' exports of around $52 billion[7]. The economy is also transforming structurally as the contribution of agriculture to GDP has dropped from 34 per cent to 15 per cent over the past 25 years; services have moved up from 41 per cent to 56 per cent of GDP (Tables 3. 1 and 3. 4). Much of this progress has been stimulated by the dismantling of the Licence Raj which included rescinding licensing requirements, overhauling public enterprises, scrapping quantitative import restrictions, reductions in trade tariffs and liberalisation of rules for foreign direct investment (FDI). However, growth of the manufacturing sector has, perhaps, not been as high as might have been expected.

Given the domestic slowdown and the expectation of sluggish global economic growth in the near term, we have projected a 7 per cent annual real GDP growth for 20012-17, following which the economy is expected to grow at an average of 8.5 per cent per year till 2032

Whereas expectations of double-digit growth rates had built up in the mid to late 2000s, these expectations have now been tempered since 2008 as the global economy slowed and so did India: The GDP growth rate dropped to 3.9 per cent in 2008-09; it picked up to 8.5 per cent and 10.5 per cent in 2009-10 and 2010-11 respectively but slipped again to 6.3 per cent in 2011-12 and 5 per cent in 2012-13 (Table 3. 1). It is quite likely that the current global economic slowdown and India's fiscal problems and other domestic factors are dragging down the economy and corrections are likely to take place in the medium term. Thus, taking into account the current domestic slowdown and the expectation that the global economy is likely to exhibit sluggish growth in the near-term, we have used a projection of 7 per cent annual real GDP growth for the 12th Plan period (2012-2017), following which the economy is expected to experience an average growth of 8.5 per centup to 2032. It is important to stress here that such growth is not possible without robust industrial growth and in fact, the government is planning to develop strategies aimed at increasing the share of manufacturing to 25 per cent of GDP[8]. We do need to note that this is not going to be easy, since manufacturing growth has fallen to less than 3 per cent during 2011-13.

These projections for GDP growth are used to project India's infrastructure requirements over the next 20 years. Such growth will not be feasible if corresponding infrastructure investments of the projected magnitude are not made. In the data given in this chapter, all economic variables are at current prices through 2011-2012 and external transactions are at the prevailing exchange rates for each year. Our projections for 2012-13 to 2031-32 are in real terms, made at constant 2012-13 prices and at a constant exchange rate of $1 = Rs 54.4 (average exchange rate in 2012-13).

ENHANCING INVESTMENT EFFICIENCY

With the economic reforms of 1991, the Indian government implemented a series of policy initiatives to deregulate and liberalise the economy to enhance competitiveness and productivity and achieve higher growth. Encouraging private and foreign participation in the economy led to higher competition, enhanced trade, provided free access to foreign investment and technology, and opened capital markets.

5. In terms of GDP/capita which bears more directly on potential welfare, GDP/capita growth rose steadily from a 10-year average of 3.2 per cent per year in the 1980s (1980-81 to 1989-90) to 3.7 per cent in the 1990s (1990-91 to 1999-2000) and 5.3 per cent in the 2000s (2000-01 to 2009-10), almost reaching the 'miracle rates' seen in East Asia before the Asian financial crisis.
6. Planning Commission (2013).
7. In 2012-13, India's exports consisted of engineering goods (22 per cent), petroleum products (14 per cent), gems and jewellery (14 per cent), chemicals (13 per cent), and textiles and other manufactures (22 per cent), making up a total of 85 per cent of all merchandise exports , establishing it as an exporter of mainly manufactures.
8. Government of India, National Manufacturing Policy, 2011.

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Table 3. 2
India: Gross Domestic Expenditure, 2000-01 to 2012-13

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Current Prices (Per cent of GDP)												
GDP at Market Prices	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Gross Domestic Capital Formation	23.5	25.1	24.5	25.3	32.5	34.3	35.9	38.0	35.5	36.3	37.0	35.4
Gross Fixed Capital Formation	22.8	25.1	23.8	24.6	28.7	30.3	31.3	32.9	32.3	31.7	31.7	30.6
Public	6.3	6.3	6.1	6.3	6.9	7.3	7.9	8.0	8.5	8.4	7.8	7.4
Private	16.6	18.8	17.7	18.3	21.8	23.0	23.4	24.9	23.8	23.3	24.0	23.2
Change in Stocks	0.7	-0.1	0.7	0.7	2.5	2.8	3.4	4.0	1.9	2.8	3.1	2.1
Public	0.4	0.4	-0.2	-0.1	0.5	0.6	0.4	0.8	0.9	0.8	0.6	0.5
Private	0.3	-0.4	1.0	1.0	2.0	2.2	3.0	3.2	1.0	2.0	2.5	1.6
Valuables	..	..	..	..	1.3	1.1	1.2	1.1	1.3	1.8	2.1	2.7
Exports of Goods & Services	12.8	12.4	14.0	14.7	17.6	19.3	21.1	20.4	23.6	20.0	21.9	23.9
Imports of Goods & Services	13.7	13.2	15.0	15.4	19.3	22.0	24.2	24.4	28.7	25.4	26.3	30.3
Total Consumption	77.5	77.6	75.9	73.9	70.1	69.2	68.0	67.2	68.6	69.1	67.2	68.0
Private Consumption	64.9	65.2	64.0	62.4	59.1	58.3	57.7	57.0	57.7	57.2	55.8	56.3
Government Consumption	12.6	12.4	11.9	11.4	10.9	10.9	10.3	10.3	10.9	11.9	11.4	11.6
(2004-05 Prices) (Annual Per cent Change)												
GDP at Market Prices	4.0	4.9	3.9	7.9	7.8	9.3	9.3	9.8	3.9	8.5	10.5	6.3
Gross Domestic Capital Formation	-6.7	11.5	3.0	10.5	36.2	16.3	15.3	17.2	-1.6	12.7	16.2	1.5
Gross Fixed Capital Formation	-1.4	15.3	-0.4	10.6	24.0	16.2	13.8	16.2	3.5	7.7	14.0	4.4
Public	1.9	3.6	1.3	10.8	5.1	16.4	18.3	12.5	12.0	5.6	4.9	2.5
Private	-0.8	8.9	8.7	14.7	23.5	16.1	12.4	17.4	0.8	8.4	17.2	5.0
Exports of Goods & Services	18.2	4.3	21.1	9.6	27.2	26.1	20.4	5.9	14.6	-4.7	19.7	15.3
Imports of Goods & Services	4.6	2.9	12.0	13.9	22.2	32.6	21.5	10.2	22.7	-2.1	15.8	21.5
Total Consumption	3.1	5.3	2.4	5.4	5.0	8.7	7.7	9.4	7.7	8.4	8.1	8.1
Private Consumption	3.4	6.0	2.9	5.9	5.2	8.6	8.5	9.4	7.2	7.4	8.6	8.0
Government Consumption	1.4	2.4	-0.2	2.8	4.0	8.9	3.8	9.6	10.4	13.9	5.9	8.6
ICOR	7.0	5.0	6.7	3.2	3.4	3.5	3.7	3.7	10.0	4.5	4.0	5.2
Memo Items (Deflators, 2004-05=100)												
Gross Domestic Product at Market Prices	84.9	87.6	90.9	94.4	100.0	104.2	110.9	117.3	127.5	135.2	147.2	159.4
Gross Domestic Capital Formation	83.8	86.7	88.6	93.0	100.0	103.5	109.2	114.7	123.0	128.3	135.4	147.3
Exports of Goods & Services	86.0	86.2	87.1	93.3	100.0	99.3	104.8	111.4	126.8	130.0	143.0	155.4
Imports of Goods & Services	76.3	77.4	84.5	85.3	100.0	98.0	103.2	109.7	118.4	123.5	132.7	145.0
Total Consumption	88.2	90.9	93.6	96.9	100.0	103.4	109.8	115.2	123.3	131.8	142.7	153.6

Source: Government of India, Central Statistical Office, National Account Statistics.

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Table 3. 3
Key Economic Ratios (2000-11)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
INDIA												
Gross Capital Formation (Per cent of GDP)	24.2	25.7	25.0	26.2	32.5	34.3	35.9	38.0	35.5	36.1	35.8	36.6
Gross Domestic Savings (Per cent of GDP)	22.6	24.2	23.5	24.6	30.7	31.5	32.7	34.0	30.5	30.8	31.7	31.1
GDP Growth (Annual Per cent)	4.0	4.9	3.9	7.9	7.8	9.3	9.3	9.8	3.9	8.2	9.6	6.9
Exports of Goods and Services (Per cent of GDP)	12.8	12.4	14.1	14.7	17.6	19.3	21.1	20.4	23.6	20.1	22.8	24.6
Imports of Goods and Services (Per cent of GDP)	13.7	13.3	15.0	15.4	19.3	22.0	24.2	24.5	28.7	25.5	26.9	29.9
Current Account Balance (Per cent of GDP)	-1.0	0.3	1.4	1.4	0.1	-1.2	-1.0	-0.7	-2.5	-1.9	-3.1	..
Central Government Debt, Total (Per cent of GDP)	54.3	58.2	61.6	61.2	61.5	61.2	59.1	56.5	56.1	54.5	47.3	..
External Debt Stocks (Per cent of Exports of Goods, Services and Income)	161.9	151.6	143.3	134.7	102.3	75.6	79.2	80.7	70.8	93.3	80.8	74.8
Total Debt Service (Per cent of Exports of Goods, Services and Income)	17.6	17.9	20.9	29.2	14.5	14.9	8.6	15.6	9.7	6.0	6.8	6.5
ICOR	6.8	4.9	6.6	3.2	3.3	3.5	3.7	3.7	9.9	4.4	3.9	5.5
CHINA												
Gross Capital Formation (Per cent of GDP)	35.1	36.3	37.9	41.2	43.3	42.1	43.0	41.7	44.1	48.2	48.2	48.5
Gross Domestic Savings (Per cent of GDP)	37.5	38.4	40.4	43.4	45.8	47.6	50.7	50.5	51.8	52.7	52.1	52.5
GDP Growth (Annual Per cent)	8.4	8.3	9.1	10.0	10.1	11.3	12.7	14.2	9.6	9.2	10.4	9.3
Exports of Goods and Services (Per cent of GDP)	23.3	22.6	25.1	29.6	34.0	37.1	39.1	38.4	35.0	26.7	30.6	31.4
Imports of Goods and Services (Per cent of GDP)	20.9	20.5	22.6	27.4	31.4	31.6	31.4	29.6	27.3	22.3	26.7	27.3
Current Account Balance (Per cent of GDP)	1.7	1.3	2.4	2.6	3.6	5.9	8.6	10.1	9.3	4.9	4.0	2.8
Central Government Debt, Total (Per cent of GDP)	..	..	..	..	..	..	..	..	..	..	..	..
External Debt Stocks (Per cent of Exports of Goods, Services and Income)	49.9	59.6	49.6	41.2	36.2	35.0	31.4	27.9	23.7	32.4	31.2	32.0
Total Debt Service (Per cent of Exports of Goods, Services and Income)	9.1	8.1	8.3	7.5	3.4	3.4	2.7	2.4	2.1	2.9	3.6	3.6
ICOR	4.3	4.2	4.0	3.7	3.9	3.6	3.2	2.9	4.3	4.5	4.4	5.0
KOREA, REP.												
Gross Capital Formation (Per cent of GDP)	30.6	29.2	29.2	29.9	29.9	29.7	29.6	29.4	31.2	26.3	29.5	29.5
Gross Domestic Savings (Per cent of GDP)	33.4	31.4	30.7	32.2	34.1	32.4	31.0	30.9	30.0	30.0	32.1	31.5
GDP Growth (Annual Per cent)	8.5	4.0	7.2	2.8	4.6	4.0	5.2	5.1	2.3	0.3	0.3	3.6
Exports of Goods and Services (Per cent of GDP)	38.6	35.7	33.1	35.4	40.9	39.3	39.7	41.9	53.0	49.7	52.3	56.2
Imports of Goods and Services (Per cent of GDP)	35.7	33.5	31.7	33.1	36.7	36.6	38.3	40.4	54.2	46.0	49.7	54.1
Current Account Balance (Per cent of GDP)	2.8	1.7	1.3	2.4	4.5	2.2	1.5	2.1	0.3	3.9	2.9	2.4
Central Government Debt, Total (Per cent of GDP)	..	..	..	..	..	..	..	..	..	..	..	..
External Debt Stocks (Per cent of Exports of Goods, Services and Income)	..	..	..	..	..	..	..	..	..	..	..	..
Total Debt Service (Per cent of Exports of Goods, Services and Income)	..	..	..	..	..	..	..	..	..	..	..	..
ICOR	3.5	7.7	4.1	10.5	6.4	7.4	5.5	5.6	12.2	85.5	3.8	7.0

(Contd...)

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	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
INDONESIA												
Gross Capital Formation (Per cent of GDP)	22.3	22.5	21.4	25.6	24.1	25.1	25.4	24.9	27.8	31.0	32.6	32.8
Gross Domestic Savings (Per cent of GDP)	32.8	30.8	27.7	32.9	28.7	29.2	30.8	29.0	28.9	33.8	34.3	34.2
GDP Growth (Annual Per cent)	4.9	3.6	4.5	4.8	5.0	5.7	5.5	6.4	6.0	4.6	6.2	6.5
Exports of Goods and Services (Per cent of GDP)	41.0	39.0	32.7	30.5	32.2	34.1	31.0	29.4	29.8	24.2	24.6	26.3
Imports of Goods and Services (Per cent of GDP)	30.5	30.8	26.4	23.1	27.5	29.9	25.6	25.4	28.8	21.4	22.9	24.9
Current Account Balance (Per cent of GDP)	4.8	4.3	4.0	3.5	0.6	0.1	3.0	2.4	0.0	2.0	0.7	0.2
Central Government Debt, Total (Per cent of GDP)	..	..	32.2	29.7	56.6	47.3	39.0	35.2	33.1	28.4	26.1	..
External Debt Stocks (Per cent of Exports of Goods, Services and Income)	196.6	204.0	190.8	189.9	162.1	146.2	120.9	116.1	104.4	139.7	115.7	99.1
Total Debt Service (Per cent of Exports of Goods, Services and Income)	22.8	23.9	25.1	26.2	24.2	20.9	25.2	18.8	14.1	19.4	17.4	14.5
ICOR	4.0	6.1	5.2	4.5	4.5	4.0	4.4	3.7	3.7	5.1	3.8	3.8
MALAYSIA												
Gross Capital Formation (Per cent of GDP)	26.9	24.4	24.8	22.8	23.1	22.4	22.7	23.4	21.5	17.8	23.2	23.6
Gross Domestic Savings (Per cent of GDP)	46.1	41.8	42.0	42.5	43.4	44.3	44.5	43.3	43.8	38.1	40.3	39.5
GDP Growth (Annual Per cent)	8.9	0.5	5.4	5.8	6.8	5.3	5.6	6.3	4.8	-1.5	7.2	5.1
Exports of Goods and Services (Per cent of GDP)	119.8	110.4	108.3	106.9	115.4	112.9	112.2	106.2	99.5	91.4	93.8	91.6
Imports of Goods and Services (Per cent of GDP)	100.6	93.0	91.1	87.3	95.0	91.0	90.4	86.3	77.2	71.1	76.6	75.7
Current Account Balance (Per cent of GDP)	9.1	7.9	7.1	12.1	12.1	13.9	16.1	15.4	16.9	15.7	11.1	11.0
Central Government Debt, Total (Per cent of GDP)	..	..	43.1	45.1	45.7	42.1	40.6	40.1	39.8	50.8	51.2	..
External Debt Stocks (Per cent of Exports of Goods, Services and Income)	36.7	43.3	43.8	39.9	35.2	31.2	29.1	29.1	28.0	35.3	34.9	33.8
Total Debt Service (Per cent of Exports of Goods, Services and Income)	5.6	6.0	7.2	7.9	6.2	5.6	4.0	4.8	3.7	6.1	5.5	3.9
ICOR	2.5	51.9	4.5	4.3	3.4	4.3	3.8	3.5	4.7	-14.2	2.6	4.6
THAILAND												
Gross Capital Formation (Per cent of GDP)	22.8	24.1	23.8	25.0	26.8	31.4	28.3	26.4	29.1	21.2	25.9	26.6
Gross Domestic Savings (Per cent of GDP)	31.5	30.6	30.5	31.8	31.7	30.3	31.8	34.8	31.7	31.8	33.4	31.2
GDP Growth (Annual Per cent)	4.8	2.2	5.3	7.1	6.3	4.6	5.1	5.0	2.5	-2.3	7.8	0.1
Exports of Goods and Services (Per cent of GDP)	66.8	65.9	64.2	65.7	70.7	73.6	73.7	73.4	76.4	68.4	71.3	76.9
Imports of Goods and Services (Per cent of GDP)	58.1	59.4	57.5	58.9	65.8	74.7	70.2	65.0	73.9	57.8	63.9	72.4
Current Account Balance (Per cent of GDP)	7.6	4.4	3.7	3.4	1.7	-4.3	1.1	6.4	0.8	8.3	4.1	..
Central Government Debt, Total (Per cent of GDP)	..	..	..	28.9	26.1	27.3	26.1	24.5	24.0	28.6	28.8	30.2
External Debt Stocks (Per cent of Exports of Goods, Services and Income)	92.8	84.1	70.1	52.7	42.3	35.3	29.5	24.3	23.4	32.9	34.4	29.1
Total Debt Service (Per cent of Exports of Goods, Services and Income)	16.3	25.4	23.2	15.7	11.1	13.8	9.5	11.9	7.8	6.5	4.7	3.8
ICOR	4.5	10.5	4.3	3.2	3.9	5.6	5.5	5.1	9.9	-11.2	2.6	..

Source: The World Bank, World Development Indicators.

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While the ensuing capital accumulation expanded the magnitude of resources available to the Indian economy, these reforms, if effective, should also have enhanced the efficiency of resource utilisation. Has this taken place?

Consider here the incremental capital output ratio (ICOR) as a measure of resource utilisation reflecting the extent to which additional investments translate into output. In the 1980s, the average level of domestic investment (or gross capital formation) was in the region of 23 to 24 per cent of GDP. This was accompanied by an average rate of GDP growth of 5 to 5.5 per cent, resulting in an ICOR of around 4.2. Gross capital formation picked up in the 1990s and beyond, increasing from 23 per cent of GDP in 1994-95 to 35.5 per cent in 2011-12, with a peak of 38 per cent in 2007-08 (Table 3.2). Such levels of gross capital formation (gross domestic investment) of more than 30 per cent of GDP were also observed during the high growth years of other Asian countries, and as such, these numbers for India portend well for its medium and long-run growth prospects. The overall ICOR for the economy dropped to around 3.6 between 2003 and 2007, albeit preceded by some rather high ICORs (around 6) in the early part of the previous decade. Reflecting the current growth slowdown, the ICOR has slipped again. International experience suggests that ICORs around 3.5 reflect 'good practice' efficiency levels, as seen in China and South Korea (Republic of Korea) during periods of rapid industrial expansion and urbanisation. In China, the ICOR fell from 5.0 in the 1970s to 4.3 through the 1990s and down to 3.5 between 2005 and 2008 (Table 3.3). These are periods when China industrialised and urbanised rapidly. In the Republic of Korea, ICORs were between 3 and 3.5 in the 1970s and 1980s periods of 'big push' industrialisation and rapid economic development. If India is able to restore the kind of investment levels that prevailed in the latter part of the last decade, levels of around 35 per cent plus, and ICORs remain between 3.5 and 4.5, it would be feasible for the country to achieve a sustained annual growth rate of 8-9 per cent, which would mean a 7-8 per cent annual growth in per capita incomes, a doubling in each of the coming two decades (Table 3.4a and 3.4b).

INDICATORS FOR OPTIMISM

The current slowdown is such that many observers would be critical of our optimism on the restoration of a robust economic growth rate. When the National Transport Development Policy Committee (NTDPC) began work in mid-2010, a sustained growth rate of over 9 per cent was thought to be feasible and likely. The subsequent developments in the global economy and difficulties encountered domestically have tempered this optimism. Consequently, the targets for the 12th Five Year Plan were also revised downward, and we have made further downward revision in our own projection to about 7 per cent average annual real growth in the 12th Plan period. In view of only 5 per cent real growth (factor cost) in the first year of the 12th Plan, even achieving this lower projection of 7 per cent will not be easy. The issue then is whether the country can go back to rates in excess of 8 per cent in subsequent Plan periods?

We need to recognise that it is only a handful of countries that have been able to escape the 'middle income' trap. Given our high levels of poverty, it is essential that we do so. A key source of optimism is that whereas overall savings have fallen from a level of 35 per cent plus in 2007-08 to around 30 per cent now, household savings have remained resilient at around 22 per cent. It is both the overall public sector (mainly government) and the corporate private sector whose savings have fallen. The key issue is restoration of the fiscal health of the central government. If, as is now planned, the overall fiscal deficit of the central government be brought back down to less than 3 per cent and state governments can maintain theirs at around 2 per cent, within the next two to three years, public savings can be restored to the levels achieved previously in 2007-08. If that is achieved, the current draft on private savings will fall and greater resources will then become available to the private sector for investment. The second imperative is restoration of inflation to the 4-5 per cent level achieved in the last decade. Fiscal correction will help in this regard. Nominal interest rates can then come down and corporate profitability can also be restored, so that private corporate sector savings also increase to the levels achieved in 2005-10.

These objectives are clearly in the realm of feasibility. Gross domestic savings and investment can then be restored to the 35-40 per cent levels necessary to achieve sustained growth of 8-9 per cent over the next two decades.

In addition to these changes in the realm of macroeconomic policy, it is also necessary to considerably enhance the efficiency of government functioning with respect to infrastructure, for investment by both the public and by the private sectors, including through public-private partnerships (PPP). The recent administrative actions taken by the central government to streamline regulatory and permitting processes through, for example, the formation of the Cabinet Committee on Investment (CCI), are encouraging. But these have to be followed up down the line to ensure that infrastructure investment does take place in a timely fashion. Much work has been done in making the bidding and allocation process for PPP projects efficient and transparent. This needs to be continued as expertise is built up.

Similar actions are necessary at the state level. In addition to lagging regions catching up, rapid urbanisation can further increase investment efficiency as higher

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Table 3. 4a

India: Gross Domestic Product, 2012-13 to 2031-32

	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE)			
						FY13-FY17	FY18-FY22	FY23-FY27	FY28-FY32
						12TH PLAN	13TH PLAN	14TH PLAN	15TH PLAN
(Rs Billion 2012-13 Prices)									
GDP at Market Prices	100,262	107,221	114,951	123,774	133,481	115,938	169,153	252,143	384,748
GDP at Factor Cost	94,631	100,822	107,956	116,094	124,509	108,803	157,302	233,297	354,921
Agriculture and Allied	16,135	16,724	17,351	18,020	18,722	17,391	21,082	25,650	31,207
Industry	24,917	26,491	28,265	30,421	32,894	28,597	42,368	65,245	103,171
Construction	7,845	8,434	9,066	9,837	10,722	9,181	14,194	22,345	35,176
Electricity, Gas and Water	1,643	1,758	1,898	2,060	2,245	1,921	2,972	4,816	7,934
Mining and Quarrying	2,184	2,326	2,489	2,675	2,889	2,513	3,770	5,800	8,924
Manufacturing	13,245	13,974	14,812	15,849	17,037	14,983	21,432	32,284	51,137
Services	53,579	57,607	62,339	67,654	72,893	62,814	93,852	142,402	220,543
Trade, Hotel, Transport and Communications	23,911	25,901	28,139	30,671	33,432	28,411	43,936	68,878	110,015
Finance, Insurance, Real Estate & Business Services	16,275	17,618	19,115	20,836	22,711	19,311	29,846	46,790	74,735
Community, Social & Personal Services	13,393	14,089	15,085	16,147	16,750	15,093	20,070	26,735	35,792
(US$ Billion 2012-13 Prices)									
GDP at Market Prices	1,843	1,971	2,113	2,275	2,453	2,131	3,109	4,634	7,071
GDP at Factor Cost	1,739	1,853	1,984	2,134	2,288	2,000	2,891	4,288	6,523
Agriculture and Allied	297	307	319	331	344	320	387	471	574
Industry	458	487	519	559	605	526	779	1,199	1,896
Construction	144	155	167	181	197	169	261	411	647
Electricity, Gas and Water	30	32	35	38	41	35	55	89	146
Mining and Quarrying	40	43	46	49	53	46	69	107	164
Manufacturing	243	257	272	291	313	275	394	593	940
Services	985	1,059	1,146	1,243	1,340	1,154	1,725	2,617	4,053
Trade, Hotel, Transport and Communications	439	476	517	564	614	522	808	1,266	2,022
Finance, Insurance, Real Estate & Business Services	299	324	351	383	417	355	549	860	1,374
Community, Social & Personal Services	246	259	277	297	308	277	369	491	658
Memo Items									
Population (Million)	1,217	1,233	1,248	1,262	1,276	1,247	1,317	1,378	1,429
Per Capita GDPmp (Rs 2012-13 Prices)	82,370	86,987	92,093	98,088	104,637	92,965	128,469	183,011	269,330
Per Capita GDPmp (US $ 2012-13 Prices)	1,514	1,599	1,693	1,803	1,923	1,709	2,361	3,364	4,950
Per Capita GDPmp (Rs 2012-13 Prices), Eop	82,370	86,987	92,093	98,088	104,637	104,637	146,276	210,769	314,080
PerCapita GDPmp (US $ 2012-13 Prices), Eop	1,514	1,599	1,693	1,803	1,923	1,923	2,688	3,874	5,773
Exchange Rate	54.4	54.4	54.4	54.4	54.4	54.4	54.4	54.4	54.4

Sources: Government of India, Central Statistical Office, National Account Statistics and NTDPC Projections.

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For manufacturing to grow rapidly, transport investment is critical. And higher investment in transport will require higher manufacturing growth. The relationship is symbiotic.

densities of people and economic activities generate economies of scale and agglomeration. In fact, there was an increase of 90 million people living in urban areas between the census periods of 2001 and 2011.

However, lack of systematic land valuation and rules for land use transformation, lack of coordination between land use and infrastructure planning, rising transport costs, and inability of utilities to expand basic infrastructure services are reducing the net benefits and efficiency gains from urbanisation[9]. Unless the policy distortions that currently bind cities and the urbanisation process are resolved, it will be challenging to enhance efficiency gains from India's once-in-a-lifetime spatial transformation. In addition to spatial transformation and convergence that can enhance efficiency, overall growth rates and efficiency also depend on sectoral performance and transformation.

SECTORAL TRANSFORMATION

Consider Tables 3.1, 3.4a and 3.4b, which provide an overview of sectoral growth rates, Table 3. 1 for the past decade or so and Table 3. 4 for the next two. The core issue here is whether India can realise 8-9 per cent GDP growth by enhancing specialisation and performance of sectors that are both labour intensive and which generate positive externalities. In this framework, the important issue is a turnaround of industry and manufacturing in particular, whose performance hinges on the availability and quality of core infrastructure such as transport and electricity. Thus, as infrastructure needs are endogenous to industrial performance, keeping up transport and overall infrastructure investment will help in stimulating industrial growth, which in turn will generate demand for additional infrastructure.

For overall GDP growth to achieve sustained high levels, Indian manufacturing growth has to be accelerated. Whereas this had indeed happened in the period 2005-08, manufacturing growth has since tapered off. The government has exhibited its concern on this issue through the appointment of the National Manufacturing Competitiveness Council (NMCC), with the stated objective of increasing the share of manufacturing to 25 per cent of GDP. We have therefore projected higher growth in manufacturing over the next 20 years than has been achieved over a similar period in the past. We have still been somewhat conservative in stepping up the rate of manufacturing growth. What is desirable is that it actually increases to double digit growth rates. However, for this to be achieved, manufacturing will need greater focused policy attention and action. For manufacturing to be competitive and to grow rapidly, transport investment is critical, both domestic and international, through more efficient railways, roads, ports and airports. Conversely, higher investment in transport will require higher manufacturing growth. Thus, the relationship between manufacturing and transport is symbiotic.

Keeping in mind an aspiration to enhance industrial (and manufacturing) growth but realising the various constraints that are likely to remain in the medium term, industry's share in GDP is projected to be 24.7 per cent during the 12th Plan between 2012-17, increasing to 26.8 per cent between 2027-32. Accompanying industrial expansion, manufacturing is projected to increase from 12.9 per cent of GDP in 2012-17 to 13.3 per cent in 2027-32. Growth rates of industry are projected at 6.4 per cent annually during 2012-17, increasing to 9.8 per cent during 2027-32. Similarly manufacturing growth rates are projected at 5.6 per cent (2012-17), increasing to 10 per cent by 2027-32. While India has not experienced 10 per cent growth in industry and manufacturing, on a sustained basis, as of now, if such a growth rate is achieved at any time, it will imply doubling of industry value added output in seven years. The growth of other industrial sectors such as construction, utilities, and mining are also projected to grow around 9.5 per cent annually from 2018 onwards, albeit rather slower growth during 2012-17 (Construction 7.7 per cent; electricity, gas and water (utilities) 7.5 per cent; mining 5.8 per cent). Correspondingly, the services sector is projected to grow at its current rapid pace of around 8.5-9.5 per cent over the next 20 years (Table 3.4).

Growth in agriculture is being projected to be between 3.4 and 4 per cent per year over the next two decades. This would be seen by some as being excessively optimistic since the past record over 50 years suggests that it is difficult for agriculture to grow at much more than 3 per cent on a sustained basis. The basis of our optimism is that the demand for food other than cereals vegetables, fruit, milk, other dairy products, fish poultry, meat has higher elasticity with respect to income. This has already been manifested in the relatively higher inflation rates experienced by these commodities over the past few years. Thus, demand for these commodities can be expected to be buoyant in the coming years, and there will have to be supply response. For this to be achieved too, major policy changes are required. Transport investment in rural connectivity and in logistics will also be essential if such growth in agriculture is to be achieved.

9. Urbanization beyond Municipal Boundaries: Nurturing Metropolitan Economies and Connecting Peri-Urban Areas in India, World Bank (2013).

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Table 3. 4b

India: Gross Domestic Product, 2012-13 to 2031-32

	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE)			
						FY13-FY17	FY18-FY22	FY23-FY27	FY28-FY32
						12TH PLAN	13TH PLAN	14TH PLAN	15TH PLAN
(Per cent Share)									
GDP at Factor Cost	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Agriculture and Allied	17.1	16.6	16.1	15.5	15.0	16.0	13.4	11.0	8.8
Industry	26.3	26.3	26.2	26.2	26.4	26.3	26.9	28.0	29.1
Construction	8.3	8.4	8.4	8.5	8.6	8.4	9.0	9.6	9.9
Electricity, Gas and Water	1.7	1.7	1.8	1.8	1.8	1.8	1.9	2.1	2.2
Mining and Quarrying	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.5	2.5
Manufacturing	14.0	13.9	13.7	13.7	13.7	13.8	13.6	13.8	14.4
Services	56.6	57.1	57.7	58.3	58.5	57.7	59.7	61.0	62.1
Trade, Hotel, Transport and Communications	25.3	25.7	26.1	26.4	26.9	26.1	27.9	29.5	31.0
Finance, Insurance, Real Estate & Business Services	17.2	17.5	17.7	17.9	18.2	17.7	19.0	20.1	21.1
Community, Social & Personal Services	14.2	14.0	14.0	13.9	13.5	13.9	12.8	11.5	10.1
(2012-13 Prices) (Average Annual Per cent Change)									
GDP at Market Prices	3.3	6.9	7.2	7.7	7.8	6.6	8.0	8.5	9.0
GDP at Factor Cost	5.0	6.9	7.2	7.7	7.8	6.9	8.0	8.5	9.0
Agriculture and Allied	1.8	3.7	3.8	3.9	3.9	3.4	4.0	4.0	4.0
Industry	3.2	6.3	6.7	7.6	8.1	6.4	8.6	9.3	9.8
Construction	5.9	7.5	7.5	8.5	9.0	7.7	9.5	9.5	9.5
Electricity, Gas and Water	4.9	7.0	8.0	8.5	9.0	7.5	9.5	10.5	10.5
Mining and Quarrying	0.4	6.5	7.0	7.5	8.0	5.8	9.0	9.0	9.0
Manufacturing	1.9	5.5	6.0	7.0	7.5	5.6	7.7	9.0	10.0
Services	6.8	8.2	8.4	8.7	8.8	8.2	8.7	8.9	9.4
Trade, Hotel, Transport and Communications	5.4	8.3	8.6	9.0	9.0	8.1	9.3	9.5	10.0
Finance, Insurance, Real Estate & Business Services	8.7	8.3	8.5	9.0	9.0	8.7	9.3	9.5	10.0
Community, Social & Personal Services	7.5	8.0	8.0	8.0	8.0	7.9	7.0	7.0	7.0
Memo Items (Annual Per cent Change)									
Population	1.3	1.3	1.3	1.1	1.1	1.2	1.0	0.8	0.7
Per Capita GDPmp (2012-13 Prices)	2.0	5.6	5.9	6.5	6.7	5.3	6.9	7.6	8.3

Sources: Government of India, Central Statistical Office, National Account Statistics and NTDPC Projections.

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Tapping domestic savings is going to be an important part of a financing strategy, but not enough in itself. External savings, reflected in the current account, would be necessary to supplement domestic savings.

FINANCING GROWTH

In the modeling framework employed in this chapter, GDP is expected to grow between 7 and 9 per cent over the next 20 years resulting in the economy more than doubling twice over this period. We are also projecting gross capital formation to increase gradually from its current 36.4 per cent of GDP (2007-12) to around 42 per cent in the next 20 years (Tables 3.2, 3.5a and 3.5b).

What are the implications of such a growth scenario? Can such investment levels be financed? And how? The acceleration of industrial growth implies higher investment needs for the following sectors: power, telecommunications, transportation, urban infrastructure, ports and airports. Tapping domestic savings is going to be an important part of a financing strategy but it is unlikely to be enough in itself. External savings, mirrored in current account deficits, would be necessary to supplement domestic savings. What would be the overall level of infrastructure investment required? How much external capital inflows can be expected? How much can domestic savings be expected to increase? These questions are answered next.

MOBILISING DOMESTIC SAVINGS

Understanding the way savings are constituted can help in projecting the increase in infrastructure investment that India requires. While tapping both domestic and foreign savings is going to be important, more clarity is needed on the potential contribution of these sources. Recent international research shows that strong investment periods in the power sector have been accompanied by an increase in domestic savings, and foreign sources, on the other hand, tend to prevail during periods of rapid investment in roads[10]. We first consider the performance and outlook for domestic savings.

The gross domestic saving rate has risen significantly since the late 1990s, but has fallen since 2008, though it is still above 30 per cent of GDP (Table 3.6). In fact, India's gross domestic savings rate in the recent past is comparable to Indonesia, Thailand and Korea, albeit much lower than that of China, Malaysia and Singapore (Table 3.3). In our projections, we assume that domestic savings will be restored and then rise over the over the next two decades, to be around 40 per cent of GDP by 2027-32 (Table 3.7). There has been a tendency to over-emphasise the importance of foreign savings in stimulating infrastructure investments in India, but the reality is that it is domestic savings that have largely financed Indian investment, including that in infrastructure and transport[11]. To get a better understanding of how domestic savings can be tapped, we consider each of its three components in turn: household savings, private corporate savings, and public sector savings.

HOUSEHOLD SAVINGS

For the household sector, we observe that savings increased from 19.7 per cent in 1998-2002 to about 23.4 per cent of GDP in 2008-2012. We project household savings to be the bedrock of domestic savings, reaching around 28 per cent over the next 20 years (Table 3.7). As already noted, despite an overall fall in gross domestic saving, household savings have remained relatively stable. Household net financial savings increased from about 6 to 7 per cent in the early 1980s to 10 per cent in the late 1990s, stabilising at this level thereafter (Table 3.6). In the future, we do not expect to see dramatic increases in net financial savings even though households will continue to increase gross savings, deeper financial markets and intermediation will translate into higher level of borrowings. Taking this perspective, we are projecting net financial savings to increase, albeit at a slower pace, reaching 13 per cent of GDP by 2028-2032 (Table 3.7). Bank deposits continue to account for the predominant share of gross financial assets, with their share increasing sharply in the second half of 2000s in contrast to the declining trend in the previous years; A trend that augurs well for infrastructure investments is the increasing share of contractual savings in life insurance funds, and provident and pension funds. Although these have not been very buoyant in the recent past, we can expect greater mobilisation of household financial savings in insurance, pension and provident funds, as incomes continue to increase. Life insurance funds accounted for over 3 per cent of GDP during 2007-12, up from about 1 per cent during the early 1990s[12]. Provident and pension funds were another 1.6 per cent of GDP during this period. This provides clear signals of the financial deepening of the economy and the formalisation of household sector savings in financial instruments. Going forward, however, the increasing penetration of insurance activity could increase the share of life insurance in total financial savings of households. We can expect much deeper penetration of insurance and pension products in the years to come: we have projected their share to go up from the current around 4 per cent of GDP to 5 per cent. With

10. Walsh et al. (2011).
11. Chapter 1 in Mohan (2011).
12. Database on Indian Economy, Reserve Bank of India, http://dbie.rbi.org.in/DBIE/dbie.rbi?site=home , accessed 1 November, 2013.

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Table 3. 5a

India: Gross Domestic Expenditure, 2012-13 to 2031-32

	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE)			
						FY13-FY17	FY18-FY22	FY23-FY27	FY28-FY32
						12TH PLAN	13TH PLAN	14TH PLAN	15TH PLAN
(Rs Billion 2012-13 Prices)									
Gross Domestic Product	100,262	107,221	114,951	123,774	133,481	115,938	169,153	252,143	384,748
Gross Domestic Capital Formation	35,373	38,600	42,172	46,401	50,738	42,657	65,725	103,700	166,526
Public	9,525	10,186	10,920	11,759	12,681	11,014	16,915	25,214	38,475
Private	25,848	28,414	31,251	34,642	38,057	31,643	48,810	78,486	128,051
Total Consumption	72,039	75,210	79,401	84,120	89,560	80,066	111,251	159,542	234,734
Public	13,052	13,410	13,796	14,850	16,008	14,223	18,724	27,666	42,168
Private	58,987	61,800	65,605	69,270	73,551	65,843	92,527	131,876	192,566
Exports of Goods & Services	24,877	27,455	30,333	33,561	37,160	30,677	51,173	86,519	148,044
Imports of Goods & Services	32,026	34,043	36,954	40,308	43,977	37,462	58,996	97,618	164,556
Memo Items									
Gross Fixed Investment	29,359	32,038	35,002	38,513	42,113	35,405	54,552	86,071	138,216
Change in Stocks	3,184	3,474	3,795	4,176	4,566	3,839	5,915	9,333	14,987
Valuables	2,830	3,088	3,374	3,712	4,059	3,413	5,258	8,296	13,322
(US$ Billion 2012-13 Prices)									
Gross Domestic Product	1,843	1,971	2,113	2,275	2,453	2,131	3,109	4,634	7,071
Gross Domestic Capital Formation	650	709	775	853	933	784	1,208	1,906	3,061
Public	175	187	201	216	233	202	311	463	707
Private	475	522	574	637	699	582	897	1,443	2,353
Total Consumption	1,324	1,382	1,459	1,546	1,646	1,472	2,045	2,932	4,314
Public	240	246	254	273	294	261	344	508	775
Private	1,084	1,136	1,206	1,273	1,352	1,210	1,701	2,424	3,539
Exports of Goods & Services	457	505	557	617	683	564	941	1,590	2,721
Imports of Goods & Services	589	626	679	741	808	689	1,084	1,794	3,024
Memo Items	-	-	-	-	-	-	-	-	-
Gross Fixed Investment	540	589	643	708	774	651	1,003	1,582	2,540
Change in Stocks	59	64	70	77	84	71	109	172	275
Valuables	52	57	62	68	75	63	97	152	245

Sources: Government of India, Central Statistical Office, National Account Statistics and NTDPC Projections.

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We expect much deeper penetration of insurance and pension products in the coming years, and projected their share to go up from the current 4 per cent to 5 per cent of GDP. With rising incomes, it is quite possible that this projection is on the lower side

rising incomes and greater penetration of financial institutions, it is quite possible that this projection is on the lower side. (Box 3.1)

While one would think that an increase in financial savings would be accompanied by a move away from savings in physical assets the trends indicate that savings in both financial and physical assets will grow hand in hand. Savings in physical assets have increased from 9.7 per cent of GDP in the period 1998-2002 to 12.3 per cent of GDP during 2008-2012. The household sector's preference for savings in the form of physical assets since 2000-01 could be attributed partly to the robust economic growth as well as rising availability of credit to meet financing needs of the household sector. An important reason for this increase is that households are borrowing more for investments in durable assets such as housing which is among the few inflation-resilient long-term investment options and part of a diversified savings portfolio for households. On the back of rapid economic growth in the early 2000s, there has also been considerable expansion in consumer finance and developer finance for housing (and other assets) in recent years and we expect savings in physical assets to continue growing. Our projections suggest that this asset class will account for 12.5 per cent of GDP during the 12th Plan period and then increase to more than 14 per cent through 2032.

One striking feature is that the percentage of shares and debentures in gross financial assets of households has remained quite small (less than 10 per cent on an average), even though it increased sharply during the (early) 1990s, spurred by the reforms in the capital market[13]. Subsequently, the share of shares and debentures started declining largely reflecting stockmarket conditions impacted by irregularities and the downturn in industrial activity and was at less than 3 per cent in the first half of 2000s. 'Shares & debentures' did pick up again during 2005-06 to 2007-08, largely coinciding with a high-growth phase and buoyant stockmarket trends, but then dropped in 2008-09 in the face of knock-on effects of the global financial crisis. Household investment in the stockmarket has remained subdued, with net investment in recent years being zero or even negative.

PRIVATE CORPORATE SECTOR SAVINGS

The private corporate sector has remained vibrant and has benefitted from increasing consumption and investment demand arising out of consistently high economic growth. With robust sales growth, improved productivity, and lower interest rates during 2000-2010, corporates recorded good growth in profits which translated into higher private corporate sector saving. The savings of the private corporate sector thus increased rapidly from 3.9 per cent of GDP during the 9th Five Year Plan period (1997-2002) to 7.8 per cent of GDP during the 11th Plan period (2007-12). In view of the broader global economic slowdown and the current sluggishness of the Indian economy, we project that corporate savings will be around their current levels around 7.5 per cent of GDP during the 12th Plan period and then increase gradually to 9.5 per cent by 2027-2032, although they have dipped in the last couple of years (Tables 3.6 and 3.7).

What is important to consider is that corporate savings had grown significantly from the low levels of 3.8 per cent in 1994-95, driven by marketisation of the economy and the entry of the private sector into areas that were historically reserved for the public sector. The corporate sector also benefitted from softening of the interest rate structure during 2003-08 accompanied by low inflation. We can expect the corporate sector to keep growing as a proportion of GDP: this would also help in increasing private corporate sector savings as a proportion of GDP.

The emphasis being placed by Government on the contribution of the private sector in infrastructure through public-private partnerships and otherwise will be difficult to realise if corporate profitability and hence corporate savings are not restored to what they were during most of the 11th Plan period. This needs the practice of both better macroeconomic and microeconomic policies. Fiscal correction is essential to redirect private household savings to the corporate sector and to reduce inflation. For nominal interest rates to come down, so that corporate profitability is restored, it is essential that inflation rates come down to the 4-5 per cent level that had been achieved during 1998-2008. This will also enable banks to give positive real deposit rates to depositors in order to increase bank deposits and hence restore financial savings. Furthermore, the World Bank's index of 'Ease of Doing Business' indicates high barriers to entry in India. Thus, regulatory policies, permitting processes, environmental clearances and the like, all have to be improved to restore corporate profitability. Finally, the role of efficient transport

13. Report of the Sub Group on Household Sector Saving: 12th Five Year Plan (2012-13 to 2016-17), Planning Commission, 2011.

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Box 3.1

Pension Funds Can and Should Invest More in Infrastructure

[The Economist, 26th October 2013, Print Edition]

IT MIGHT seem like a marriage made in heaven. Infrastructure projects take a long time to build but then deliver cash flows over an extended period. Pension funds have liabilities that stretch over several decades. Why not get the latter to finance the former?

But the couple have barely survived the first date, let alone made it to the altar. A new report from the OECD, a think-tank, estimates that global pension funds have just 0.9 per cent of their portfolios in pure infrastructure plays.

In part, that is due to the OECD's decision to define infrastructure assets as unlisted debt and equity; pension funds have significant exposure to the listed shares and bonds of power companies and the like. From the point of view of public policy, however, the OECD's definition is the correct one. The utility shares owned by pension funds are those of companies that were privatised in the 1980s and 1990s; the infrastructure they operate was the result of government spending in previous decades.

At the moment, public finances are very tight. Although governments would like to see more infrastructure get built (thanks, not least to the Keynesian stimulus that might result), they would rather not bear the whole burden. The difficult bit about infrastructure projects, apart from the original decision to commission them, is the cost of construction. That is where governments would like pension funds, and the rest of the private sector, to open their wallets.

What's stopping them? Risk is clearly an important factor. Pension funds want reliable cash flows that can be used to pay retirees, not the uncertainties that are associated with greenfield projects. As the OECD report points out, there is a 'lack of objective high-quality data on infrastructure investments.' This makes it difficult for funds to calculate how infrastructure would fit into their portfolios: for example, whether its returns would be closely correlated with other assets, such as equities. Another problem is that small pension funds may lack the expertise to get directly involved in such large projects; they have to invest via an infrastructure fund, and pay a management fee for the privilege.

The biggest infrastructure investors so far have been the giant Australian and Canadian pension funds, which can benefit from economies of scale. Britain is trying to achieve the same effect by setting up a Pensions Investment Platform which will pool infrastructure investments; the hope is for a £20 billion ($32 billion) fund within ten years. However, the scheme has been slow to get going—one person involved described it as like 'herding cats'—and even if it is successful it will not be sufficient to fund Britain's highest-profile project, a proposed high-speed rail line from London to Manchester.

A new report from Llewellyn Consulting and the Pensions Insurance Corporation points to other problems for pension funds, including the lack of political certainty. Capital spending is often the first item to be cut when governments run into budget difficulties and tough decisions are put off to suit electoral cycles (expansion of airport capacity near London is a notable example). The report suggests one possible solution: that the government should borrow a separate sum to finance infrastructure spending with the stated intention of selling assets to the likes of pension funds after a number of years. Such debt could be recorded separately in the National Accounts, an idea that was suggested to the British government by one of the report's sponsors back in 2009.

An alternative option would be a national investment bank, along the lines of the European Investment Bank. It would borrow from the market and use its capital to guarantee the equity portion of infrastructure projects. That would allow pension funds to buy the more secure debt elements of the project's funding.

The Olympics showed that Britain can build projects on time when the country puts its mind to it. A similar effort is required now. The need is clear. More than half of companies surveyed by the Confederation of British Industry compared Britain unfavourably with other EU countries on this issue. Among the G7 countries, only Italy is regarded as having worse infrastructure. And there is no shortage of potential funding Britain's pension assets are equal to 112 per cent of GDP. Surely someone can put the two together.

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infrastructure is essential for corporate efficiency, competitiveness and profitability.

In summary, the role of the private sector in infrastructure and transport investment will be difficult to achieve at the magnitudes expected unless corporate profitability is restored. It would then become possible for private corporate savings to increase and be invested as equity in the infrastructure sector, in addition to increasing investment in manufacturing and services.

PUBLIC SECTOR SAVINGS

An important development that has taken place since the late 2000s is the deterioration in public sector savings. From being around 5 per cent of GDP in 2007-08, this savings class has fallen to 1.3 per cent of GDP in 2011-12 (Table 3.6). And the main culprit here is public/government administration, where savings were (-) 2.0 per cent of GDP in 2011-12[14]. The combined (Centre and states) fiscal deficit during the 11th Plan averaged 7.3 per cent of GDP; of this, the GFD of the Centre was 5.1 per cent of GDP and the states was 2.3 per cent. The average revenue deficit of the Centre was 3.7 per cent of GDP, while the states had a marginal surplus (0.1 per cent of GDP) on the revenue account. While the revenue account of the states as a whole has improved substantially, the Centre's revenue deficit continues to be an area of concern. The attainment of higher gross domestic savings is therefore crucially dependent on increases in public sector savings. Continuing macro-economic stabilisation and reduction in fiscal deficit is essential if gross domestic savings are to increase further.

The 13th Finance Commission made the case that the fiscal deficit of the Central Government should be brought down to 3 per cent of GDP by 2013-14 and maintained at that level in subsequent years, and the Centre's revenue deficit should be progressively reduced and eliminated, followed by the emergence of revenue surplus by 2014-15. For the consolidated position of the state governments, the Commission's recommendation translates into a fiscal deficit target of 2.4 per cent of GDP in 2013-14 and 2014-15. In view of the fiscal slippage in the aftermath of the 2008 crisis and based on recommendations of the Kelkar panel, the Finance Ministry has now proposed a revised path for fiscal consolidation for the Central Government, wherein by 2016-17, the fiscal deficit will be brought down to 3 per cent and the revenue deficit to 1.5 per cent.

Improved fiscal management by itself can help in increasing domestic savings by 3 per cent of GDP. In this context, the tax-GDP ratio for the Central Government had increased sharply during the 2000s to 11.9 per cent in 2007-08, although it has declined since then to 9.9 per cent in 2011-12. On the other hand, interest payments-GDP ratio for the Central Government has decreased from 4.4 per cent in 2003-04 to 3.0 per cent in 2011-12. It is therefore not unrealistic to project an improvement in both the gross fiscal deficit of the Central Government and in its revenue deficit.

Within the public sector, savings of public sector undertakings (PSU) have been positive and stable on an average ranging between 3 per cent and 4 per cent of GDP over the past 15 years. Going forward, we project savings of these PSUs to increase gradually to around 4.7 per cent of GDP by 2027-32 (Table 3.7).

DOMESTIC SAVINGS: SUMMARY

The plausible projections of savings enhancement made above in each of the three main segments, the household sector, the private corporate sector, and the public sector, yield a good possibility of gross domestic savings increasing from a projected 32.7 per cent in 2012-17 to about 40 per cent of GDP by 2027-32. We may note that the gross domestic savings level had reached 36.8 per cent in 2007-08. Implications of these projections are (Table 3.7):

- That the household sector continues to contribute to long-term formal financial savings instruments in the future. Overall, we are projecting household savings to increase from about 23 per cent in 2012-17 to 28 per cent in 2027-32.
- The expansion of the private corporate sector continues over the next decade along with a continued increase in its share of domestic savings. We are projecting private corporate sector savings to increase from 7.4 per cent in 2012-17 to about 9.6 per cent in 2027-32.
- A sustained improvement in performance of the public sector so that the current drag of public sector savings deficit is reduced. We are projecting overall public sector savings to increase from around 2.2 per cent of GDP in 2012-17 to about 3.4 per cent in 2027-32.

From the point of view of infrastructure investment, a continuing increase in contractual savings in life insurance, provident fund and pension funds from the current level of about 4 per cent of GDP to over 5 per cent by 2027-32 is very important. These projections may be on the conservative side. This kind of expansion in such savings is essential to increase the stock of long-term savings which are most suitable for investment in infrastructure, which typically has long payback periods. With increas-

14. A sharp but temporary decline in public sector savings occurred in 2008-09 largely on account of the Sixth Pay Commission arrear payouts and fiscal stimulus measures. (Report of the Sub-Group on Household Sector Saving during the 12th Five Year Plan (2012-13 to 2016-17 (2011).

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Table 3. 5b

India: Gross Domestic Expenditure, 2012-13 to 2031-32

	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE)			
						FY13-FY17	FY18-FY22	FY23-FY27	FY28-FY32
						12TH PLAN	13TH PLAN	14TH PLAN	15TH PLAN
Current Prices (Per cent of GDP)									
Gross Domestic Product	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Gross Domestic Capital Formation	35.3	36.0	36.7	37.5	38.0	36.8	38.9	41.1	43.3
Public	9.5	9.5	9.5	9.5	9.5	9.5	10.0	10.0	10.0
Private	25.8	26.5	27.2	28.0	28.5	27.3	28.9	31.1	33.3
Total Consumption	71.9	70.1	69.1	68.0	67.1	69.1	65.8	63.3	61.0
Public	13.0	12.5	12.0	12.0	12.0	12.3	11.1	11.0	11.0
Private	58.8	57.6	57.1	56.0	55.1	56.8	54.7	52.3	50.1
Exports of Goods & Services	24.8	25.6	26.4	27.1	27.8	26.5	30.3	34.3	38.5
Imports of Goods & Services	31.9	31.8	32.1	32.6	32.9	32.3	34.9	38.7	42.8
Memo Items									
Gross Fixed Investment	29.3	29.9	30.4	31.1	31.5	30.5	32.2	34.1	35.9
Change in Stocks	3.2	3.2	3.3	3.4	3.4	3.3	3.5	3.7	3.9
Valuables	2.8	2.9	2.9	3.0	3.0	2.9	3.1	3.3	3.5
(2004-05 Prices) (Annual Per cent Change)									
Gross Domestic Product	3.3	6.9	7.2	7.7	7.8	6.6	8.0	8.5	9.0
Gross Domestic Capital Formation	2.8	9.1	9.3	10.0	9.3	8.1	9.3	9.8	9.4
Public	24.9	6.9	7.2	7.7	7.8	10.7	9.1	8.5	9.0
Private	-3.5	9.9	10.0	10.9	9.9	7.3	9.3	10.3	9.5
Total Consumption	4.0	4.5	5.6	6.0	6.5	5.3	7.2	7.5	8.7
Public	25.2	2.7	2.9	7.6	7.8	9.0	6.1	8.5	9.0
Private	10.2	4.8	6.2	5.6	6.2	6.6	7.4	7.3	8.6
Exports of Goods & Services	-0.2	10.4	10.5	10.6	10.7	8.3	10.9	11.2	11.4
Imports of Goods & Services	1.6	6.3	8.5	9.1	9.1	6.9	10.2	10.6	11.1
Memo Items									
Gross Fixed Investment	-1.2	9.1	9.3	10.0	9.3	7.2	9.3	9.8	9.4
Change in Stocks	55.4	9.1	9.3	10.0	9.3	17.4	9.3	9.8	9.4
Valuables	7.7	9.1	9.3	10.0	9.3	9.1	9.3	9.8	9.4
ICOR - Gross Capital Formation	10.7	5.1	5.0	4.8	4.8	6.1	4.8	4.0	4.0

Sources: Government of India, Central Statistical Office, National Account Statistics and NTDPC Projections.

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Table 3.6
India: Gross Domestic Savings, 2000-01 to 2011-12

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Per cent of GDP												
Gross Domestic Savings	23.8	24.9	25.9	29.0	32.4	33.4	34.6	36.8	32.0	33.7	34.0	30.8
Household Sector	21.4	23.2	22.3	23.2	23.6	23.5	23.2	22.4	23.6	25.2	23.5	22.3
Financial Saving	9.9	10.5	10.0	11.0	10.1	11.4	11.3	11.6	10.1	12.0	10.4	8.0
Financial Savings (Gross)	11.4	12.2	12.8	13.7	13.8	15.8	17.9	15.4	13.0	16.0	13.4	10.8
Currency	0.7	1.2	1.1	1.5	1.1	1.4	1.6	1.6	1.6	1.5	1.8	1.2
Bank Deposits	4.4	4.8	4.8	5.5	5.4	7.2	10.0	7.8	7.4	6.1	5.7	5.5
Non- Banking Deposits	0.1	(0.0)	0.5	0.1	0.0	0.0	0.1	0.0	0.3	0.3	0.1	0.2
Life Insurance Fund	1.6	1.8	2.1	1.8	2.1	2.3	2.7	3.4	2.7	4.0	2.8	2.5
Provident and Pension Fund	2.3	1.9	1.8	1.7	1.7	1.7	1.7	1.4	1.3	2.0	1.8	1.7
Claims on Government	1.8	2.2	2.2	3.1	3.3	2.4	0.4	(0.6)	(0.5)	0.7	0.5	(0.2)
Shares & Debentures	0.5	0.4	0.3	0.3	0.3	0.9	1.2	1.5	(0.0)	0.7	0.0	(0.1)
Units of UTI	(0.0)	(0.1)	(0.1)	(0.3)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	-	-	-
Trade Debt(Net)	0.0	(0.0)	-	(0.0)	(0.0)	(0.0)	0.2	0.3	0.2	(0.0)	0.1	0.1
Financial Liabilities	1.5	1.6	2.8	2.7	3.7	5.0	6.6	3.8	2.9	3.1	3.6	2.8
Savings in Physical Assets	11.5	12.7	12.3	12.1	13.4	11.7	11.9	10.8	13.5	13.2	13.1	14.3
Private Corportate Sector	3.7	3.3	3.9	4.6	6.6	7.5	7.9	9.4	7.4	8.4	7.9	7.2
Joint Stock Companies	3.5	3.0	3.4	4.0	6.0	7.0	7.4	8.9	7.0	7.9	7.5	6.8
Cooperative Banks & Societies	0.2	0.3	0.5	0.6	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4
Public Sector	(1.3)	(1.6)	(0.3)	1.3	2.3	2.4	3.6	5.0	1.0	0.2	2.6	1.3
Public Authorities	(4.2)	(4.9)	(4.2)	(2.8)	(1.8)	(1.6)	(0.5)	1.1	(2.4)	(2.7)	(0.3)	(1.7)
Government Administration	(5.0)	(5.5)	(4.7)	(3.3)	(2.3)	(2.1)	(1.0)	0.5	(2.8)	(3.1)	(0.6)	(2.0)
Departmental (Comm.) Enterprises	0.8	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.4	0.4	0.3	0.4
Non-Departmental Enterprises	2.8	3.4	3.9	4.1	4.1	4.0	4.0	3.9	3.3	2.8	2.9	3.0
Memo Item												
GDP at Market Prices (Rs Billion at Current Prices)	21,687	23,483	25,307	28,379	32,422	36,934	42,947	49,871	56,301	64,778	77,953	89,749

Source: Government of India, Central Statistical Office, National Account Statistics and Reserve Bank of India.

ing incomes and longer life expectancy, the demand for such savings instruments can also be expected to increase substantially in the coming years. At present, such savings are much easier to make by employees working within the organised sector. It is quite likely that there is considerable latent demand for contractual savings by workers in the unorganised sector across the whole economy. This is also reflected in the consistently high level of savings that are collected through the various government-run small savings schemes, mostly through the post office. The very strong implication of these projections is that if the domestic savings are to be enhanced to the level envisaged, major reforms must be instituted towards further deepening and widening of the life insurance, provident and pension funds in the country. The much delayed approval of the Pension Fund Regulatory and Development Authority Act finally setting up the Pension Fund Regulatory and Development Authority (PFRDA) on a statutory basis is a good sign for the future development of the pension fund industry.

It is vital for infrastructure investment that these savings instruments are available to the widest array of savers throughout the country. Better availability of

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Box 3. 2

How to Finance Infrastructure: Macroeconomic Lessons and Emerging Markets Case Studies

How emerging countries have managed rapid economic growth along with supporting infrastructure, contributes to the discussion on the available options for India's current infrastructure investment planning. Examples from Brazil, China, Korea and Chile provide alternatives for financing infrastructure.

As previously established, rapid economic growth is accompanied with increases in infrastructure investment. Specifically, booms in power capacity tend to be financed domestically, while investment in roads usually is financed with the help of foreign capital.

Fiscal and financial conditions, as well as savings, usually improve during periods where infrastructure investment is growing. Therefore, focusing on the way countries finance their infrastructure improvements can be helpful to planning the increase in infrastructure investment that India requires.

There are several options to improve infrastructure financing, depending on the country characteristics. However, it is not clear if increases should be financed domestically or externally. In general, domestic savings increase during strong investment periods in the power sector. Foreign sources on the other hand, tend to prevail during periods of rapid investment in roads.

How are these increases financed? It seems that public finances do not decline during periods of rapid investment. Higher growth due to infrastructure booms leads to higher central government revenues; however it appears that spending totals are not significantly higher.

Another characteristic of high infrastructure investment periods is the financial deepening, both in terms of bank credit and bond finance. Therefore, infrastructure finance could be increased within a growing financial system instead of crowding out other sources of finance.

Country experiences also include the development of the private sector investment in infrastructure. Chile and Korea developed local bond markets to support relatively long-term issuances by infrastructure companies. Chile developed the pension system. With a market for local currency-denominated long-term securities, the country minimised the need for bank finance. In Korea, the main private sources are foreign and individual investors; however, in previous stages banks also purchased infrastructure debt. Further, in China and Brazil, bank loans have been instrumental. In China, public banks have supplied long-term financing, while in Brazil, the Brazilian Development Bank (BNDES), is the major source of finance.

Source: Walsh et al. (2011).

safe and high-return contractual savings instruments is likely to result in an overall enhancement of the household savings level. At the same time, getting public sector savings in order should be of high priority.

At present, households are quite simply not investing in the stockmarket, either directly or indirectly through mutual funds. If private sector investment in infrastructure is to increase by the magnitudes envisaged, vehicles need to be found for household financial savings to be invested in infrastructure companies through the stockmarket. This also implies better and credible governance in private sector infrastructure companies that inspire confidence in investors.

MOBILISING EXTERNAL SAVINGS

Mobilising external savings will be important to augment domestic savings to finance India's gross domestic investment, particularly in infrastructure (See Box 3.1 for lessons from emerging economies). Over the next 20 years, Gross Domestic Investment (GDI) has been projected to increase from an average of around 36.2 per cent of GDP during the 11th Plan period (2007-12) to around 43 per cent during the 15th Plan period (2027-32) (Tables 3.5a and 3.5b). At the same time, domestic savings are projected to increase from their current 30-32 per cent of GDP to 40.9 per cent by 2027-2032 (Table 3.7). Hence, external capital inflows will remain important in the financing

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Table 3.7
India: Gross Domestic Savings, 2012-13 to 2031-32

	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE)			
						FY13-FY17	FY18-FY22	FY23-FY27	FY28-FY32
						12TH PLAN	13TH PLAN	14TH PLAN	15TH PLAN
Per cent of GDP									
Gross Domestic Savings	29.6	31.3	32.5	33.6	34.5	32.5	35.9	38.6	40.9
Household Sector	21.4	22.7	22.8	23.3	23.6	22.8	24.5	26.3	27.9
Financial Saving	7.7	8.2	11.0	11.0	11.0	9.9	11.4	12.3	13.0
Financial Savings (gross)	10.4	11.0	14.5	15.1	15.5	13.5	16.1	17.3	18.3
Currency	1.2	1.2	1.4	1.5	1.5	1.4	1.6	1.7	1.8
Bank Deposits	5.3	5.6	7.2	7.5	7.7	6.8	8.0	8.6	9.1
Non- Banking Deposits	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Life Insurance Fund	2.4	2.5	2.5	2.6	2.7	2.6	2.8	3.0	3.2
Provident and Pension Fund	1.6	1.7	1.5	1.6	1.6	1.6	1.7	1.8	1.9
Claims on Government	(0.2)	(0.2)	1.0	1.0	1.1	0.6	1.1	1.2	1.3
Shares & Debentures	(0.1)	(0.1)	0.7	0.7	0.7	0.4	0.8	0.8	0.9
Units of UTI	-	-	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Trade Debt(Net)	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Financial Liabilities	2.7	2.8	3.5	4.0	4.5	3.6	4.6	5.0	5.3
Saving in Physical Assets	13.7	14.6	11.8	12.3	12.6	12.9	13.1	14.0	14.9
Private Corporate Sector	6.9	7.3	7.0	7.6	8.1	7.4	8.5	9.1	9.6
Joint Stock Companies	6.5	6.9	6.5	7.1	7.6	7.0	7.9	8.5	9.0
Cooperative Banks & Societies	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6
Public Sector	1.3	1.3	2.7	2.8	2.8	2.2	3.0	3.2	3.4
Public Authorities	(1.6)	(1.7)	(1.1)	(1.1)	(1.1)	(1.3)	(1.2)	(1.2)	(1.3)
Government Administration	(2.0)	(2.1)	(1.5)	(1.6)	(1.6)	(1.7)	(1.7)	(1.8)	(1.9)
Departmental (comm.) Enterprises	0.3	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6
Non-Departmental Enterprises	2.9	3.0	3.7	3.9	4.0	3.5	4.1	4.4	4.7
Memo Item									
Gross Domestic Product at Market Prices - (Rs Billion 2012-13 prices)	100,262	107,221	114,951	123,774	133,481	115,938	169,153	252,143	384,748

Sources: Government of India, Central Statistical Office, National Account Statistics and NTDPC Projections.

of investment in India. And historically, expansion in economic activity, particularly during the 2nd, 3rd, 6th, and 7th Plans have been associated with higher financing through external sources as reflected in larger current account deficits. In the more recent period (since 2008-09), however, the higher recourse to foreign savings has been associated with a slowing economy.

In recent years, there has been a great deal of stress laid on mobilising external savings for transport investment, and for infrastructure as a whole. The objective in this section is to estimate the maximum feasible level of external savings that can be mobilised to finance overall investment in India, and hence for infrastructure and transport. What is of importance is that such external capital inflows should be sustainable. Net capital inflows that are absorbed by the economy as a whole are identically equal to the current account deficit (CAD). Thus, considerations for sustainability include the magnitude of CAD that would be regarded as safe

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Table 3. 8a

India: Balance of Payments: Summary, 2000-01 to 2011-12

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
US$ Billion												
Current Account Balance	-2.7	3.4	6.3	14.1	-2.5	-9.9	-9.6	-15.7	-27.9	-38.2	-45.9	-78.3
Exports of Goods and Services	61.7	61.8	74.5	93.2	128.5	162.8	202.7	256.5	295.0	276.0	383.3	450.7
Exports of Goods, F.O.B.	45.5	44.7	53.8	66.3	85.2	105.2	128.9	166.2	189.0	182.4	250.5	309.8
Exports of Services	16.3	17.1	20.8	26.9	43.2	40.6	73.8	90.3	106.0	96.0	132.9	140.9
Imports of Goods and Services	72.5	70.1	81.6	96.7	146.7	191.5	235.0	309.1	360.6	359.1	465.1	576.4
Imports of Goods, C.I.F.	57.9	56.3	64.5	80.0	118.9	157.1	190.7	257.6	308.5	300.6	381.1	499.5
Imports of Services	14.6	13.8	17.1	16.7	27.8	34.5	44.3	51.5	52.0	60.0	84.1	76.9
Net Factor Income	-5.0	-4.2	-3.4	-4.5	-5.0	-5.9	-7.3	-5.1	-7.1	-8.0	-17.3	-16.0
Private Transfers (Net)	12.9	15.4	16.4	21.6	20.5	24.5	29.8	41.7	44.6	51.8	53.1	63.5
Official Transfers (Net)	0.3	0.5	0.5	0.6	0.3	0.2	0.3	0.2	0.2	0.3	0.0	0.0
Foreign Investment	5.9	6.7	4.2	13.7	13.0	15.5	14.8	43.3	8.3	50.4	39.7	39.2
Foreign Direct Investment	3.3	4.7	3.2	2.4	3.7	3.0	7.7	15.4	22.4	18.0	9.4	22.1
Portfolio Investment	2.6	2.0	0.9	11.4	9.3	12.5	7.1	27.4	-14.0	32.4	30.3	17.2
External Assistance, net	0.4	1.1	-3.1	-2.9	1.9	1.7	1.8	2.1	2.4	2.9	4.9	2.3
Commercial Borrowings, Net	4.3	-1.6	-1.7	-2.9	5.2	2.5	16.1	22.6	7.9	2.0	12.5	10.3
Short-Term Credit (Supplier's Credit)	0.6	-0.8	1.0	1.4	3.8	3.7	6.6	15.9	-2.0	7.6	11.0	6.7
Bank Capital	-2.0	2.9	10.4	6.0	3.9	1.4	1.9	11.8	-3.2	2.1	5.0	16.2
Rupee Debt Service	-0.6	-0.5	-0.5	-0.4	-0.4	-0.6	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1
Other Capital	0.3	0.8	0.6	1.7	0.7	1.2	4.2	11.0	-5.9	-13.2	-11.0	-6.9
Erros and Omissons	-0.3	-0.2	-0.2	0.6	0.6	-0.5	1.0	1.3	0.4	0.0	-3.0	-2.4
Overall Balance	5.9	11.8	17.0	31.4	26.2	15.1	36.6	92.2	-20.1	13.4	13.1	-12.8
Reserves (Increase –/ Decrease +)	-5.9	-11.8	-17.0	-31.4	-26.2	-15.1	-36.6	-92.2	20.1	-13.4	-13.1	12.8
Foreign Exchange Reserves	42.9	54.7	76.1	113.0	141.5	151.6	199.2	309.7	252.0	279.1	304.8	294.4
Foreign Currency Assets, end of period	39.6	51.0	71.9	107.4	135.6	145.1	191.9	299.2	241.4	254.7	274.3	260.1
(Per cent of GDP)												
Exports of Goods and Services	13.0	12.6	14.3	15.1	17.8	19.5	21.4	20.7	24.1	20.2	22.4	24.1
Imports of Goods and Services	15.3	14.2	15.6	15.7	20.3	0.0	24.8	24.9	29.4	26.3	27.2	30.8
Private Transfers (Net)	2.7	3.1	3.1	3.5	2.8	2.9	3.1	3.4	3.6	3.8	3.1	3.4
Foreign Investment	1.2	1.4	0.8	2.2	1.8	1.9	1.6	3.5	0.7	3.7	2.3	2.1
Foreign Direct Investment	0.7	1.0	0.6	0.4	0.5	0.4	0.8	1.2	1.8	1.3	0.5	1.2
Portfolio Investment	0.5	0.4	0.2	1.8	1.3	1.5	0.7	2.2	-1.1	2.4	1.8	0.9
Commercial Borrowings	0.9	-0.3	-0.3	-0.5	0.7	0.3	1.7	1.8	0.6	0.1	0.7	0.6

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	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
(Per cent Change in US$ Terms)												
Exports of Goods and Services	15.9	0.2	20.5	25.0	37.9	26.7	24.5	26.6	15.0	-6.4	38.9	17.6
Exports of Goods, F.O.B.	21.1	-1.6	20.3	23.3	28.5	23.4	22.6	28.9	13.7	-3.5	37.3	23.7
Exports of Services	3.6	5.4	21.1	29.4	61.0	-6.1	81.7	22.4	17.3	-9.4	38.4	6.0
Imports of Goods and Services	8.1	-3.3	16.4	18.6	51.7	30.5	22.8	31.6	16.6	-0.4	29.5	23.9
Imports of Goods, C.I.F.	4.6	-2.8	14.5	24.1	48.6	32.1	21.4	35.1	19.8	-2.6	26.7	31.1
Imports of Services	25.2	-5.2	23.9	-2.3	66.4	24.0	28.5	16.2	1.1	15.3	40.0	-8.5
Reserves (as Months of G&S Imports)	7.1	9.4	11.2	14.0	11.6	9.5	10.2	12.0	8.4	9.3	7.9	6.1

Source: Reserve Bank of India, Hand Book of Statistics.
Note: F.O.B: Free On Board; C.I.F.: Cost, Insurance and Freight.

and sustainable by financial markets. We examine this issue by first focusing on feasible development in the current account, and then in the capital account.

THE CURRENT ACCOUNT

India's exports have grown at a healthy pace, significantly faster than world exports since 2002, reflecting the resilience of India's exports linked to a strategic trade policy that is aimed at diversifying trade in terms of commodities as well as destinations. This has helped in mitigating the adverse effects of global shocks[15]. Exports of goods and services as a share of GDP increased from 11.8 per cent during 1998-2002, reaching 22.1 per cent during 2008-12 (Tables 3.8a, 3.8b, 3.8c and 3.8d). In terms of products, the share of engineering goods and petroleum products in the export basket has increased while the share of labour-intensive goods has declined. Except for 2008-09 and 2009-10, which were crisis years for global trade, Indian exports of goods and services have been growing at rates in excess of 20-25 per cent since 2002. However, in view of the current slowdown in exports, and the very slow recovery of the global economy and a higher base, we are projecting a much lower growth rate of less than 9 per cent in exports of goods and services over the 12th Plan period, and then accelerating to around 11-12 per cent annually over the following three Plan periods. (These projections are in constant 2012-13 US dollars) (Table 3.9). Whereas the current account deficit had been contained at prudent levels right through the 1990s and upto 2009-10, there has been an expansion of this deficit in the last couple of years, reaching 4.8 per cent of GDP in 2012-13. In projecting exports and imports for the future, we have gradually tapered off this deficit during the remaining years of the 12th Plan to reach 2.6 per cent of GDP by 2016-17. We have then kept the current account deficit at around 2.5 per cent, which is what we believe to be a prudent sustainable level. The growth projections of GDP and of exports then determine the growth projections of imports of goods and services.

With these assumptions, exports of goods and services are projected to grow to about 38 per cent of GDP by 2027-32, the 15th Plan period. By way of comparison, the current exports of goods and services from China amount to about 31 per cent of GDP. In absolute terms, exports of goods and services are projected to increase from $450 billion in 2011-12 to about $680 billion in 2016-17, and annual averages of $930 billion, $1.6 trillion, and $2.7 trillion during the 13th, 14th and 15th Plans respectively. In terms of only goods exports, this implies growth from $310 billion in 2011-12 to $480 billion in 2016-17, and annual averages of $680 billion, $1.2 trillion and $2.1 trillion during the 13th, 14th and 15th Plans. The corresponding projections of imports of goods and services can then be seen, keeping the CAD at around 2.5 per cent of GDP throughout the period after the 12th Plan, and the projections average annually $1.0 trillion, $1.8 trillion and $3.0 trillion during the 13th, 14th and 15th Plan respectively (Tables 3.9a & 3.9b).

Such projections of exports and imports of goods and services will not be feasible without the corresponding growth in investment in all aspects of transport, logistics and ports. The various sectoral chapters outline the kind of investments envisaged. Furthermore, the special attention given to the transport of energy commodities coal, iron ore and petroleum in Chapter 8 provides a specific focus on the need for coordination between investment strategies for the power, coal, railways and ports sectors.

15. Report of the Sub Group on Inflow of Foreign Savings: 12th Five Year Plan (2012-13 to 2016-17), Planning Commission, 2011.

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Table 3. 8b

India: Balance of Payments: Current Account, 2000-01 to 2011-12

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
US$ Billion												
Exports of goods, f.o.b.	45.5	44.7	53.8	66.3	85.2	105.2	128.9	166.2	189.0	182.4	250.5	309.8
Primary Products	7.1	7.2	8.7	9.9	13.6	16.4	19.7	27.6	25.3	26.4	32.8	45.6
Petroleum Products	1.9	2.1	2.6	3.6	7.0	11.6	18.6	28.4	27.5	28.2	41.5	55.6
Manufactured Goods	34.3	33.4	40.2	48.5	60.7	54.3	84.9	103.0	123.1	115.2	158.0	186.8
Other Goods	2.1	2.1	2.2	4.3	3.9	11%	5.6	7.3	13.0	12.7	18.1	21.8
Exports of Services	16.3	17.1	20.8	26.9	43.2	57.7	73.8	90.3	106.0	96.0	132.9	140.9
Travel	3.5	3.1	3.3	5.0	6.7	7.9	9.1	11.3	10.9	11.9	15.3	18.5
Transportation,	2.0	2.2	2.5	3.2	4.7	6.3	8.0	10.0	11.3	11.2	14.3	18.2
Software Services	6.3	7.6	9.6	12.8	17.7	23.6	31.3	40.3	46.3	49.7	55.5	67.6
Business Services	..	..	..	..	5.2	9.3	14.5	16.8	18.6	11.3	24.0	25.9
Financial Services	..	..	..	..	0.5	1.2	3.1	3.2	4.4	3.7	6.5	6.0
Other Services	4.4	4.3	5.3	5.8	8.5	9.4	7.7	8.7	14.4	8.3	17.3	4.7
Imports of Goods, C.I.F.	57.9	56.3	64.5	80.0	118.9	157.1	190.7	257.6	308.5	300.6	381.1	499.5
Petroleum, Crude and Products	15.7	14.0	17.6	20.6	29.8	44.0	56.9	79.6	93.7	87.1	106.0	154.9
Capital Goods	8.9	9.9	13.5	18.3	25.1	37.7	47.1	70.1	71.8	65.9	78.5	99.4
Mainly Export Related Goods	8.1	8.3	10.3	12.7	17.1	18.6	17.9	20.8	31.9	31.3	53.6	54.5
Consumption Goods	1.4	2.0	2.4	3.1	3.1	2.8	4.3	4.6	5.0	9.0	8.9	11.6
Other goods	23.8	22.1	20.6	25.4	43.7	54.0	64.5	82.5	106.1	107.4	134.1	179.2
Imports of Services	14.6	13.8	17.1	16.7	27.8	34.5	44.3	51.5	52.0	60.0	84.1	76.9
Travel	2.8	3.0	3.3	3.6	5.2	6.6	6.7	9.3	9.4	9.3	11.1	13.8
Transportation,	3.6	3.5	3.3	2.3	4.5	8.3	8.1	11.5	12.8	11.9	13.9	16.4
Software Services	0.6	0.7	0.7	0.5	0.8	1.3	2.3	3.4	2.6	1.5	2.2	8.1
Business Services	..	..	..	..	7.3	7.7	15.9	16.6	15.3	18.0	27.8	26.8
Financial Services	..	..	..	..	0.8	1.0	3.0	3.1	3.0	4.6	7.5	8.0
Other Services	..	..	..	..	0.7	0.3	0.8	0.9	1.1	1.4	1.2	1.6
Net Factor Income	-5.0	-4.2	-3.4	-4.5	-5.0	-5.9	-7.3	-5.1	-7.1	-8.0	-17.3	-16.0
Factor Receipts	2.7	3.4	3.5	3.9	4.6	6.4	9.3	14.3	14.3	13.0	9.1	10.1
Factor Payments	7.7	7.6	7.0	8.4	9.6	12.3	16.6	19.3	21.4	21.1	26.4	26.1
of which: Interest payments	4.2	4.4	4.2	5.5	4.4	4.5	5.0	7.3	7.3	5.5	5.4	7.0
of which: Other factor payments	3.5	3.2	2.7	2.9	5.1	7.7	11.7	12.0	14.1	15.5	21.0	19.1
Private Transfers (Net)	12.9	15.4	16.4	21.6	20.5	24.5	29.8	41.7	44.6	51.8	53.1	63.5
Private Transfers Receipts	13.1	15.8	17.2	22.2	21.1	25.0	30.8	43.5	46.9	53.6	55.6	66.1
Private Transfers Payments	0.2	0.4	0.8	0.6	0.6	0.5	1.0	1.8	2.3	1.8	2.5	2.7
Official Transfers (Net)	0.3	0.5	0.5	0.6	0.3	0.2	0.3	0.2	0.2	0.3	0.0	0.0
Official Transfers Receipts	0.3	0.5	0.5	0.6	0.6	0.7	0.6	0.8	0.6	0.7	0.6	0.6
Official Transfers Payments	0.0	0.0	0.0	0.0	0.4	0.5	0.4	0.5	0.4	0.5	0.6	0.6
Current Account Balance	-2.7	3.4	6.3	14.1	-2.5	-9.9	-9.6	-15.7	-27.9	-38.2	-45.9	-78.3

Source: Reserve Bank of India, Hand Book of Statistics.

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Table 3. 8c

India: Balance of Payments: Capital Account, 2000-01 TO 2011-12

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
US$ Billion												
Capital Account	8.8	8.6	10.8	16.7	28.0	25.5	45.2	106.6	7.4	51.6	62.0	67.8
Receipts	54.1	43.3	46.4	75.9	98.5	144.4	233.3	438.4	315.8	345.8	499.4	478.8
Payments	45.3	34.7	35.5	59.1	70.5	70.5	188.1	331.8	308.4	294.1	437.4	411.1
Foreign Investment	5.9	6.7	4.2	13.7	13.0	15.5	14.8	43.3	8.3	50.4	39.7	39.2
Inbound	17.7	15.5	14.0	32.7	46.9	77.3	133.2	271.1	171.7	198.7	289.4	234.6
Outbound	11.9	8.8	9.8	18.9	33.9	61.8	118.5	227.8	163.3	148.3	249.8	195.4
Foreign Direct Investment	3.3	4.7	3.2	2.4	3.7	3.0	7.7	15.4	22.4	18.0	9.4	22.1
FDI in India	4.0	6.1	5.0	4.3	6.0	8.9	22.7	34.2	41.7	33.1	25.9	33.0
FDI Abroad	0.8	1.4	1.8	1.9	2.3	5.9	15.0	18.8	19.4	15.1	16.5	10.9
Portfolio Investment	2.6	2.0	0.9	11.4	9.3	12.5	7.1	27.4	(14.0)	32.4	30.3	17.2
Inflow	13.6	9.3	8.8	28.2	40.8	68.1	109.6	233.8	128.7	160.2	254.0	185.6
Outflow	11.0	7.3	7.9	16.9	31.6	55.6	102.6	206.4	142.7	127.8	223.7	168.4
External Assistance, Net	0.4	1.1	(3.1)	(2.9)	1.9	1.7	1.8	2.1	2.4	2.9	4.9	2.3
Disbursements	2.9	3.4	2.9	3.4	3.8	3.6	3.8	4.2	5.2	5.9	7.9	5.6
Repayments	2.5	2.2	6.0	6.2	1.9	1.9	2.0	2.1	2.8	3.0	2.9	3.4
Commercial Borrowings, Net	4.3	(1.6)	(1.7)	(2.9)	5.2	2.5	16.1	22.6	7.9	2.0	12.5	10.3
Disbursements	9.6	2.7	3.5	5.2	9.1	14.3	20.9	30.3	15.2	15.0	24.1	32.6
Repayments	5.3	4.3	5.2	8.2	3.9	11.8	4.8	7.7	7.4	13.0	11.6	22.2
Short-Term Credit (Supplier's Credit)	0.6	(0.8)	1.0	1.4	3.8	3.7	6.6	15.9	(2.0)	7.6	11.0	6.7
Disbursements	11.2	5.6	5.2	11.1	17.4	21.5	30.0	47.7	41.8	53.3	75.7	102.8
Repayments	10.7	6.4	4.2	9.7	13.6	17.8	23.4	31.7	43.8	45.7	64.7	96.1
Bank Capital	(2.0)	2.9	10.4	6.0	3.9	1.4	1.9	11.8	(3.2)	2.1	5.0	16.2
of which: NRI Deposits (Net)	2.3	2.8	3.0	3.6	(1.0)	2.8	4.3	0.2	4.3	2.9	3.2	11.9
Disbursements	9.7	13.9	19.0	19.2	14.6	21.7	37.2	55.8	65.2	61.5	92.3	89.9
of which: NRI Deposits	9.0	11.4	10.2	14.3	8.1	17.8	19.9	29.4	37.1	41.4	49.3	64.3
Repayments	11.7	11.0	8.5	13.2	10.7	20.3	35.3	44.1	68.5	59.4	87.4	73.7
of which: NRI Deposits	6.7	8.7	7.2	10.6	9.0	15.0	15.6	29.2	32.9	38.4	46.0	52.4
Rupee Debt Service	(0.6)	(0.5)	(0.5)	(0.4)	(0.4)	(0.6)	(0.2)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Other Capital	0.3	0.8	0.6	1.7	0.7	1.2	4.2	11.0	(5.9)	(13.2)	(11.0)	(6.9)
Disbursements	2.9	2.3	1.8	4.3	6.7	5.9	8.2	29.2	16.7	11.5	9.9	13.3
Repayments	2.6	1.5	1.3	2.6	6.1	4.7	4.0	18.3	22.6	24.6	20.9	20.2
Errors and Omissions	(0.3)	(0.2)	(0.2)	0.6	0.6	(0.5)	1.0	1.3	0.4	(0.0)	(3.0)	(2.4)
Overall Balance	5.9	11.8	17.0	31.4	26.2	15.1	36.6	92.2	(20.1)	13.4	13.1	(12.8)
Foreign Exchange Reserves	42.9	54.7	76.1	113.0	141.5	151.6	199.2	309.7	252.0	279.1	304.8	294.4
Foreign Currency Assets	39.6	51.0	71.9	107.4	135.6	145.1	191.9	299.2	241.4	254.7	274.3	260.1
Gold	2.7	3.0	3.5	4.2	4.5	5.8	6.8	10.0	9.6	18.0	23.0	27.0
SDRs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	4.6	4.5
Reserve Trench Position in International Monetary Fund (IMF)	0.6	0.6	0.7	1.3	1.4	0.8	0.5	0.4	1.0	1.4	2.9	2.8

Source: Reserve Bank of India, Hand Book of Statistics.

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Table 3. 8d

India: Balance of Payments: Capital Account, 2000-01 to 2011-12

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Per cent of GDP												
Capital Account	1.9	1.7	2.1	2.7	3.9	3.1	4.8	8.6	0.6	3.8	3.6	3.6
Receipts	11.4	8.8	8.9	12.3	13.7	17.3	24.6	35.4	25.8	25.3	29.2	25.6
Payments	9.5	7.0	6.8	9.6	9.8	8.5	19.8	26.8	25.2	21.5	25.6	21.9
Foreign Investment	1.2	1.4	0.8	2.2	1.8	1.9	1.6	3.5	0.7	3.7	2.3	2.1
Inbound	3.7	3.1	2.7	5.3	6.5	9.3	14.0	21.9	14.0	14.5	16.9	12.5
Outbound	2.5	1.8	1.9	3.1	4.7	7.4	12.5	18.4	13.3	10.9	14.6	10.4
Foreign Direct Investment	0.7	1.0	0.6	0.4	0.5	0.4	0.8	1.2	1.8	1.3	0.5	1.2
FDI in India	0.8	1.2	1.0	0.7	0.8	1.1	2.4	2.8	3.4	2.4	1.5	1.8
FDI Abroad	0.2	0.3	0.3	0.3	0.3	0.7	1.6	1.5	1.6	1.1	1.0	0.6
Portfolio Investment	0.5	0.4	0.2	1.8	1.3	1.5	0.7	2.2	(1.1)	2.4	1.8	0.9
Inflow	2.9	1.9	1.7	4.6	5.7	8.2	11.6	18.9	10.5	11.7	14.8	9.9
Outflow	2.3	1.5	1.5	2.7	4.4	6.7	10.8	16.7	11.6	9.4	13.1	9.0
External Assistance, Net	0.1	0.2	(0.6)	(0.5)	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.1
Disbursements	0.6	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.4	0.4	0.5	0.3
Repayments	0.5	0.5	1.1	1.0	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Commercial Borrowings, Net	0.9	(0.3)	(0.3)	(0.5)	0.7	0.3	1.7	1.8	0.6	0.1	0.7	0.6
Disbursements	2.0	0.5	0.7	0.8	1.3	1.7	2.2	2.4	1.2	1.1	1.4	1.7
Repayments	1.1	0.9	1.0	1.3	0.5	1.4	0.5	0.6	0.6	1.0	0.7	1.2
Short-Term Credit (Supplier's Credit)	0.1	(0.2)	0.2	0.2	0.5	0.4	0.7	1.3	(0.2)	0.6	0.6	0.4
Disbursements	2.4	1.1	1.0	1.8	2.4	2.6	3.2	3.8	3.4	3.9	4.4	5.5
Repayments	2.3	1.3	0.8	1.6	1.9	2.1	2.5	2.6	3.6	3.3	3.8	5.1
Bank Capital	(0.4)	0.6	2.0	1.0	0.5	0.2	0.2	0.9	(0.3)	0.2	0.3	0.9
Of Which: NRI Deposits (Net)	0.5	0.6	0.6	0.6	(0.1)	0.3	0.5	0.0	0.3	0.2	0.2	0.6
Disbursements	2.1	2.8	3.6	3.1	2.0	2.6	3.9	4.5	5.3	4.5	5.4	4.8
Of Which: NRI Deposits	1.9	2.3	2.0	2.3	1.1	2.1	2.1	2.4	3.0	3.0	2.9	3.4
Repayments	2.5	2.2	1.6	2.1	1.5	2.4	3.7	3.6	5.6	4.3	5.1	3.9
Of Which: NRI Deposits	1.4	1.8	1.4	1.7	1.3	1.8	1.6	2.4	2.7	2.8	2.7	2.8
Rupee Debt Service	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Other Capital	0.1	0.2	0.1	0.3	0.1	0.1	0.4	0.9	(0.5)	(1.0)	(0.6)	(0.4)
Disbursements	0.6	0.5	0.4	0.7	0.9	0.7	0.9	2.4	1.4	0.8	0.6	0.7
Repayments	0.5	0.3	0.2	0.4	0.8	0.6	0.4	1.5	1.8	1.8	1.2	1.1
Errors and Omissions	(0.1)	(0.0)	(0.0)	0.1	0.1	(0.1)	0.1	0.1	0.0	(0.0)	(0.2)	(0.1)

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	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Per cent of GDP												
Overall Balance	1.2	2.4	3.2	5.1	3.6	1.8	3.9	7.4	(1.6)	1.0	0.8	(0.7)
Foreign Exchange Reserves	9.0	11.1	14.6	18.3	19.6	18.2	21.0	25.0	20.6	20.4	17.8	15.7
Foreign Currency Assets	8.3	10.4	13.7	17.4	18.8	17.4	20.2	24.1	19.7	18.6	16.0	13.9
Gold	0.6	0.6	0.7	0.7	0.6	0.7	0.7	0.8	0.8	1.3	1.3	1.4
SDRs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.2
Reserve trench position in IMF	0.1	0.1	0.1	0.2	0.2	0.1	0.0	0.0	0.1	0.1	0.2	0.2
GDP (US$ BILLION)	474.7	492.4	522.9	617.6	721.6	834.2	948.4	1239.3	1226.1	1366.2	1711.0	1872.9

Source: Reserve Bank of India, Hand Book of Statistics.

What is also noteworthy in the developments expected in the current account is the increase in factor payments expected over time as a consequence of the debt and equity flows needed as external savings for financing the projected investments. From the existing factor payment of about $26 billion in 2011-12, including interest and other payments, this may be expected to rise to about $60 billion by 2016-17, and then increasing to about $80 billion, $130 billion and $220 billion annually during the 13th, 14th and 15th Plan. As a proportion of GDP, factor payments amount to around 1.8 per cent of GDP: this would increase to about 3 per cent of GDP by the 15th Plan (Table 3.9b). These projections attempt to quantify the servicing of debt and equity flows that have been projected.

THE CAPITAL ACCOUNT

In arriving at feasible estimates of the external savings that can be projected for financing investment in India, the key issue that has to be considered is the sustainability of external capital flows. There has been an increasing tendency to focus on external flows for the financing of infrastructure and transport investment in recent years. Our approach is to estimate the level of feasible capital flows while aiming to keep the current account deficit at around 2.5 per cent of GDP after the 12th Plan period. Owing to the expanded CAD in 2010-13, the average CAD will be higher than this during the 12th Plan period at around 3.6 per cent of GDP, tapering from 4.8 per cent in 2012-13 to 2.6 per cent in 2016-17. This can be achieved by keeping the CAD broadly stable at around $80 billion through the rest of this Plan period, and in the next Plan period (2017-22). We have then kept the CAD constant in the region of 2.5 per cent of GDP in subsequent Plan periods, which is what we consider prudent. The volatility of capital flows experienced in the first half of 2013, along with the corresponding pressure on the exchange rate illustrate the difficulties that can arise as a consequence of expansion of the CAD and corresponding external debt flows.

In estimating the total capital flows needed, we have also kept under consideration the need to keep foreign exchange reserves at prudent levels that are necessary for ensuring financial stability and to deal with situations that may arise from volatility in capital flows. We have therefore aimed to keep the foreign exchange reserves in the region of six months of imports of goods and services. With trade projected to grow faster than GDP, this implies stepping up reserves from just under 16 per cent of GDP in 2011-12 to about 19, 20 and 22 per cent in the 13th, 14th and 15th Plans. To put things in context, the foreign exchange reserves of China amounted to $3.4 trillion at end-2012, about 18 months of imports of goods and services and 41 per cent of GDP. This criterion implies that net capital flows have to be in excess of CAD by the required additions to reserves. Incidentally, the expansion in reserves is also necessary for the required expansion of base money, the Reserve Bank of India's balance sheet, that is necessary to fuel the monetary expansion consistent with projected GDP growth.

Consequently, while keeping the CAD at around 2.5 per cent of GDP, net capital flows will need to be in excess of 4 per cent of GDP through the whole period considered, nearing 4.5-5.0 per cent during the 15th Plan period (Table 3.9).

During the last two decades, there has been a process of continued phased liberalisation of the capital account. Consequently, the share of FDI as a proportion of GDP has gone up from 0.2 per cent of GDP in 1993-94 to 1.0 per cent in 2005-06 and further to 1.2 per cent during 2010-11. Net FDI flows are accordingly projected to keep increasing from 1.5 per cent of GDP ($32 billion) during the 12th Plan to 1.7 per cent ($50 billion and $80 billion) during the 13th Plan and 14th Plan respectively and just under 2 per cent ($130 billion) in the 15th Plan period. There has been a substantial rise in the outward FDI by Indian companies since 2006-07 due to liberalisation

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Table 3. 9a

India: Balance of Payments: Summary, 2012-13 to 2031-32

	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (Annual Average)			
						FY13-FY17	FY18-FY22	FY23-FY27	FY28-FY32
						12TH PLAN	13TH PLAN	14TH PLAN	15TH PLAN
US$ Billion									
Current Account Balance	(87)	(77)	(75)	(73)	(69)	(76)	(77)	(115)	(177)
Exports of Goods and Services	452	499	552	610	676	558	930	1,573	2,692
Exports of Goods, F.O.B.	307	343	384	429	481	389	683	1,206	2,137
Exports of Services	146	156	168	181	195	169	247	367	555
Imports of Goods and Services	582	619	672	733	800	681	1,073	1,775	2,992
Imports of Goods, C.I.F.	502	533	579	632	690	587	926	1,535	2,592
Imports of Services	81	86	93	101	110	94	146	240	400
Net Factor Income	(22)	(26)	(31)	(35)	(39)	(30)	(55)	(92)	(152)
Private Transfers (Net)	64	69	77	85	94	78	120	179	275
Official Transfers (Net)	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Foreign Investment	47	51	54	59	63	55	83	124	203
Foreign Direct Investment	20	31	33	36	39	32	52	78	133
Portfolio Investment	27	19	21	23	24	23	31	46	70
Commercial Borrowings	21	43	48	48	38	40	48	76	126
Overall Balance	4	22	33	38	37	23	56	86	151
Foreign Exchange Reserves	293	315	348	386	422	353	586	943	1,557
Memo Items									
(Per cent of GDP)									
Exports of Goods and Services	24.5	25.3	26.1	26.8	27.5	26.2	29.9	33.9	38.1
Imports of Goods and Services	31.6	31.4	31.8	32.2	32.6	32.0	34.5	38.3	42.3
Private Transfers (Net)	3.5	3.5	3.6	3.7	3.8	3.7	3.8	3.9	3.9
Current Account Balance	(4.7)	(3.9)	(3.5)	(3.2)	(2.8)	(3.6)	(2.5)	(2.5)	(2.5)
Foreign Investment	2.5	2.6	2.6	2.6	2.6	2.6	2.7	2.7	2.9
Foreign Direct Investment	1.1	1.6	1.6	1.6	1.6	1.5	1.7	1.7	1.9
Portfolio Investment	1.4	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.0
Commercial Borrowings, Net	1.1	2.2	2.3	2.1	1.6	1.9	1.5	1.6	1.8
(Per cent change in US$ terms)									
Exports of Goods and Services	0.4	10.4	10.5	10.6	10.7	8.5	10.9	11.2	11.4
Exports of Goods, F.O.B.	(1.0)	11.9	11.9	11.9	11.9	9.3	12.0	12.1	12.1
Exports of Services	3.4	7.2	7.4	7.8	7.9	6.7	8.0	8.4	8.8
Imports of Goods and Services	1.0	6.3	8.6	9.1	9.1	6.8	10.2	10.7	11.1
Imports of Goods, C.I.F.	0.4	6.4	8.6	9.1	9.1	6.7	10.2	10.7	11.1
Imports of Services	5.0	5.9	8.2	8.7	8.8	7.3	10.0	10.4	11.1
Reserves (as Months of G&S Imports)	6.0	6.1	6.2	6.3	6.3	6.2	6.6	6.4	6.2
GDPmp (US$ Billion)	1,843	1,971	2,113	2,275	2,453	2,131	3,109	4,634	7,071

Source: Reserve Bank of India, Hand Book of Statistics and NTDPC Estimates.

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Table 3. 9b

India: Balance of Payments: Current Account, 2012-13 to 2031-32

	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE)			
						FY13-FY17	FY18-FY22	FY23-FY27	FY28-FY32
						12TH PLAN	13TH PLAN	14TH PLAN	15TH PLAN
US$ Billion									
Exports of Goods, F.O.B.	307	343	384	429	481	389	683	1,206	2,137
Petroleum Products	60	66	73	80	88	73	118	190	306
Manufactured Goods	191	215	243	275	311	247	455	839	1,545
Other Goods	56	62	68	74	82	68	110	177	285
Exports of Services	146	156	168	181	195	169	247	367	555
Imports of Goods, C.I.F.	502	533	579	632	690	587	926	1,535	2,592
POL and Other Energy	169	179	194	211	230	197	307	503	839
Capital Goods	96	104	114	127	140	116	191	331	581
Mainly Export Related	38	41	44	48	52	44	69	114	190
Other Imports	198	210	227	247	269	230	359	588	982
Imports of Services	81	86	93	101	110	94	146	240	400
Net Factor Income	(22)	(26)	(31)	(35)	(39)	(30)	(55)	(92)	(152)
Factor Receipts	13	12	13	15	17	14	24	40	68
Factor Payments	34	39	44	50	56	45	79	132	219
Of which: Interest payments	10	12	14	17	20	15	29	50	83
Of which: Other factor payments	25	27	30	32	35	30	49	83	136
Private Transfers (Net)	64	69	77	85	94	78	120	179	275
Private Transfers Receipts	67	72	79	88	97	81	123	183	280
Private Transfers Payments	3	3	3	3	3	3	3	4	5
Official Transfers (Net)	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Official Transfers Receipts	1	1	1	1	1	1	1	1	1
Official Transfers Payments	1	1	1	1	1	1	1	1	1
Current Account Balance	(87)	(77)	(75)	(73)	(69)	(76)	(77)	(115)	(177)

Source: Reserve Bank of India, Hand Book of Statistics and NTDPC projections.

of outward investment policies and efforts by Indian companies to compete better in the global economy. This trend may be expected to continue. The projections given here are in terms of net FDI; hence the implication is that incoming FDI will have to be significantly higher than the net projected to take account of the outward FDI from India (Table 3.9c and 3.9d).

The Indian capital market has picked up in terms of investments by 'Foreign Institutional Investors' (FII). Excluding 2008-09 (the crisis year), the average net FII inflows during 11th Plan worked out to over $26 billion. A glance at the record of FII inflows suggests high volatility in these flows, which are very dependent on perceptions of developments in the Indian economy, along with changing conditions in global financial markets. What may also be observed is that net flows are a fraction of gross inflows, since there is a constant churning of portfolio investments. Projections made are only for net FII flows.

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Table 3. 9c

India: Balance of Payments: Capital Account, 2012-13 to 2031-32

	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE)			
						FY13-FY17	FY18-FY22	FY23-FY27	FY28-FY32
						12TH PLAN	13TH PLAN	14TH PLAN	15TH PLAN
US$ Billion									
Capital Account Balance	72	99	107	111	105	99	134	201	328
Foreign Investment	47	51	54	59	63	55	83	124	203
Direct Investment	20	31	33	36	39	32	52	78	133
Portfolio Investment	27	19	21	23	24	23	31	46	70
Commercial Borrowing	21	43	48	48	38	40	48	76	126
Disbursements	43	63	73	79	82	68	123	194	303
Repayments	22	20	25	31	44	28	75	118	177
Change in Reserves (- Increase/+ Decrease)	(4)	(22)	(33)	(38)	(37)	(23)	(56)	(86)	(151)
Total External Debt	360	408	461	513	556	460	702	1,026	1,544
External Debt Service	37	37	45	55	71	49	112	176	271
Short-term debt	78	79	84	88	95	85	125	199	359
Foreign Exchange Reserves	293	315	348	386	422	353	586	943	1,557
Foreign Exchange Reserves (as Months of G & S Imports)	6.0	6.1	6.2	6.3	6.3	6.2	6.6	6.4	6.2
Foreign Exchange Reserves (Percentage of GDP)	15.9	16.0	16.5	16.9	17.2	16.6	18.8	20.3	22.0
Memo Item									
GDP (US$ Billion)	1,843	1,971	2,113	2,275	2,453	2,131	3,109	4,634	7,071

Source: Reserve Bank of India, Hand Book of Statistics and NTDPC projections.

Net portfolio investment is seen to be about 1.1 per cent of GDP in 2012-17 and then projected to stay at about 1.0 per cent of GDP during the subsequent Plan periods. Some would find such a foreign investment profile to be too conservative. Even with such a profile, the servicing of the accumulated stock of foreign equity capital, including both FDI and portfolio investment, would rise to 1.5-1.6 per cent of GDP by 2012-17 and increase by 0.1 percentage points in each of the subsequent Plan periods.

How do we project overall foreign equity and debt flows? In general, foreign equity flows are deemed better than debt flows from the point of view of financial stability. On the other hand, from the point of view of infrastructure and transport investments, it is felt necessary to attract long-term debt flows. In order to keep a reality check, we have observed the current overall debt-equity ratios in the Indian corporate sector. This comes to about 70:100, or say, about 2:3. We have therefore projected the debt flow/equity flow ratios in overall capital flows at roughly this ratio through the period projected (Table 3.9c).

In fact, infrastructure projects actually tend to have higher debt-equity ratios. Moreover, one of the advantages of receiving foreign equity inflows is that it is then easier to leverage foreign debt inflows at more favourable rates. However, the existing high level of Indian foreign debt of approximately $390 billion (March 2013) reduces the degree of flexibility in receiving larger inflows of new foreign debt flows in the near term future. Thus, the recent expansion of debt flows will need to be restrained for the rest of the 12th Plan period. The projections suggest that as a consequence of this recent increase in debt, repayment levels will increase during the 13th Plan period, thus reducing net flows even if gross flows are adequate. As may be appreciated, these projections are difficult to make. Whereas our projections are suggesting a roughly 3:2 ratio between equity and debt flows, there may be some room for

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Table 3. 9d

India: Balance of Payments: Capital Account, 2012-13 to 2031-32

	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE)			
						FY13-FY17	FY18-FY22	FY23-FY27	FY28-FY32
						12TH PLAN	13TH PLAN	14TH PLAN	15TH PLAN
Per cent of GDP									
Capital Account Balance	3.9	5.0	5.1	4.9	4.3	4.6	4.3	4.3	4.6
Foreign Investment	2.5	2.6	2.6	2.6	2.6	2.6	2.7	2.7	2.9
Direct Investment	1.1	1.6	1.6	1.6	1.6	1.5	1.7	1.7	1.9
Portfolio Investment	1.4	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.0
Commercial Borrowing (Net)	1.1	2.2	2.3	2.1	1.6	1.9	1.5	1.6	1.8
Disbursements	2.3	3.2	3.4	3.5	3.4	3.2	4.0	4.2	4.3
Repayments	1.2	1.0	1.2	1.4	1.8	1.3	2.4	2.5	2.5
Change in Reserves (- Increase/+ Decrease)	(0.2)	(1.1)	(1.5)	(1.7)	(1.5)	(1.1)	(1.8)	(1.9)	(2.1)
Total External Debt	19.5	20.7	21.8	22.6	22.7	21.6	22.6	22.1	21.8
External Debt Service	2.0	1.9	2.1	2.4	2.9	2.3	3.6	3.8	3.8
Short-Term Debt	4.2	4.0	4.0	3.8	3.9	4.0	4.0	4.3	5.1
Foreign Exchange Reserves	15.9	16.0	16.5	16.9	17.2	16.6	18.8	20.3	22.0
Memo Item									
GDP (US$ Billion)	1,843	1,971	2,113	2,275	2,453	2,131	3,109	4,634	7,071

Source: Reserve Bank of India, Hand Book of Statistics and NTDPC projections.

adjusting this composition to increase the share of debt flows. From the point of view of infrastructure and transport projects, which typically have higher leverage ratios, the composition of external capital flows may need to be tweaked somewhat in favour of debt, while keeping in mind the implications for interest payments and debt repayments. We have not attempted to change our projections in this direction.

The debt repayments for external commercial borrowing are expected to rise from the current $28 billion to about $75 billion during the 13th Plan, rising to about $180 billion annually during the 15th Plan. Consequently, substantial increases in gross external commercial borrowing will have to take place if the projected level of net debt flows are to materialise. The projections suggest that gross external commercial borrowing (including private non-guaranteed) will have to increase from about $33 billion in 2011-12 to average annual gross inflows of about $70 billion in the 12th Plan and $120 billion in the 13th Plan and rising to $300 billion in the 15th Plan. Furthermore, the external commercial borrowing policy should be tilted towards encouraging long-term debt flows to infrastructure. If external commercial borrowings continue to be controlled during this period, these are the kind of magnitudes which would have to be permitted so that appropriate capital inflows take place to fuel the increasing needs for overall investment.

With most of new debt being expected to be private non-guaranteed, these projections are crucially dependent on continuing improvement in India's sovereign credit rating, and of its corporate entities, both public and private, investing in the infrastructure and transport sector, along with its financial institutions internationally. In order to facilitate good credit ratings, and to provide adequate cushion in the face of rising capital inflows, imports levels and debt servicing requirements, our projections have provided for a cover of foreign exchange reserves at about 6 months of imports. The reserves are thus projected to rise from approximately *$290 billion (March 2013) to an average of $350 billion in the 12th Plan to $590 billion in the 13th Plan and rising to $1.5 trillion by the 15th Plan*. Sudden unforeseen shocks occurring internationally or within the domestic economy should then not have significant effects on the international confidence. It is also important to understand that with rising exposure of the domestic economy to trade and to foreign debt and equity, large volatility in the domestic currency would cause considerable difficulty to domestic firms, particularly in infrastructure sectors, to service their external obligations. A relatively high

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level of reserves should then help in maintaining a stable real exchange rate. In order to provide this continuing accretion to reserves, capital inflows have therefore to be somewhat higher than the current account deficit at any given time.

The mobilisation of such external capital inflows will be crucial for infrastructure and transport investment. As emphasised earlier, the maintenance of good credit ratings will be essential to impart confidence to would-be investors. The substantial and ambitious trade expansion projected would form the basis of market confidence in India's ability to service such external liabilities of both equity and debt. *A key lesson of this exercise is that continuing expansion of trade, both imports and exports, is crucial for the financing of growing domestic investment in India, and particularly that of infrastructure*. Finally, sustaining a current account deficit of much higher than 2.5 per cent of GDP is unlikely to be viable in the foreseeable future. This provides the maximum feasible limit on the volume of foreign savings that can be prudently absorbed, although, keeping in mind the need for adding to reserves, net capital flows will need to be at around 4.5 per cent of GDP (Table 3.9d).

As mentioned in the beginning, these projections of external capital inflows have been made on a judgemental basis on what the markets would be willing to lend to and invest in India based on the fundamentals of the economy. *The debt service ratio* according to these projections *would range between about 3 to 6 per cent as a proportion of current receipts over the next 20 years*. Exports as a percentage of GDP would rise from current 28 per cent of GDP to about 40 per cent, while imports would rise from the current 30 per cent to about 42 per cent. The implications of these projections is that export expansion and an open regime for equity flows, especially foreign direct investment will be essential to mobilise the volume of capital inflows projected.

Within these overall projections for external capital ,inflows the volume flowing into the infrastructure sectors will depend on how hospitable the regulatory regimes are in each sector for foreign investment. As in the other sectors, external commercial debt would tend to be closely associated with foreign investment. In sectors such as power and telecommunications, foreign equity inflows would tend to be associated with suppliers' credits as well as credits from official export credit agencies such as US EXIM Bank, the Japanese EXIM Bank and others. Since the repayment for both equity and debt associated with infra¬structure projects would have a longer duration, the payment burden arising from such capital inflows would be stretched out over time if the proportion of such inflows going into infra¬structure can be maintained at a high level. In our projections for the financing of infrastructure

Since infrastructure projects typically have higher leverage ratios, the composition of external capital flows may need to be tweaked somewhat in favour of debt, while keepiing in mind implcations of repayment issues

investment requirements, we have assumed that a total of about 40 per cent of external capital in¬flows would flow to the infrastructure sector.

Even somewhat conservative projections of the current account deficit at about 2.5 per cent of GDP by 2031-32, and optimistic assumptions of trade expansion, yield quite large volumes of capital inflows. Total net capital inflows are projected to rise from the current *$90 billion (2012-13) to about $110 billion by the end of the 12th Five Year Plan*, $135 billion, $200 billion, $330 billion, annually in the 13th, 14th and 15th Plans, divided between debt and foreign equity with the latter being preferably somewhat higher.

With these projections, the stock of total debt would rise to about *$550 billion by 2016-17, $700 billion average during the 13th Plan and $1.5 trillion by the 15th Plan period*. Debt service payments would rise to about *$130 billion by 2021-22 and $300 billion by 2031-32 (Tables 3.10, 3.11, 3.12)*. Such magnitude of flows, both inflows and out flows, are not feasible to maintain without healthy and sustained overall economic growth of the kind that has been projected and prudent macroeconomic and financial policies. And this will only be possible if there is no further widening of the current account deficit.

Capital flows should tend to be higher in those infrastructure areas where the cash flow already forms a natural hedge and it is denominated in US dollars. Some of these areas are ports, airports, airlines, and telecommunications.

There are some problems for certain areas where infrastructure investment does not receive such high cash flows. These areas are more likely to be rupee-denominated, for example roads and the power sector. Another problem relates to the volume of infrastructure financing which depends on how long it takes to receive returns on investments. In many cases, the returns occur over very long periods of time (from 30 to 100 years), whereas financing returns are usually needed in a much shorter time. Another problem related to the Indian financial system is that it does not have much long-term debt available. These problems could be partially solved if international capital markets feel that the country has a sustainable current account, with a small possibility of widening it. Moreover, as already emphasised, growth of pensions and other long-term contractual savings is crucial for development of long-term debt markets in the country.

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Thinking about the rules for foreign equity investment in India, most of the investments do not require approval of the Indian government. Infrastructure companies have also tapped external credit markets. About a third of external commercial borrowings (ECBs) in the 11th Plan were for infrastructure, particularly air transport (aircraft), telecom, and power equipment. There was very little external commercial borrowing for the transport sectors, except for aircraft acquisition.

For the future, a judicious balance is envisaged between debt and non-debt-creating inflows. Both kinds of inflows need to be serviced. In principle, the returns on equity ought to be higher than those on debt. But the returns on equity are performance-related, and therefore better for financial stability than those on debt. More over, a portion of the returns on FDI tends to be continually reinvested. Such retained earnings finance new investment but also need to be serviced in future years. The simulations have taken account of this. FDI is, by its nature, less mobile: once invested, it is not usually expected to be disinvested for a long period of time, if ever.

Capital flows should tend to be higher in those transport infrastructure sectors where the cash flow already forms a natural hedge and is denominated in US dollars. Some of these areas are ports, airports, airlines, and telecommunications

The debt projections have assumed average debt terms of seven years maturity and returns of 150 basis points above LIBOR (London Inter Bank Offered Rate). The net debt inflow is limited by the debt service targets mentioned above.

INVESTMENT IN INFRASTRUCTURE AND TRANSPORT REQUIRED FOR ECONOMIC GROWTH

Achieving a high sustained rate of economic growth requires corresponding investments in infrastructure, including all aspects of transportation. As argued earlier, industrial growth will need to be accelerated in particular, which place higher demands on the provision of power, transportation and logistics. The continued expansion of trade requires corresponding investment in ports, airports and all forms of domestic transport linkages as well.

Broad magnitudes of the trends expected in the demand for transport have been indicated in Chapter 2. In this section, we obtain broad orders of magnitude of infrastructure investment, and transport investment in particular, that will be consistent with growth in macroeconomic magnitudes, while maintaining appropriate domestic and external balances.

INFRASTRUCTURE INVESTMENT: A HISTORICAL PERSPECTIVE

In order to estimate the infrastructure requirements over the next 20 years, it is useful to look at its investment history since the 1990s. The key infrastructure categories are electricity, gas and water supply (EGW) and transport, storage and communication (TSC). For a more detailed break-up, TSC is sub-divided into railways, other transport (roads, ports, airports, aviation, trucks, buses etc.), storage and communication. Urban infrastructure is not isolated as a separate category in the National Accounts; therefore, a part of this will be included in water supply (including sanitation) and urban transport will be incorporated in 'other transport'.

The estimates for infrastructure investment provided in this chapter are based on National Accounts estimates for gross domestic capital formation (GDCF). These estimates are typically lower than those usually made for infrastructure investment by the Planning Commission and other agencies[16]. For example, expenditures made for buying land in the process of making infrastructure investments are not included in GDCF since such expenditures are regarded as transfer payments in the GDP context. Nonetheless, such expenditures are real expenditures from the point of view of the investor, public or private. Apart from land, there are also other definitional differences. In addition, with the increase in the number of PPP projects in recent years, the statistical system is yet to fully devise procedures to cover these investments on a systemic basis. It is therefore likely that GDCF estimates according to National Accounts may be underestimated for recent year Whereas it is difficult to arrive at precise estimates, such underestimation could be of the order of 1 to 1.5 per cent of GDP.

As a proportion of GDP, total GDCF in infrastructure (National Accounts basis) ranged from about 3.9 per cent to 4.4 per cent, averaging 4.1 per cent of GDP during the 1990s. In the 2000s, the average was about 5.0 per cent. Currently, total investment in infrastructure is around 5.3 per cent. The absolute amount of investment on infrastructure in 1993-94 was about Rs 420 billion ($13.2 billion). The corresponding figure for 2001-02, the last year of the 9th Plan, was about Rs 1,070 billion ($22 billion), Rs 2,150 billion ($47 billion) at the end of the 10th Plan in 2006-07, and Rs 4,900 billion ($102 billion) in 2011-12 at the end of the 11th Plan, all in current prices (Table 3.13a). Thus, there has been substantial growth in absolute

16. Planning Commission (2011a).

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Table 3.10
India: External Debt Summary, 2000-01 to 2011-12

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
US$ Billion												
Multilateral	31.1	31.9	30.0	29.3	31.7	32.6	35.3	39.5	39.5	42.9	48.5	50.5
Government Borrowing	27.4	28.3	27.3	26.8	29.2	30.0	32.5	36.2	35.7	37.8	42.6	43.7
Concessional	19.1	19.7	21.6	22.7	24.0	23.7	24.9	26.9	25.1	25.7	27.0	27.2
Non-Concessional	8.3	8.6	5.7	4.2	5.2	8.4	7.6	9.3	10.6	12.1	15.6	16.5
Non-Government Borrowing	3.7	3.6	2.7	2.5	2.5	2.6	2.8	3.3	3.8	5.0	5.9	6.8
Concessional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non - Concessional	3.7	3.6	2.7	2.5	2.5	2.6	2.8	3.3	3.8	5.0	5.9	6.8
Bilateral	16.0	15.3	16.8	17.3	17.0	15.8	16.1	19.7	20.6	22.6	25.7	26.8
Government Borrowing	12.2	11.5	12.7	13.0	13.1	12.2	12.3	14.9	14.7	15.9	18.0	18.0
Concessional	11.9	11.4	12.5	12.9	13.1	12.2	12.3	14.9	14.7	15.9	18.0	18.0
Non-Concessional	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Government Borrowing	3.8	3.8	4.1	4.3	3.9	3.5	3.7	4.9	6.0	6.7	7.7	8.8
Concessional	1.2	1.4	1.7	2.0	1.7	1.6	0.4	0.4	0.6	0.7	0.9	1.3
Non-Concessional	2.6	2.4	2.5	2.3	2.2	2.0	3.3	4.4	5.3	6.0	6.8	7.4
International Monetary Fund	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.1	1.0	6.0	6.3	6.2
Trade Credit	5.9	5.4	5.0	4.7	5.0	5.4	7.2	10.3	14.5	16.8	18.6	19.9
Commercial Borrowings	24.4	23.3	22.5	22.0	26.4	26.5	41.4	62.3	62.5	70.7	88.6	104.4
NRI Deposits	16.6	17.2	23.2	31.2	32.7	36.3	41.2	43.7	41.6	47.9	51.7	58.6
Rupee Debt	3.7	3.0	2.8	2.7	2.3	2.1	2.0	2.0	1.5	1.7	1.6	1.4
Total Long-Term Debt	97.7	96.1	100.2	108.2	116.3	119.6	144.2	178.7	181.2	208.6	240.9	280.7
Short-Term Debt	3.6	2.7	4.7	4.4	17.7	19.5	28.1	47.0	49.4	52.3	65.0	65.1
Gross Total Debt	101.3	98.8	104.9	112.7	134.0	139.1	172.4	224.4	224.5	260.9	305.9	345.8
Memo Items												
Concessional Debt as Per cent of Total Debt	35.4	35.9	36.8	35.8	30.7	28.4	23.0	19.7	18.7	16.8	15.5	15.6
Short Term Debt as Per cent of Total Debt	3.6	2.8	4.5	3.9	13.2	14.0	16.3	20.4	19.3	20.0	21.2	22.6
Debt Stock-GDP Ratio	22.5	21.1	20.3	18.0	18.1	16.8	17.5	18.0	20.3	18.3	17.8	20.0
Short Term Debt as Per cent of Foreign Reserves	8.5	5.0	6.1	3.9	12.5	12.9	14.1	15.2	19.6	18.8	21.3	22.1
Debt Service Ratio (Per cent)	16.6	13.7	16.0	16.1	5.9	10.1	4.7	4.8	4.4	5.8	4.3	6.0
Foreign Exchange Reserves	42.9	54.7	76.1	113.0	141.5	151.6	199.2	309.7	252.0	279.1	304.8	294.4
GDPmp (US$ Billion)	475	492	523	618	722	834	948	1239	1226	1366	1711	1873

Source: Reserve Bank of India, Handbook of Statistics.

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Table 3.11
India: External Debt Service, 2001-02 to 2011-12

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
US$ Billion											
Multilateral	2.2	5.9	4.6	1.3	1.5	1.9	2.1	2.0	2.1	2.3	2.5
Principal	1.4	5.1	4.1	0.9	1.1	1.1	1.3	1.4	1.6	1.9	2.0
Interest	0.8	0.8	0.5	0.4	0.5	0.7	0.8	0.6	0.5	0.5	0.5
Bilateral	1.5	1.6	2.9	2.0	1.5	1.4	1.6	1.9	2.0	2.1	2.3
Principal	1.1	1.2	2.5	1.5	1.2	1.0	1.1	1.3	1.4	1.5	1.6
Interest	0.4	0.5	0.4	0.4	0.3	0.4	0.5	0.6	0.6	0.5	0.7
IMF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Principal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Export Credit	1.2	1.4	1.1	0.7	1.3	1.0	2.0	1.7	2.0	2.1	3.2
Principal	0.9	1.2	0.9	0.6	1.1	0.6	1.3	1.2	1.4	1.7	2.7
Interest	0.3	0.2	0.2	0.1	0.2	0.4	0.6	0.6	0.7	0.5	0.5
Commercial Borrowings	3.9	4.4	8.6	3.4	13.1	5.0	7.3	8.3	12.1	10.7	21.1
Principal	2.8	3.6	6.7	2.6	10.4	3.0	4.5	5.2	9.8	7.8	16.6
Interest	1.1	0.8	1.8	0.8	2.7	2.0	2.8	3.2	2.3	2.9	4.5
NRI Deposits	1.8	1.4	1.6	1.4	1.5	2.0	1.8	1.5	1.6	1.7	2.3
Interest	1.8	1.4	1.6	1.4	1.5	2.0	1.8	1.5	1.6	1.7	2.3
Rupee Debt	0.5	0.5	0.4	0.4	0.6	0.2	0.1	0.1	0.1	0.1	0.1
Principal	0.5	0.5	0.4	0.4	0.6	0.2	0.1	0.1	0.1	0.1	0.1
Total Debt Service	11.1	15.2	19.2	9.2	19.6	11.4	14.9	15.6	19.9	19.1	31.5
Principal	6.8	11.5	14.6	6.1	14.3	5.9	8.3	9.1	14.2	13.0	23.0
Interest	4.3	3.7	4.6	3.0	5.2	5.5	6.6	6.5	5.7	6.1	8.5
Memo Items											
Current Receipts	81.0	95.2	119.2	154.1	194.2	242.8	314.3	356.2	345.1	448.1	528.4
Debt Service Ratio	13.7	16.0	16.1	5.9	10.1	4.7	4.8	4.4	5.8	4.3	6.0
Interest Current Receipts	5.4	3.9	3.8	2.0	2.7	2.3	2.1	1.8	1.7	1.4	1.6

Source: Ministry of Finance, India's External Debt - A Status Report 2011-12.

terms. As a proportion of GDP also, GDCF in infrastructure has increased from 4.2-4.3 per cent in the 8th and 9th Plans to around 5.8 per cent of GDP in the 11th Plan, although as mentioned earlier, there is reasonable likelihood that private investment in infrastructure has been underestimated in PPP projects during the 11th Plan. Looking at different infrastructure sectors, investment in electricity, gas and water supply has been relatively stable at around 1.5 to 1.7 per cent during the 9th and 10th Plans, rising to about 2.1 per cent during the 11th Plan. Investment in transport has increased significantly from about 1.5 to 1.6 per cent in the 1990s to around 2.5 to 2.6 per cent in the 11th Plan period. Within transport, what has increased is investment in roads and bridges, from about 0.4 per cent of GDP in 2000-01 to about 1.2 per cent by 2011-12. This is manifested by the National Highway Development Project (NHDP) and the Pradhan Mantri Gram Sadak Yojana (PMGSY) (Prime Minister's Rural Roads Programme). Over the same period, investment in railways has been stagnant at around 0.4 per cent of GDP. It is then not surprising that, as documented in

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Table 3.12
India: External Debt Summary, 2012-13 to 2031-32

	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE)			
						FY13-FY17	FY18-FY22	FY23-FY27	FY28-FY32
						12TH PLAN	13TH PLAN	14TH PLAN	15TH PLAN
US$ Billion									
A. Disbursements									
Public & Publicly Guaranteed	17.9	23.1	28.0	32.7	32.6	26.9	32.0	31.5	31.5
2. Private Creditors	7.5	12.3	17.1	22.0	22.0	16.2	22.0	22.0	22.0
a. Bonds	5.0	10.0	15.0	20.0	20.0	14.0	20.0	20.0	20.0
b. Commercial	2.5	2.2	2.1	2.0	2.0	2.2	2.0	2.0	2.0
c. Other Private	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
Private Non-Guaranteed	35.0	50.5	50.3	53.3	53.2	48.5	90.2	154.3	236.7
Total From Long-Term Loans	52.9	73.6	78.4	86.0	85.8	75.3	122.2	185.8	268.2
IMF Purchases	-	-	-	-	-	-	-	-	-
Net Short-Term Capital	-	0.7	5.4	3.5	7.3	3.4	11.2	17.3	44.4
Total Disbursements (LT+IMF+ST)	52.9	74.3	83.7	89.5	93.0	78.7	133.4	203.1	312.6
B. External Debt									
Public & Publicly Guaranteed	112.9	123.5	137.2	155.4	168.4	139.5	188.9	196.9	197.4
2. Private Creditors	32.3	38.0	46.9	60.6	69.6	49.5	81.1	81.3	81.0
a. Bonds	16.8	21.6	29.7	45.2	56.4	33.9	68.8	70.0	70.0
b. Commercial	15.5	16.4	17.1	15.4	13.1	15.5	12.2	11.2	11.0
c. Other Private	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
Private Non-Guaranteed	163.1	200.1	234.0	264.4	286.4	229.6	382.3	623.4	982.4
Total from Long-Term Loans	276.0	323.6	371.2	419.8	454.8	369.1	571.2	820.3	1,179.8
Use of IMF Credit	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Net Short-Term Capital	78.1	78.7	84.1	87.6	94.8	84.6	124.5	199.3	358.6
Total DOD (LT+IMF+ST)	360.1	408.5	461.4	513.5	555.7	459.8	701.8	1,025.7	1,544.5
Memo Items (Per cent)									
Disbursements/GDP	2.9	3.8	4.0	3.9	3.8	3.7	4.3	4.4	4.4
External Debt/GDP	19.5	20.7	21.8	22.6	22.7	21.6	22.6	22.1	21.8
External Debt/Current Receipts	67.7	70.0	71.6	72.0	70.4	70.5	65.1	57.1	50.8
Short-Term Debt/External Debt	21.7	19.3	18.2	17.1	17.1	18.4	17.7	19.4	23.2
Concessional Debt/Total Debt	15.4	14.4	13.3	12.5	12.0	13.3	10.4	8.0	5.6
Short-Term Debt/Reserves	28.8	26.8	25.8	24.1	23.7	25.6	22.1	21.6	23.4
GDPmp (US$ Billion)	1,843	1,971	2,113	2,275	2,453	2,131	3,109	4,634	7,071
Current Receipts (US$ Billion)	532	584	644	713	790	653	1,077	1,797	3,039
Reserves (US$ billion)	271	293	326	364	401	331	564	921	1,535

Source: The World Bank Debt Reporting System and NTDPC Projections.

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Table 3.13a

India: Investments in Infrastructure, 2000-01 to 2011-12

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
(RUPEES BILLION IN CURRENT PRICES)												
Infrastructure - Total	981	1,071	1,096	1,232	1,489	1,867	2,149	2,586	3,574	4,031	4,516	4,891
Electricity, Gas, Water Supply	365	402	390	507	533	674	837	982	1,182	1,360	1,730	1,892
Railways	54	68	91	109	131	154	183	222	297	318	312	312
Other Transport	222	195	281	303	368	428	378	501	692	700	734	1,002
Roads and Bridges	78	169	170	219	280	354	499	544	671	789	921	1,057
Storage	13	15	14	14	-3	7	8	10	18	21	25	37
Communications	249	221	150	80	180	251	244	327	714	843	794	590
Infrastructure - Public Sector	720	806	743	944	977	1,246	1,588	1,910	2,292	2,544	2,680	2,890
Electricity, Gas, Water Supply	319	332	311	447	452	590	758	861	1,030	1,145	1,344	1,477
Railways	55	70	89	108	131	154	183	222	297	318	312	312
Other Transport	38	27	35	32	34	59	83	200	168	157	139	130
Roads and Bridges	78	169	170	219	280	354	499	544	671	789	808	923
Storage	13	14	14	13	-5	0	1	0	0	3	7	11
Communications	218	194	125	125	84	89	64	82	127	133	70	36
Infrastructure - Private Sector	262	265	352	288	512	621	560	676	1,282	1,486	1,836	2,001
Electricity, Gas, Water Supply	47	71	79	60	81	83	79	120	152	215	386	415
Railways	-1	-2	2	1	0	0	0	0	0	0	0	0
Other Transport	184	168	246	271	334	369	295	301	524	543	595	872
Roads and Bridges	0	0	0	0	0	0	0	0	0	0	113	134
Storage	0	1	1	1	1	7	7	9	18	18	18	26
Communications	31	27	25	-45	96	162	180	245	587	711	724	554
(US$ BILLION IN CURRENT PRICES)												
Infrastructure - Total	21.5	22.4	22.6	26.8	33.1	42.2	47.5	64.3	77.8	85.0	99.1	102.1
Electricity, Gas, Water Supply	8.0	8.4	8.1	11.0	11.9	15.2	18.5	24.4	25.7	28.7	37.9	39.5
Railways	1.2	1.4	1.9	2.4	2.9	3.5	4.0	5.5	6.5	6.7	6.8	6.5
Other Transport	4.9	4.1	5.8	6.6	8.2	9.7	8.3	12.5	15.1	14.8	16.1	20.9
Roads and Bridges	1.7	3.5	3.5	4.8	6.2	8.0	11.0	13.5	14.6	16.6	20.2	22.1
Storage	0.3	0.3	0.3	0.3	-0.1	0.1	0.2	0.2	0.4	0.4	0.5	0.8
Communications	5.5	4.6	3.1	1.8	4.0	5.7	5.4	8.1	15.6	17.8	17.4	12.3
Infrastructure - Public Sector	15.8	16.9	15.4	20.5	21.7	28.2	35.1	47.5	49.9	53.7	58.8	60.3
Electricity, Gas, Water Supply	7.0	7.0	6.4	9.7	10.1	13.3	16.7	21.4	22.4	24.1	29.5	30.8
Railways	1.2	1.5	1.8	2.4	2.9	3.5	4.0	5.5	6.5	6.7	6.8	6.5
Other Transport	0.8	0.6	0.7	0.7	0.8	1.3	1.8	5.0	3.7	3.3	3.0	2.7
Roads and Bridges	1.7	3.5	3.5	4.8	6.2	8.0	11.0	13.5	14.6	16.6	17.7	19.3
Storage	0.3	0.3	0.3	0.3	-0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.2
Communications	4.8	4.1	2.6	2.7	1.9	2.0	1.4	2.0	2.8	2.8	1.5	0.8

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	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Infrastructure - Private Sector	5.7	5.6	7.3	6.3	11.4	14.0	12.4	16.8	27.9	31.3	40.3	41.8
Electricity, Gas, Water Supply	1.0	1.5	1.6	1.3	1.8	1.9	1.7	3.0	3.3	4.5	8.5	8.7
Railways	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Transport	4.0	3.5	5.1	5.9	7.4	8.3	6.5	7.5	11.4	11.5	13.1	18.2
Roads and Bridges	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.8
Storage	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.4	0.4	0.4	0.5
Communications	0.7	0.6	0.5	-1.0	2.1	3.7	4.0	6.1	12.8	15.0	15.9	11.6

Source: Government of India, Central Statistical Office, National Account Statistics.

chapter 2, there has been a continuing shift of both freight and passenger traffic from the railways to roads (Tables 3.13a, 3.13b, 3.13c, and 3.13d).

As a proportion of total GDCF, investment in infrastructure has varied between 14 and 19 per cent since the 2000s. In some other fast-growing middle-income countries, this proportion is near 20-25 per cent. This suggests that investment in infrastructure needs to be accelerated so that high sustainable overall growth can be achieved.

Looking at other features of infrastructure investment, the key systemic change is in the increasing share of private investment, as has been promoted by policy. Overall, the share of private sector investment has increased from around 12-18 per cent in the 8th Plan to about 40 per cent in the last years of the 11th Plan, with a corresponding fall in the public sector share. The most dramatic change is in the communication sector, as might be expected, with the private sector share increasing from zero in the early 1990s to almost 90 per cent towards the end of the 11th Plan. There is also a significant increase in the transport sector, in both roads and bridges and other transport, though not in railways. It seems, however, that the National Accounts may not adequately capture all the investments in roads through PPP, and in ports and airports.

PROJECTING INFRASTRUCTURE AND TRANSPORT INVESTMENT REQUIREMENTS 2012-32

Stepping up infrastructure investments is key for accelerating industrial development and economic growth in India. Based on the macro consistent projections, we are projecting infrastructure investments to increase from the 11th Plan average level of 5.8 per cent of GDP (2007-12) to 6.9 per cent in the 12th Plan and then 8.0 per cent for the remaining period from 2018 through 2032. Infrastructure investments of around 8 per cent of GDP are needed for economic transformation, and lessons from South East and East Asian countries show similar patterns. In these countries, gross domestic investment rates increased to over 30 per cent of GDP, and rates of infrastructure investment rose to levels of 7 to 8per centof GDP. Gross domestic investment levels in India have been over 35 per cent of GDP during the 11th Plan period despite the slowdown in recent years, similar to recently fast-growing South East and East Asian countries. During the 15th Plan period (2027-32), we are projecting that gross domestic investment (gross domestic capital formation) to increase to 42 per cent of GDP. Once the country reaches a per capita GDP of about $6,000 (2012-13 prices) and the basic infrastructure is in place, we can envisage some tapering down of gross domestic capital formation rates, as we may expect in China now, including those for infrastructure and transport (Table 3.14).

SECTORAL PROJECTIONS

Within infrastructure, we are projecting a significant enhancement in the investment in transport (railways, roads and bridges, and other transport) from around 2.7 per cent of GDP during the 11th Plan, with a step jump to 3.2 per cent in the 12th Plan and 3.7 per cent in the subsequent three Plan periods. Total investment in transport can then be seen to range between 45 to 50 per cent of total infrastructure investment (Figure 3.1).

It is difficult to project the sectoral composition of investment in infrastructure on any systematic basis, and the different sectors within the transport sector. The only guidance available is some continuation of past trends and the use of judgement in some inter se changes in sectoral shares as may be desirable from the policy viewpoint. For example, as shown earlier, we have been underinvesting in Indian Railways relative to the roads sector. That it is feasible to enhance investment in a particular sector from a policy point of view is demonstrated by the increase in investment in roads from 0.2 per cent of GDP in the early 1990s to more than 1 per cent in recent years (Table 3.13b). Finally, we also make use of the

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Table 3.13b

India: Investments in Infrastructure, 2000-01 to 2011-12

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Per cent of GDP												
Infrastructure - Total	4.5	4.6	4.3	4.3	4.6	5.1	5.0	5.2	6.3	6.2	5.8	5.4
Electricity, Gas, Water Supply	1.7	1.7	1.5	1.8	1.6	1.8	1.9	2.0	2.1	2.1	2.2	2.1
Railways	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.3
Other Transport	1.0	0.8	1.1	1.1	1.1	1.2	0.9	1.0	1.2	1.1	0.9	1.1
Roads and Bridges	0.4	0.7	0.7	0.8	0.9	1.0	1.2	1.1	1.2	1.2	1.2	1.2
Storage	0.1	0.1	0.1	0.0	(0.0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communications	1.1	0.9	0.6	0.3	0.6	0.7	0.6	0.7	1.3	1.3	1.0	0.7
Infrastructure - Public Sector	3.3	3.4	2.9	3.3	3.0	3.4	3.7	3.8	4.1	3.9	3.4	3.2
Electricity, Gas, Water Supply	1.5	1.4	1.2	1.6	1.4	1.6	1.8	1.7	1.8	1.8	1.7	1.6
Railways	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.3
Other Transport	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.4	0.3	0.2	0.2	0.1
Roads and Bridges	0.4	0.7	0.7	0.8	0.9	1.0	1.2	1.1	1.2	1.2	1.0	1.0
Storage	0.1	0.1	0.1	0.0	(0.0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communications	1.0	0.8	0.5	0.4	0.3	0.2	0.1	0.2	0.2	0.2	0.1	0.0
(PER CENT OF GROSS DOMESTIC CAPITAL FORMATION)												
Infrastructure - Total	19.2	18.2	17.7	17.2	14.1	16.4	13.9	13.6	17.9	17.1	15.7	15.4
Electricity, Gas, Water Supply	7.2	6.8	6.3	7.1	5.1	5.9	5.4	5.2	5.9	5.8	6.0	5.9
Railways	1.1	1.2	1.5	1.5	1.2	1.4	1.2	1.2	1.5	1.4	1.1	1.0
Other Transport	4.4	3.3	4.5	4.2	3.5	3.8	2.5	2.6	3.5	3.0	2.5	3.2
Roads and Bridges	1.5	2.9	2.7	3.0	2.7	3.1	3.2	2.9	3.4	3.4	3.2	3.3
Storage	0.3	0.3	0.2	0.2	(0.0)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Communications	4.9	3.8	2.4	1.1	1.7	2.2	1.6	1.7	3.6	3.6	2.8	1.9
Infrastructure - Public Sector	14.1	13.7	12.0	13.1	9.3	11.0	10.3	10.1	11.5	10.8	9.3	9.1
Electricity, Gas, Water Supply	6.2	5.6	5.0	6.2	4.3	5.2	4.9	4.5	5.1	4.9	4.7	4.6
Railways	1.1	1.2	1.4	1.5	1.2	1.4	1.2	1.2	1.5	1.4	1.1	1.0
Other Transport	0.7	0.5	0.6	0.4	0.3	0.5	0.5	1.1	0.8	0.7	0.5	0.4
Roads and Bridges	1.5	2.9	2.7	3.0	2.7	3.1	3.2	2.9	3.4	3.4	2.8	2.9
Storage	0.2	0.2	0.2	0.2	(0.0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communications	4.3	3.3	2.0	1.7	0.8	0.8	0.4	0.4	0.6	0.6	0.2	0.1
Infrastructure - Private Sector	5.1	4.5	5.7	4.0	4.9	5.5	3.6	3.6	6.4	6.3	6.4	6.3

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	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Electricity, Gas, Water Supply	0.9	1.2	1.3	0.8	0.8	0.7	0.5	0.6	0.8	0.9	1.3	1.3
Railways	(0.0)	(0.0)	0.0	0.0	0.0	(0.0)	0.0	0.0	0.0	0.0	(0.0)	0.0
Other Transport	3.6	2.9	4.0	3.8	3.2	3.3	1.9	1.6	2.6	2.3	2.1	2.7
Roads and Bridges	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4
Storage	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1
Communications	0.6	0.5	0.4	(0.6)	0.9	1.4	1.2	1.3	2.9	3.0	2.5	1.7
MEMO ITEMS (RS BILLION AT CURRENT PRICES)												
GDPmp	21,687	23,483	25,307	28,379	32,422	36,934	42,947	49,871	56,301	64,778	77,953	89,749
Gross Domestic Capital Formation	5,104	5,883	6,193	7,181	10,522	11,356	15,406	18,968	20,001	23,513	28,824	31,814

Source: Government of India, Central Statistical Office, National Account Statistics.

Table 3. 13c
India: Investments in Infrastructure, 2000-01 to 2011-12

(PUBLIC-PRIVATE SHARES (PER CENT) OF TOTAL INFRASTRUCTURE INVESTMENTS)												
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Infrastructure - Public Sector	73.3	75.3	67.8	76.6	65.6	66.8	73.9	73.9	64.1	63.1	59.3	59.1
Electricity, Gas, Water Supply	87.2	82.4	79.8	88.1	84.8	87.6	90.6	87.8	87.1	84.2	77.7	78.1
Railways	101.1	103.0	97.7	99.4	100.0	100.1	100.0	100.0	100.0	100.0	100.0	100.0
Other Transport	17.1	13.8	12.4	10.6	9.3	13.7	22.0	39.9	24.3	22.4	18.9	13.0
Roads and Bridges	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	87.7	87.4
Storage	96.3	95.3	96.3	91.2	135.0	0.9	13.9	1.6	0.6	14.5	28.0	29.5
Communications	87.5	87.8	83.5	155.7	46.8	35.5	26.2	25.0	17.8	15.7	8.8	6.1
INFRASTRUCTURE - PRIVATE SECTOR	26.7	24.7	32.2	23.4	34.4	33.2	26.1	26.1	35.9	36.9	40.7	40.9
Electricity, Gas, Water Supply	12.8	17.6	20.2	11.9	15.2	12.4	9.4	12.2	12.9	15.8	22.3	21.9
Railways	(1.1)	(3.0)	2.3	0.6	-	(0.1)	-	-	-	0.0	(0.0)	-
Other Transport	82.9	86.2	87.6	89.4	90.7	86.3	78.0	60.1	75.7	77.6	81.1	87.0
Roads and Bridges	-	-	-	-	-	-	-	-	-	-	12.3	12.6
Storage	3.7	4.7	3.7	8.8	(35.0)	99.1	86.1	98.4	99.4	85.5	72.0	70.5
Communications	12.5	12.2	16.5	(55.7)	53.2	64.5	73.8	75.0	82.2	84.3	91.2	93.9

Source: Government of India, Central Statistical Office, National Account Statistics.

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Table 3.13d

India: Investments in Infrastructure, 2004-05 to 2011-12

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
(RUPEES BILLION IN 2004-05 PRICES)								
Infrastructure - Total	1,489	1,802	1,980	2,286	3,005	3,239	3,472	3,585
Electricity, Gas, Water Supply	533	647	764	860	990	1,075	1,322	1,383
Railways	131	150	170	193	237	251	237	222
Other Transport	368	415	357	459	600	585	593	780
Roads and Bridges	280	343	459	476	555	634	697	737
Storage	(3)	6	8	8	14	15	17	24
Communications	180	240	224	289	609	678	605	438
Infrastructure - Public Sector	977	1,201	1,459	1,682	1,914	2,027	2,105	2,098
Electricity, Gas, Water Supply	452	566	692	756	869	903	1,024	1,079
Railways	131	150	170	193	237	251	237	222
Other Transport	34	56	78	183	145	128	108	97
Roads and Bridges	280	343	459	476	555	634	675	665
Storage	(5)	0	1	0	0	2	5	7
Communications	84	85	59	72	109	109	56	28
Infrastructure - Private Sector	512	601	521	604	1091	1239	1514	1656
Electricity, Gas, Water Supply	81	81	71	104	121	172	298	304
Railways	0	0	0	0	0	0	0	0
Other Transport	334	359	278	276	456	458	485	683
Roads and Bridges	0	0	0	0	0	0	22	73
Storage	1	6	6	8	14	13	12	17
Communications	96	155	165	217	501	569	549	410
(US$ BILLION IN 2004-05 PRICES)								
Infrastructure - Total	33.1	40.7	43.7	56.8	65.4	68.3	76.2	74.8
Electricity, Gas, Water Supply	11.9	14.6	16.9	21.4	21.6	22.7	29.0	28.9
Railways	2.9	3.4	3.8	4.8	5.2	5.3	5.2	4.6
Other Transport	8.2	9.4	7.9	11.4	13.1	12.3	13.0	16.3
Roads and Bridges	6.2	7.7	10.1	11.8	12.1	13.4	15.3	15.4
Storage	-0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5
Communications	4.0	5.4	4.9	7.2	13.3	14.3	13.3	9.1
Infrastructure - Public Sector	21.7	27.1	32.2	41.8	41.7	42.8	46.2	43.8
Electricity, Gas, Water Supply	10.1	12.8	15.3	18.8	18.9	19.0	22.5	22.5
Railways	2.9	3.4	3.8	4.8	5.2	5.3	5.2	4.6
Other Transport	0.8	1.3	1.7	4.6	3.1	2.7	2.4	2.0
Roads and Bridges	6.2	7.7	10.1	11.8	12.1	13.4	14.8	13.9
Storage	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Communications	1.9	1.9	1.3	1.8	2.4	2.3	1.2	0.6
Infrastructure - Private Sector	11.4	13.6	11.5	15.0	23.8	26.1	33.2	34.6
Electricity, Gas, Water Supply	1.8	1.8	1.6	2.6	2.6	3.6	6.5	6.3

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	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Railways	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Transport	7.4	8.1	6.1	6.8	9.9	9.6	10.6	14.2
Roads and Bridges	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.5
Storage	0.0	0.1	0.1	0.2	0.3	0.3	0.3	0.4
Communications	2.1	3.5	3.6	5.4	10.9	12.0	12.1	8.6

Source: Government of India, Central Statistical Office, National Account Statistics.

estimates derived by the different sectoral Working Groups of the NTDPC.

For the non-transport sectors, we have increased the share of the power sector slightly from about a third of total infrastructure investment in the 12th Plan to 35 per cent in view of the still many unmet needs of large sections of the population. The share of the telecom sector has correspondingly been brought down from about 22 per cent of total infrastructure investment in the 12th Plan to about 20 per cent in subsequent Plans (Table 3.14).

Coming to the transport sectors, there is a clear need for raising the share of Indian Railways in total infrastructure investment and within the transport sector as well. As noted, significant success has been achieved in ramping up investment in roads over the past 2 decades, and particularly since the year 2000. Thus, we are proposing a significant increase in investment in Railways from about 0.4 per cent of GDP in the last 2 decades to around 0.8 per cent in the 12th Plan and then rising to around 1.1 and 1.2 per cent of GDP in the following three Plan periods. (The estimates in the Railways chapter 1 Volume III suggest some tapering during the 15th Plan period). The initiative of the Dedicated Freight Corridor (DFC) and its continued expansion throughout the next two decades will require sustained investment in the Railways. Given the need for total renewal of rolling stock as well, this projected increase is absolutely essential if adequate transport facilities have to be provided in the next two decades. This projection would not accommodate investment in capital intensive projects such as the high speed rail transport that is sometimes proposed. For roads and bridges, we have kept up the investment at an enhanced level, around 1.2 per cent of GDP in the 12th Plan and 1.3 per cent of GDP thereafter over the subsequent three Plan periods. Thus, the scorching pace of growth over the past two decades has been slowed down. There is still considerable need for rural road connectivity in the country, with only about 54 per cent of unconnected habitations been provided with all weather roads in the recent past. We can also expect the graded construction of expressways over the 13th Plan and beyond (Figure 3.1).

'Other transport' covers all the other transport sectors This includes all of road transport vehicles, ports, shipping, inland water transport, civil aviation and urban transport. We are projecting a slight acceleration in this category as investment in each of these categories can be expected to grow faster than in the past as incomes grow and urbanization proceeds apace. As detailed in the urban transport chapter, with accelerating urbanization, increased motorization and need for mass transit of all varieties, we can expect continuing increases in the investments in urban transport for urban roads, mass transit systems, buses and intermediate public transport. As the number of million plus and ten million plus cities increases, there will be increasing need for efficient urban transport.

Our macroeconomic projections suggest a continued expansion in trade both exports and imports. Total trade in goods and services is projected to grow from around 60 per cent of GDP in the 12th Plan to around 80 per cent in the 15th Plan (2027-32). It is trade in goods that is more transport intensive. In our projections, the share of goods in total trade in good and services is projected to increase from about 78 per cent in the 12th Plan to 83 per cent during the 15th Plan, while undergoing more than sevenfold increase in absolute terms. This will not be possible without significant growth in port capacity, domestic transport links through Railways DFCs and an expanded highway system, along with modernization of associated logistics system.

What do our projections suggest for the overall investment in transport over the next twenty years? First, we are projecting overall infrastructure investment to increase from about 5.8 per cent of GDP achieved in the Eleventh Plan to 6.9 per cent in the 12th Plan and to 8 per cent in the following three Plan periods. Within that, we are projecting transport investment to increase from about 2.7 per cent of GDP during the Eleventh Plan period to 3.2 per cent in the 12th Plan and 3.7 per cent thereafter. That implies that the share of transport in infrastructure investment would remain roughly constant at around 46 to 48 per cent.

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Table 3.14a

India: Investments in Infrastructure, 2012-13 to 2031-32

	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE) FY13-FY17 12TH PLAN	FY18-FY22 13TH PLAN	FY23-FY27 14TH PLAN	FY28-FY32 15TH PLAN
(RUPEES BILLION IN 2012-13 PRICES)									
Infrastructure - Total	5,795	6,680	7,794	9,141	10,592	8,107	13,769	20,524	31,318
Electricity, Gas, Water Supply	1,905	2,144	2,529	2,971	3,471	2,604	4,736	7,060	10,773
Railways	501	590	805	990	1,201	928	1,861	3,026	4,617
Other Transport	902	1,072	1,150	1,362	1,602	1,391	2,199	3,278	5,002
Roads and Bridges	1,253	1,447	1,667	1,918	2,136	1,507	2,199	3,026	4,617
Storage	30	32	34	43	47	37	68	101	154
Communications	1,203	1,394	1,609	1,857	2,136	1,640	2,706	4,034	6,156
Infrastructure - Public Sector	3,459	3,861	4,521	5,217	5,887	4,603	7,535	11,050	16,700
Electricity, Gas, Water Supply	1,486	1,651	1,897	2,169	2,499	1,940	3,315	4,942	7,541
Railways	486	566	764	911	1,081	864	1,675	2,526	3,694
Other Transport	244	279	287	327	384	348	463	656	1,000
Roads and Bridges	1,003	1,086	1,250	1,439	1,495	1,122	1,539	2,118	3,232
Storage	0	0	0	0	0	0	1	1	2
Communications	241	279	322	371	427	328	541	807	1,231
Infrastructure - Private Sector	2,336	2,819	3,273	3,924	4,705	3,504	6,234	9,475	14,619
Electricity, Gas, Water Supply	419	493	632	802	972	664	1,421	2,118	3,232
Railways	15	24	40	79	120	63	186	499	923
Other Transport	659	793	862	1,035	1,217	1,044	1,735	2,622	4,001
Roads and Bridges	251	362	417	480	641	385	660	908	1,385
Storage	30	32	34	43	46	37	67	100	152
Communications	963	1,115	1,287	1,485	1,709	1,312	2,165	3,227	4,925
(US$ BILLION IN 2012-13 PRICES)									
Infrastructure - Total	107	123	143	168	195	149	253	377	576
Electricity, Gas, Water Supply	35	39	46	55	64	48	87	130	198
Railways	9	11	15	18	22	17	34	56	85
Other Transport	17	20	21	25	29	26	40	60	92
Roads and Bridges	23	27	31	35	39	28	40	56	85
Storage	1	1	1	1	1	1	1	2	3
Communications	22	26	30	34	39	30	50	74	113
Infrastructure - Public Sector	64	71	83	96	108	85	138	203	307
Electricity, Gas, Water Supply	27	30	35	40	46	36	61	91	139
Railways	9	10	14	17	20	16	31	46	68
Other Transport	4	5	5	6	7	6	9	12	18
Roads and Bridges	18	20	23	26	27	21	28	39	59
Storage	0	0	0	0	0	0	0	0	0
Communications	4	5	6	7	8	6	10	15	23

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	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE)			
						FY13-FY17 12TH PLAN	FY18-FY22 13TH PLAN	FY23-FY27 14TH PLAN	FY28-FY32 15TH PLAN
Infrastructure - Private Sector	43	52	60	72	86	64	115	174	269
Electricity, Gas, Water Supply	8	9	12	15	18	12	26	39	59
Railways	0	0	1	1	2	1	3	9	17
Other Transport	12	15	16	19	22	19	32	48	74
Roads and Bridges	5	7	8	9	12	7	12	17	25
Storage	1	1	1	1	1	1	1	2	3
Communications	18	20	24	27	31	24	40	59	91

Sources: Central Statistical Office, National Account Statistics. Sectoral data for 2011-12 and for public sector 2010-11 and 2011-12 are NTDPC estimates.

In absolute terms, total investment in infrastructure is projected to rise from about Rs 25 trillion ($425 billion) in the 11th Plan to about Rs 40 trillion ($745 billion) in the 12th Plan. This is significantly lower than the $1 trillion that is generally discussed in the context of the 12th Plan. Even if we account for the difference in definitions between GDCF concept in National Accounts as used here, and the gross investment concept used by the Planning Commission, this estimate is not likely to be in a range much higher than about $850 billion. The corresponding estimates for total transport investment are projected to increase from about Rs 11 trillion ($200 billion) in the Eleventh Plan to about Rs19 trillion ($335 billion) in the 12th Plan. Once again, accounting for the difference in definitions, the actual projected investment could amount to about $400 billion. Investment in new roads or railway tracks would involve considerable land acquisition expenditures: this would not be included in the National Accounts GDCF estimates (Figure 3.1).

Going further than the 12th Plan, our total infrastructure investment projections amount to about Rs 70 trillion ($1.25 trillion), Rs 100 trillion ($1.9 trillion) and Rs 155 trillion ($2.9 trillion) in the 13th, 14th and 15th Plans. The corresponding transport investments would be about Rs 30 trillion($600 billion), Rs 45 trillion ($850 billion) and Rs 70 trillion ($1.30 trillion) in the 13th, 14th and 15th Plans respectively. (All estimates in 2012-13 prices).

COMPARISON OF MODEL PROJECTIONS WITH WORKING GROUP ESTIMATES

The NTDPC also made bottom-up estimates for requirements in each infrastructure sector. Each Working Group (Railways, Roads, Ports and Shipping, Civil Aviation and Urban Infrastructure) made its own estimates for the investment required over the next four Five Year Plan periods until 2031-32. These estimates are provided in Table 3.15 along with the projections based on our macro-modelling exercise. It may be seen that the Working Group estimates are lower than the model projections beyond the 12th Plan period, except for the Railways, where they are lower in the 14th and 15th Plan periods.

What this suggests is that from a macroeconomic and resource flow feasibility perspective, we can be more ambitious in our planning for transport sector improvements from the 13th Plan period onwards. The focus after the 12th Plan can be on improving the quality of our transport infrastructure across the board better urban transport infrastructure, better buses, better railway coaches, more modern railway rolling stock for freight, higher quality ports, more international quality airports, better all-weather rural roads, state and district roads and the like.

The lower Railways Working Group estimates in the 14th and 15th Plan indicate that the substantive recommendations for stepping up railways investments are quite realistic from the overall resource availability perspective. The need for reorganisation of the Railways in order to deliver this magnitude of capacity and quality enhancement therefore becomes even more important.

Interestingly, the Roads Working Group investment estimates are significantly lower from the 13th Plan onwards. As mentioned earlier, this suggests that we can be more ambitious in our quest for providing connectivity to all habitations in the country through the PMGSY. Once basic connectivity is achieved, more focus can be given

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Table 3.14b

India: Investments in Infrastructure, 2012-13 to 2031-32

	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE)			
						FY13-FY17	FY18-FY22	FY23-FY27	FY28-FY32
						12TH PLAN	13TH PLAN	14TH PLAN	15TH PLAN
(PER CENT OF GDP)									
Infrastructure - Total	5.8	6.2	6.8	7.4	7.9	7.0	8.1	8.1	8.1
Electricity, Gas, Water Supply	1.9	2.0	2.2	2.4	2.6	2.2	2.8	2.8	2.8
Railways	0.5	0.6	0.7	0.8	0.9	0.8	1.1	1.2	1.2
Other Transport	0.9	1.0	1.0	1.1	1.2	1.2	1.3	1.3	1.3
Roads and Bridges	1.3	1.4	1.5	1.6	1.6	1.3	1.3	1.2	1.2
Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communications	1.2	1.3	1.4	1.5	1.6	1.4	1.6	1.6	1.6
Infrastructure - Public Sector	3.5	3.6	3.9	4.2	4.4	4.0	4.5	4.4	4.3
Electricity, Gas, Water Supply	1.5	1.5	1.7	1.8	1.9	1.7	2.0	2.0	2.0
Railways	0.5	0.5	0.7	0.7	0.8	0.7	1.0	1.0	1.0
Other Transport	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Roads and Bridges	1.0	1.0	1.1	1.2	1.1	1.0	0.9	0.8	0.8
Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communications	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Infrastructure - Private Sector	2.3	2.6	2.8	3.2	3.5	3.0	3.7	3.8	3.8
Electricity, Gas, Water Supply	0.4	0.5	0.6	0.6	0.7	0.6	0.8	0.8	0.8
Railways	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2
Other Transport	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.0	1.0
Roads and Bridges	0.3	0.3	0.4	0.4	0.5	0.3	0.4	0.4	0.4
Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communications	1.0	1.0	1.1	1.2	1.3	1.1	1.3	1.3	1.3
(PER CENT OF GDCF)									
Infrastructure - Total	16.4	17.3	18.5	19.7	20.9	19.0	20.9	19.8	18.8
Electricity, Gas, Water Supply	5.4	5.6	6.0	6.4	6.8	6.1	7.2	6.8	6.5
Railways	1.4	1.5	1.9	2.1	2.4	2.2	2.8	2.9	2.8
Other Transport	2.6	2.8	2.7	2.9	3.2	3.3	3.3	3.2	3.0
Roads and Bridges	3.5	3.8	4.0	4.1	4.2	3.5	3.3	2.9	2.8
Storage	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Communications	3.4	3.6	3.8	4.0	4.2	3.8	4.1	3.9	3.7
Infrastructure - Public Sector	9.8	10.0	10.7	11.2	11.6	10.8	11.5	10.7	10.0
Electricity, Gas, Water Supply	4.2	4.3	4.5	4.7	4.9	4.5	5.0	4.8	4.5
Railways	1.4	1.5	1.8	2.0	2.1	2.0	2.5	2.4	2.2
Other Transport	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.6	0.6
Roads and Bridges	2.8	2.8	3.0	3.1	2.9	2.6	2.3	2.0	1.9
Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communications	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.7

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	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE)			
						FY13-FY17 12TH PLAN	FY18-FY22 13TH PLAN	FY23-FY27 14TH PLAN	FY28-FY32 15TH PLAN
Infrastructure - Private Sector	6.6	7.3	7.8	8.5	9.3	8.2	9.5	9.1	8.8
Electricity, Gas, Water Supply	1.2	1.3	1.5	1.7	1.9	1.6	2.2	2.0	1.9
Railways	0.0	0.1	0.1	0.2	0.2	0.1	0.3	0.5	0.6
Other Transport	1.9	2.1	2.0	2.2	2.4	2.4	2.6	2.5	2.4
Roads and Bridges	0.7	0.9	1.0	1.0	1.3	0.9	1.0	0.9	0.8
Storage	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Communications	2.7	2.9	3.1	3.2	3.4	3.1	3.3	3.1	3.0
(PUBLIC-PRIVATE SHARES (PER CENT) OF TOTAL INFRASTRUCTURE INVESTMENTS)									
Infrastructure - Public Sector	59.7	57.8	58.0	57.1	55.6	57.4	55.7	54.7	54.3
Electricity, Gas, Water Supply	78.0	77.0	75.0	73.0	72.0	74.5	70.0	70.0	70.0
Railways	97.0	96.0	95.0	92.0	90.0	93.2	90.0	83.5	80.0
Other Transport	27.0	26.0	25.0	24.0	24.0	25.0	21.1	20.0	20.0
Roads and Bridges	80.0	75.0	75.0	75.0	70.0	74.5	70.0	70.0	70.0
Storage	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Communications	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Infrastructure - Private Sector	40.3	42.2	42.0	42.9	44.4	42.6	44.3	45.3	45.7
Electricity, Gas, Water Supply	22.0	23.0	25.0	27.0	28.0	25.5	30.0	30.0	30.0
Railways	3.0	4.0	5.0	8.0	10.0	6.8	10.0	16.5	20.0
Other Transport	73.0	74.0	75.0	76.0	76.0	75.0	78.9	80.0	80.0
Roads and Bridges	20.0	25.0	25.0	25.0	30.0	25.5	30.0	30.0	30.0
Storage	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
Communications	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Memo Items									
Gross Domestic Product at Market prices (Rs Billion)	100,262	107,221	114,951	123,774	133,481	115,938	169,153	252,143	384,748
Gross Domestic Capita Formation (Rs Billion)	35,373	38,600	42,172	46,401	50,738	42,657	65,725	103,700	166,526

Sources: Central Statistical Office, National Account Statistics.

to improvement in the quality of all rural roads, so that more widespread all-weather connectivity is achieved. Second, state and district roads have not received the attention they deserve so far: this can clearly be enhanced from the 13th Plan onwards. For achieving both of these objectives, there is great need for enhancing the capabilities of state governments' executing agencies, as proposed in the chapter on Research Human Resource Development (Chapter 11, Volume II).

Third, as the current plans for NHDP near completion, greater attention can be given to the improvement in quality of the four-lane highways, and construction of expressways from the 13th Plan onwards.

Our projections for 'Other Transport' provide room for higher investment than projected by the Working Groups in ports, urban infrastructure, civil aviation, etc. We have not made specific projections for investment in logistics parks, other aspects of modern logistics (Chapter 4, Volume II), information technology for transport (Chapter 10, Volume II), all aspects of safety (Chapter 12, Volume II), Research and Human Resource Development (Chapter 11, Volume II), international connectivity (Chapter 13, Volume II), and the proposals on enhancing connectivity with and in the North East (Chapter 6, Volume III).

Thus, our projections suggest that the recommendations given in this report on various aspects of transport sector development are quite realistic from the resource availability point of view. The more difficult issues relate to the organisational and institu-

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Overall, we are projecting the share of private sector investment to increase from around 40 per cent in the 11th Plan to around 46 per cent in the 15th Plan (2027-32) with much of the increase taking place in the 12th and 13th Plans and then stabilising.

tional changes that are required to achieve the magnitude of investments projected.

We next look at how these projected investment estimates could be divided between the public and private sectors.

INCREASING PRIVATE SECTOR PARTICIPATION IN INFRASTRUCTURE AND TRANSPORT

Globally, throughout the 20th century, the bulk of investment in infrastructure in general and transport in particular, was carried out by the public sector: directly by governments at different levels, or indirectly through public sector enterprises. India was no different and, until the early 1990s, almost all investment in transport was done by the public sector except road transport services (eg. buses and trucks). This was essentially because transport services have been regarded as public goods and services and, moreover, transport infrastructure involves significant economies of scale and is also characterised by indivisibilities in provision.

As technologies changed in the 1990s, it became increasingly possible to introduce contestability, if not competition, in different infrastructure sectors, including various aspects of transport. In addition, as demands for transport have been rising and public fiscal resources have been strained, there have been growing incentives for governments in most countries to seek private sector investment in transport, and other aspects of infrastructure. Thus, beginning in the early to mid-1990s, public policy in India has increasingly encouraged private sector participation in infrastructure.

Taking infrastructure as a whole, the private sector share in infrastructure investment has grown from around 10-15 per cent in the late 1980s and early 1990s to almost 40 per cent in the last couple of years of the 12th Plan (i.e. during 2010-12) (Table 3.13c). As may be expected, the largest transformation is in the telecom sector, with the private sector increasing from zero in the early 1990s to almost 90 per cent in recent years. Within the transport sector, most projects under the NHDP are in the PPP mode thus increasing the share of private sector in the roads sector significantly. Much of the investment in ports is also increasingly in the private sector, as port terminals in Major Ports are given out to the private sector to invest, and state governments encourage investment in Non-Major Ports on a full ownership basis. Similarly, the major airports of Delhi, Mumbai, Hyderabad, Bangalore and Kochi have been privatised and the policy increasingly is for the Airports Authority of India to also make investments in the PPP mode. Although much of urban transport necessarily remains in the public sector, attempts are being made to introduce the PPP concept in major urban transport projects as well. Thus, the share of the private sector in 'Other Transport' has increased from around 40-60 per cent in the early to mid-1990s to 80-90 per cent in the 2000s. Within the transport sector, it is the railways where private sector participation remains low; and is likely to remain low even if a greater effort is made to invite private sector participation.

In making projections for the future, we have kept in mind recent trends, current policy prescriptions, as well as international experience in private sector investment in transport. Overall, we are projecting the share of private sector investment to increase from around 40 per cent in the 11th Plan to around 46 per cent in the 15th Plan (2027-32) with much of the increase taking place in the 12th and 13th Plans and then stabilising (Table 3.14c).

We have projected the private sector share in roads to increase from less than 15 per cent in the latter years of the 11th Plan to around 25 per cent in the 12th Plan and then stabilising at around 30 per cent in subsequent Plans. It should be noted that these shares are much higher than almost any other country in the world. In the Railways, we are projecting the private sector share to go up to around 6-7 per cent in the 12th Plan and increasing gradually to as much as 20 per cent in the 14th and 15th Plans. In 'Other Transport', we have kept the private sector share at around 75-80 per cent throughout the whole period, not too different from current trends. A good proportion of private investment in 'Other Transport' consists of private investment in buses and trucks and other vehicles: hence the high share of the private sector in this category in the National Accounts. It is possible that as share of urban transport infrastructure increases, the share of the public sector may be higher than in these projections (Table 3.14c).

We may note parenthetically that these shares are relatively high by international standards. Except for the United States, most railway systems in the world are in the public sector, though there is often private sector investment in rolling stock. Similarly, private sector investment in roads is an exception rather than the rule in most countries. Most ports and airports are in the public sector, structured as landlord ports or airports, though much of terminal investment is done by private sector operators. Almost all road transport is, of course, in the private sector in most places. In view of such

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Table 3.14c
India: Investments in Infrastructure, 2012-13 to 2031-32

	2012-13	2013-14	2014-15	2015-16	2016-17	FIVE YEAR PLANS (ANNUAL AVERAGE) FY13-FY17 12TH PLAN	FY18-FY22 13TH PLAN	FY23-FY27 14TH PLAN	FY28-FY32 15TH PLAN
(Public-Private Shares (Per cent) of Total Infrastructure Investments)									
Infrastructure - Public Sector	59.7	57.8	58.0	57.1	55.6	56.8	54.7	53.8	53.3
Electricity, Gas, Water Supply	78.0	77.0	75.0	73.0	72.0	74.5	70.0	70.0	70.0
Railways	97.0	96.0	95.0	92.0	90.0	93.2	90.0	83.5	80.0
Other Transport	27.0	26.0	25.0	24.0	24.0	25.0	21.1	20.0	20.0
Roads and Bridges	80.0	75.0	75.0	75.0	70.0	74.5	70.0	70.0	70.0
Storage	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Communications	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Infrastructure - Private Sector	40.3	42.2	42.0	42.9	44.4	43.2	45.3	46.2	46.7
Electricity, Gas, Water Supply	22.0	23.0	25.0	27.0	28.0	25.5	30.0	30.0	30.0
Railways	3.0	4.0	5.0	8.0	10.0	6.8	10.0	16.5	20.0
Other Transport	73.0	74.0	75.0	76.0	76.0	75.0	78.9	80.0	80.0
Roads and Bridges	20.0	25.0	25.0	25.0	30.0	25.5	30.0	30.0	30.0
Storage	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
Communications	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Memo Items									
Gross Domestic Product at Market Prices(Rs Billion)	100,262	107,221	114,951	123,774	133,481	115,938	169,153	252,143	384,748
Gross Domestic Capital Formation (Rs Billion)	35,373	38,600	42,172	46,401	50,738	42,657	65,725	103,700	166,526

Sources: Central Statistical Office, National Account Statistics.

global experience and trends, the Indian thrust on private sector participation in transport is at the leading edge in the world. Consequently, there should be adequate awareness of the difficulties inherent in private sector participation, and there is likely to be need for vigilance at the policy, planning and project execution level on a consistent basis. Moreover, it is also likely that there will be need for innovation in each of these areas continuously, along with substantial capacity development at all levels in both the private and public sectors, as this report is emphasising.

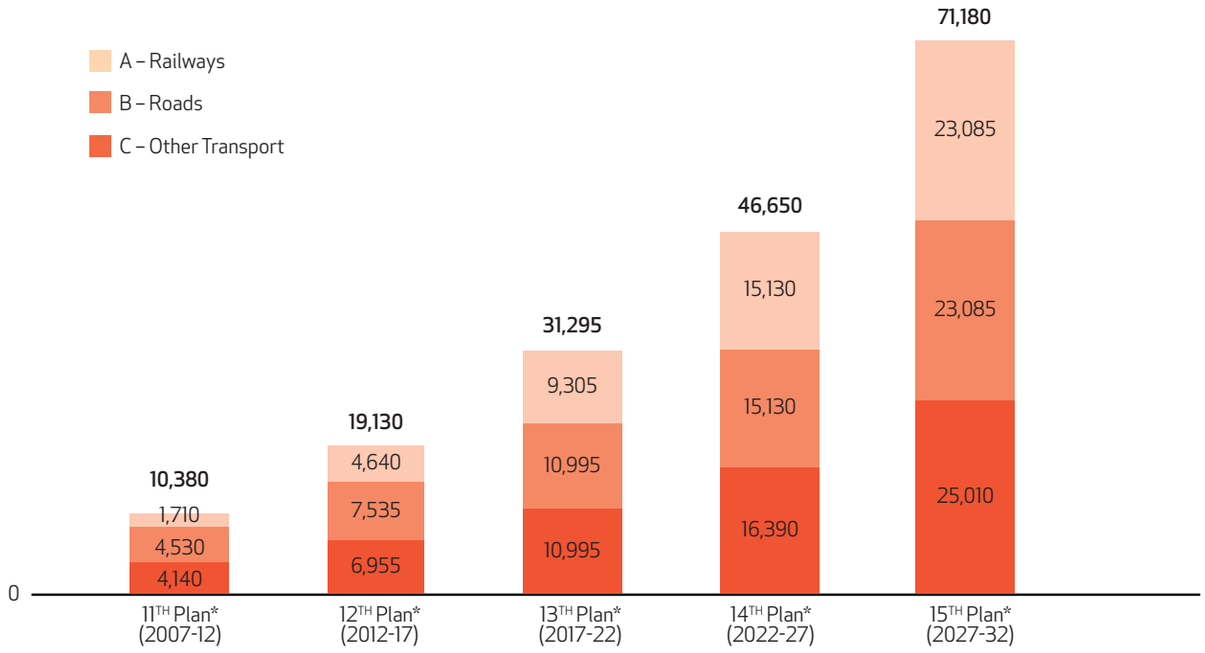
As noted earlier, the projections of private sector investment in infrastructure as a whole, and in transport in particular, is at relatively optimistic proportions and levels. For this to be achieved, the regulatory environment governing all transport sectors will have to be such as to reduce perceived risk for private investors. In particular, the processes governing public private partnerships in transport infrastructure will have to be transparent and credible so that greater investment can flow through PPP arrangements.

TRANSPORT INVESTMENT REQUIREMENTS: 2012-32

What are the overall implications of these projections for infrastructure and transport investment? First, as a proportion of GDP, total investment in infrastructure (on a National Accounts basis) is set to increase from an average of 5.5 to 6 per cent during the 11th Plan (2007-12) to about 7 per cent in the 12th Plan and then stabilising at around 8 per cent in subsequent periods until the 15th Plan (2027-32). About 1 to 1.5 per cent of GDP can be added to make these projections comparable with

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Figure 3.1
Projection of Infrastructure and Transport Investments Required, 2012-13 Prices
[RS Billion]



	11TH PLAN* (2007-12)	12TH PLAN (2012-17)	13TH PLAN (2017-22)	14TH PLAN (2022-27)	15TH PLAN (2027-32)
TOTAL INFRASTRUCTURE (Rs. Billion)	22,500	40,535	68,800	1,03,000	1,56,600
US $ Billion	413	745	1,270	1,890	2,880
Per cent of GDP	5.8	7.0	8.1	8.1	8.1

* Actual

the Planning Commission definitions of infrastructure investment.

Total investment in transport is projected to increase from about 2.6 per cent average in the 11th Plan to 3.3 per cent in the 12th Plan, and stabilising at 3.7 per cent of GDP in the 13th, 14th and 15th Plans (2017-32). Here again, 0.5 to 0.7 per cent of GDP can be added to be comparable with the Planning Commission investment concepts.

In absolute terms, this implies an increase in total transport sector investment from about Rs 10.4 trillion (US $190 billion) in the 11th Plan to about Rs 19 trillion ($350 billion) in the 12th Plan, Rs 30, 45 and 70 trillion ($575, 850 and 1,300 billion) respectively in the 13th, 14th and 15th Plans (Figure 3.1) (all in 2012-13 prices). In this scenario, both public and private sector investments in transport as a proportion of GDP will need to increase significantly.

PUBLIC SECTOR

Figure 3.2 exhibits our assumptions regarding increasing private sector participation in railways and roads, while keeping it at around 75-80 per cent in 'Other Transport'. With these assumptions, and our strategy of increasing investment in the Railways, public sector investment in transport is envisaged to increase from an average of 1.8 per cent of GDP in the 11th Plan to around 2.0 per cent in the 12th Plan and then remaining stable at 2.1 to 2.2 per cent till the 15th Plan. In absolute numbers, this implies an increase in public sector investments in transport from an annual average of around Rs 1.3 trillion ($27-30 billion) in the latter years of the 11th Plan to Rs 2.3 trillion ($43 billion) in the 12th Plan, Rs 3.7 trillion ($70 billion) in the 13th Plan and rising to Rs 7.9 trillion ($145 billion) by the 15th Plan, all at constant 2012-13 prices (Table 3.14a).

PRIVATE SECTOR

Consistent with current government policy, we have made relatively optimistic assumptions on increasing private sector participation in transport infrastructure. At 13 per cent, the National Accounts may underestimate the private sector contribution to investment in roads during the latter years of the 11th Plan. In fact, for the first three years (2007-10), it is estimated at zero. We have assumed it to be about 25 per cent for the 12th Plan and rising to

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Table 3.15

Comparison of Model and Working Group Projections for Transport Investment

[Rs Billion – 2012-13 Prices]

	11TH PLAN* (2007-12)	12TH PLAN (2012-17)	13TH PLAN (2017-22)	14TH PLAN (2022-27)	15TH PLAN (2027-32)
I. RAILWAYS					
Working Group		5,190	9,190	12,040	8,900
Model	1,710	4,640	9,305	15,130	23,085
II. ROADS					
Working Group**		9,570	8,560	13,250	13,890
Model	4,530	7,535	10,995	15,130	23,085
III. OTHER TRANSPORT					
Working Group**					
Road Transport		53	61	70	81
Ports		574	613	848	1,181
Inland Water Transport		45	185	185	223
Civil Aviation		675	942	1,776	2,838
Urban Transport		2,340	3,340	4,360	7,200
TOTAL		3,687	5,141	7,239	11,523
Model	4,140	6,955	10,995	16,390	25,010
GRAND TOTAL					
Working Group		18,447	22,891	32,529	34,313
Model	10,380	19,130	31,295	46,650	71,180

*Actual from National Accounts
** Set up by NTDPC

30 per cent in the following three Plan periods. In the Railways, private sector contribution was effectively zero in the 11th Plan: we have assumed around 7 per cent for the 12th Plan, and then rising slowly to 20 per cent by the 15th Plan. 'Other Transport' includes all organised and unorganised private sector investment in buses, trucks etc: its share has been around 75-80 per cent for some years. We have assumed it to be 75 per cent in the 12th Plan, and then around 80 per cent for the following three Plan periods. Since urban infrastructure investment will rise in the coming years, which may inevitably be largely in the public sector, it is possible that this may be overestimating the private sector contribution in 'Other Transport'.

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

How do we evaluate these numbers from the point of view of broad feasibility? In the last two years of the 11th Plan (2010-12), the private sector was estimated to have invested an annual average of around Rs 700-900 billion (2012-13 prices) in transport. Our projection is for an average of Rs 1.5 trillion per year in the 12th Plan, about double that during 2010-12. An addition of about Rs 700-800 billion per year would therefore seem to be within the realms of possibility. Total resource flow to the private sector as a

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Our expectations from the private sector are ambitious, and if they do not fructify, the government needs to put in place contingency plans, so that public sector resource mobilisation and execution can substitute for any shortfalls in private sector investment

whole was about Rs 14-15 trillion in 2012-13[17]. These estimates therefore imply that about 5-7 per cent of the total flow of resources to the organised private sector should be utilised for transport investment, These are clearly very large numbers, even if we look at the more immediate future of the next 5-10 years. Broadly speaking, a major step up in transport investment is required in the current 12th Plan and further in the 13th Plan ending in 2022, in both the public and private sectors. The expectations from the private sector are ambitious, and if they do not fructify, the government needs to put contingent plans in place, so that public sector resource mobilisation and execution can substitute for any shortfalls in private sector investment.

In any case, public sector investment in infrastructure cannot be expected to be reduced even as a proportion of GDP; if anything, it needs to be increased marginally. If such resources are to be available to the public sector for transport, these investments need to be commercially viable with the consistent application of user charges, transport taxes, and the like at all levels.

SOURCES OF FINANCING FOR TRANSPORT INVESTMENT

Having made the projections for the kind of transport investments that are required to fulfill the vision for transport envisioned in this report, it is now useful to get some sense of what the sources of such financing could be. This is not easy to do since there are no reliable estimates available of the pattern of financing in the transport sector overall. The sectors covered by transport are very varied, ranging from investments in trucks to those in aircraft, and from rural roads to airports. During the last five to 10 years, moreover, with the increasing share of private sector investment in infrastructure, and in different sectors in transport in particular, information on the financing pattern is even more difficult to compile since it involves analysis of all the different private firms involved in different areas of transport. Hence, this section provides only a very broad idea of what the sources of financing for transport investment could be. The projections made in this section indicate broadly where resources can come from, as between foreign and domestic sources; between budgetary and non-budgetary sources for the public sector; and between debt and equity for the private sector, both foreign and domestic.

FOREIGN FINANCING

It is first useful to see the possible extent of foreign financing of transport. We assume arbitrarily that about 40 per cent of total net capital flows to the country can flow to the infrastructure sector as a whole. Further, of total foreign capital flows to infrastructure, about 40 per cent could be invested in transport projects, which then amount to about 15-16 per cent of total capital flows. Table 3.9d exhibits detailed projections for the capital account, the key features of which are reproduced in Table 3.16. With the projected total equity and debt flows, the feasible foreign flows to the transport sector amount to about 0.65 to 0.70 per cent of GDP through the whole period 2012-2032. If we assume that a similar 15-16 per cent of both debt and equity flows are applied to the transport sector, equity flows amount to about 0.40 per cent to GDP throughout the period, and net foreign debt flows to about 0.25 to 0.30 per cent. Thus, in the 12th Plan period, these should amount to an average of about $8.5 billion of annual equity flows and about $6.5 billion in debt flows for investment in the transport sector. Table 3.16 projects the comparable figures in the 13th, 14th and 15th Plans on a consistent basis.

We may note that a more detailed calculation of these flows would need a better appreciation of the magnitudes of resources commanded by the various infrastructure companies in different transport sectors in the country, and then projecting them on a realistic basis. Particular account would need to be taken of the sustainability of foreign debt for these companies. Furthermore, we have provided approximate projections of net debt flows, but these would depend on the pattern of disbursements and repayments. The figures here therefore may be seen for illustrative purposes only, in terms of broad possible magnitudes.

PUBLIC SECTOR

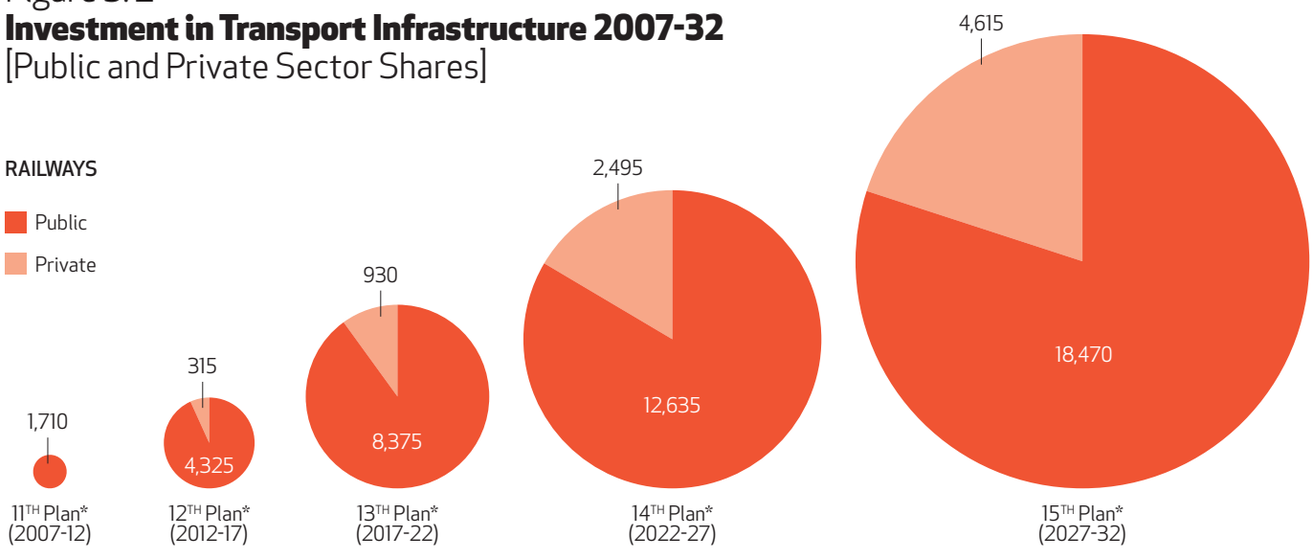
We now look at the possible financing patterns for public and private sectors. An examination of the 11th and 12th Plan financing patterns for investment by the public sector in transport sector exhibit the following trends:

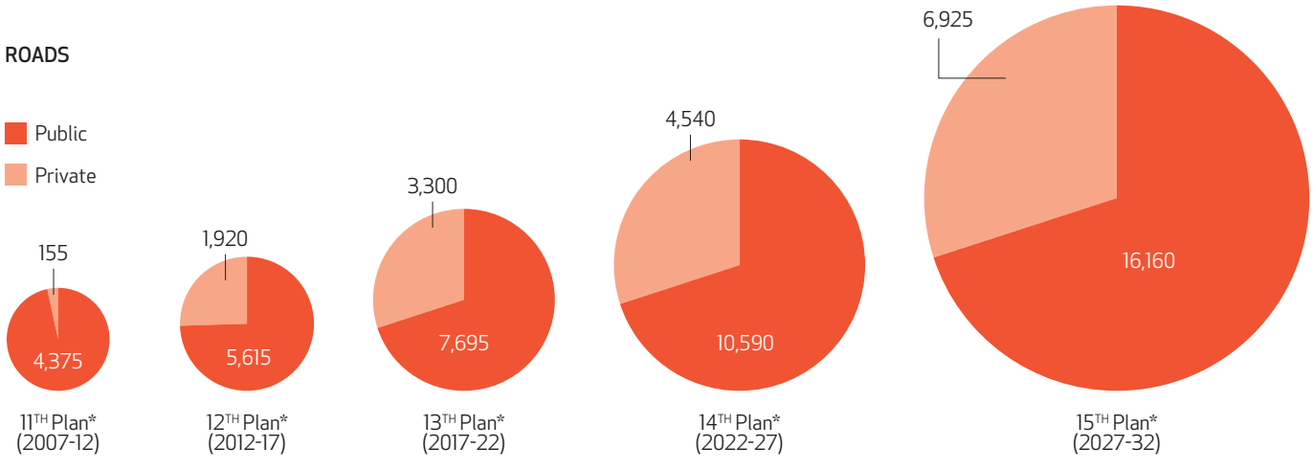
Central Government	
Budgetary support	40 per cent
Internal and Extra Budgetary Resource (IEBR)	30 per cent
State governments	
Budgetary support	30 per cent
Total 100 per cent	

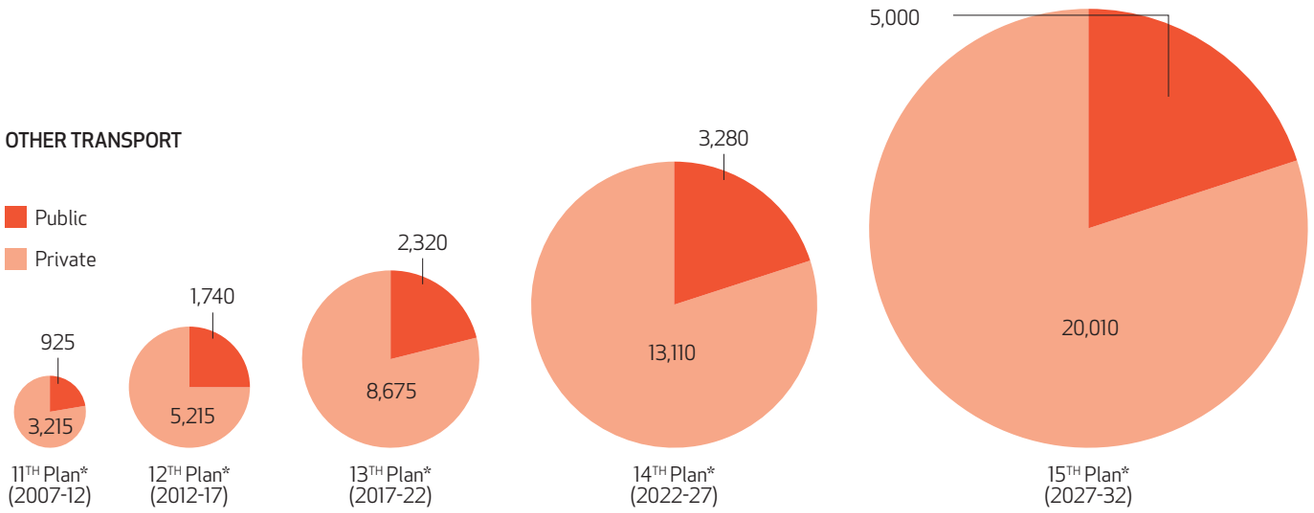
17. Reserve Bank of India (2013).

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Figure 3. 2
Investment in Transport Infrastructure 2007-32
[Public and Private Sector Shares]







	11TH PLAN* (2007-12)	12TH PLAN (2012-17)	13TH PLAN (2017-22)	14TH PLAN (2022-27)	15TH PLAN (2027-32)
TOTAL TRANSPORT (Rs Billion)	10,380	19,130	31,295	46,650	71,180
US $ Billion	190	350	575	850	1,308

*Actual from National Accounts

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Table 3.16
Financing of Transport Investment: A Possible Projection
[Per cent of GDP]

	12TH PLAN (2012-17)	13TH PLAN (2017-22)	14TH PLAN (2022-27)	15TH PLAN (2027-32)
	I. INVESTMENT PROJECTIONS			
TOTAL INFRASTRUCTURE	**7.0**	**8.2**	**8.2**	**8.1**
As Per cent of GDCF	19.0	21.1	20.0	18.7
Public	4.0	4.5	4.5	4.3
Private	3.0	3.7	3.7	3.8
TRANSPORT INVESTMENT	3.3	3.7	3.7	3.7
Public	2.0	2.2	2.1	2.1
Private	1.3	1.5	1.6	1.6
	II. FINANCING			
A. FOREIGN				
Total Capital Flows	**4.6** (495)	**4.3** (670)	**4.3** (1005)	**4.6** (1640)
Equity	2.7 (275)	2.8 (415)	2.7 (620)	2.8 (1015)
Debt	1.9 (220)	1.5 (255)	1.6 (385)	1.8 (625)
FOREIGN FLOWS FOR TRANSPORT (APPROXIMATELY 15 PER CENT OF TOTAL FLOWS)	**0.70** (75)	**0.65** (100)	**0.65** (150)	**0.70** (235)
Equity	0.40 (42)	0.40 (60)	0.40 (90)	0.40 (140)
Debt	0.30 (33)	0.25 (40)	0.25 (60)	0.30 (95)
B. DOMESTIC	**2.60** (275)	**3.05** (475)	**3.05** (700)	**3.00** (1050)

Note: Figures in paranthesis are in US$ billion

We have therefore assumed that, overall, 70 per cent of total public sector transport investments will be expected to come from the Budget. And about 30 per cent from Internal and Extra Budgetary Resources (IEBR) including public sector borrowing, which includes foreign borrowings by public sector enterprises. Thus, of the 2.2 per cent of GDP projected for public sector investment in transport in the next four Plan periods, resources amounting to around 1.40 to 1.55 per cent of GDP would need to come from budgetary sources and about 0.70 per cent to 0.75 per cent of GDP from IEBR, including foreign borrowings. After examining the flows of official lending, we have made a rough estimation of about 0.10 per cent of GDP as foreign borrowing flowing to the public sector (Table 3.17).

PRIVATE SECTOR

Coming to private sector investments in transport, it is found that a substantial proportion of total funding could indeed come from foreign sources, if these projections are broadly reasonable. Thus, of the 1.3 to 1.6 per cent of GDP expected to be invested by the private sector in transport over the next 20 years, about 0.55 to 0.60 per cent, or about a third, could come from foreign sources. The proportion is somewhat higher in the 12th Plan because of the higher current account deficit that has already taken place. The implication of these projections are that the share of foreign equity financing of private sector transport investments could be comparable to that by the domestic private sector. Further, domestic debt financing would have to be significantly higher than sustainable foreign debt financing. This is reasonable since most cash flows in the domestic transport sector are in the domestic currency. In sectors such as ports and airports, however, foreign borrowings could be naturally hedged since a substantial part of their earnings are in foreign currency.

Consequently, of the domestic financing projected for transport investments in the private sector, the

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Table 3.17
Financing of Transport Investment: Public and Private Sectors
[Per cent of GDP]

	12TH PLAN (2012-17)	13TH PLAN (2017-22)	14TH PLAN (2022-27)	15TH PLAN (2027-32)
PUBLIC SECTOR	**2.0**	**2.2**	**2.1**	**2.1**
Budget (70 Per cent)	1.40	1.55	1.50	1.50
IEBR (30 Per cent)	0.60	0.65	0.60	0.60
Foreign Debt	0.10	0.10	0.10	0.10
Private Sector				
FOREIGN	**0.60**	**0.55**	**0.55**	**0.60**
Equity	0.40	0.40	0.40	0.40
Debt	0.20	0.15	0.15	0.20
DOMESTIC	0.70	0.95	1.05	1.00
Equity	0.25	0.35	0.40	0.40
Debt	0.45	0.60	0.65	0.60
TOTAL	**1.30**	**1.50**	**1.60**	**1.60**
Equity	0.65	0.75	0.80	0.80
Debt	0.65	0.75	0.80	0.80
TOTAL TRANSPORT	**3.3**	**3.7**	**3.7**	**3.7**

debt equity ratio turns out to be in a range from about 2:1 to about 3:2 over the four Plan periods projected. What these projections illustrate is that if we account for the sustainability of the Indian balance of payments over the long term, the extent of external borrowing for the transport sector would be somewhat limited to about 0.25 to 0.30 per cent of GDP overall, leaving the rest of debt required to be raised in domestic markets. As emphasised earlier, it is of the utmost importance that much greater efforts are made to invigorate the pension and insurance sectors for greater long-term savings to flow into these funds. It is only if such long-term funds are available, can this kind of domestic borrowing become possible for investment by the private sector in transport.

OVERALL ASSESSMENT

Are these projections reasonable if translated into absolute amounts? (Table 3.18) During the 12th Plan, about Rs 8.2 trillion would need to be made available from the Budget, supplemented by about Rs 3.5 trillion from IEBR for public sector transport investment. This implies an average of about Rs 1.6 trillion per year from budgetary resources and about Rs 700 billion from IEBR per year during the 12th Plan. Looking at the private sector, there would need to be total investment of about Rs 7.45 trillion over the 12th Plan of which about Rs 4.1 trillion would come from domestic sources and about Rs 3.5 trillion from foreign sources. Domestic equity of about Rs 1.4 trillion would need to be raised during the 12th Plan period to be supplemented by about Rs 2.7 trillion in debt from domestic sources. Translated into annual average numbers, this comes to about Rs 280 billion per year in terms of equity and Rs 540 billion per year in terms of debt raised. Total bank credit disbursed to the transport sector over the last three years has been of the order of 0.5 per cent of GDP annually. If account is taken of other sources of borrowing, projections made for debt financing of the private sector would appear to be within the realms of feasibility. The comparable numbers for following Plans are provided in Tables 3.17 and 3.18.

The magnitudes of these numbers would seem to be reasonable. However, for such an investment programme to be successful, there is a great need for appropriate transport sector policies that can indeed attract such levels of both foreign and

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Since a good deal of equity investment in most private sector companies arises from retained earnings, the business climate would have to be such that private investment in the infrastructure sector is adequately profitable on a consistent basis

domestic private investment. Since a good deal of equity investment in most private sector companies arises from retained earnings, the business climate would have to be such that private investment in infrastructure is adequately profitable on a consistent basis.

In summary, our projections suggest that with appropriate policies, it should be feasible to raise adequate financing for the transport investment projected from both domestic and foreign sources. Public sector investment will remain important, and around 70 per cent of public sector investment would need to come from Central and state budgetary sources. For success in raising adequate Internal and Extra Budgetary Resources (IEBR), it will be essential to follow consistent and appropriate policies for user charges wherever feasible in the transport sector. Innovative sources of budgetary financing will also need to be considered such as those proposed for Urban Transport (Volume III, Chapter 5). In the projections made in this section, it is probable that the expectation of foreign investment may be somewhat higher. So far, foreign firms have not yet shown much interest in such investments even though India has the largest PPP programme in roads; however, significant interest is available for investment in other transport infrastructure areas such as ports and airports. Potentially, foreign interest could also come in investment in rolling stock in the railways as and when permitted.

SUMMARY

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

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

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

ACCELERATING GROWTH

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

WHY TRADE NEEDS TO EXPAND

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

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

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Table 3. 18
Financing of Transport Investment: Public and Private Sectors
[Rs Billion, 2012-13 Prices]

	12TH PLAN (2012-17)	13TH PLAN (2017-22)	14TH PLAN (2022-27)	15TH PLAN (2027-32)
PUBLIC SECTOR	**11,680**	**18,390**	**26,505**	**39,630**
Budget (70 Per cent)	8,176	12,957	18,932	28,307
IEBR (30 Per cent)	3,504	5,433	7,573	11,323
Foreign Debt	584	836	1,262	1,887
PRIVATE SECTOR				
FOREIGN	3,438	4,732	6,925	11,831
Equity	2,292	3,441	5,036	7,888
Debt	1,146	1,291	1,889	3,944
DOMESTIC	4,012	8,173	13,220	19,719
Equity	1,433	3,011	5,036	7,888
Debt	2,579	5,162	8,184	11,831
TOTAL	**7,450**	**12,905**	**20,145**	**31,550**
Equity	3,725	6,453	10,073	15,775
Debt	3,725	6,453	10,073	15,775
TOTAL TRANSPORT	19,130	31,295	46,650	71,180

including both foreign direct and portfolio inflows will represent an increase from the current $45 billion to $200 billion by 2027-32.

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

THE INVESTMENTS REQUIRED

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

For investments in transport, the annual level of investment in railways, roads and bridges, and other transport, will increase from Rs 2.2 trillion ($45 billion) in 2011-12 to Rs 3.8 trillion ($70 billion) during the 12th Plan, Rs 6.3 trillion ($110 billion) in the 13th Plan and rising to about Rs 14 trillion ($250 billion) in the 15th Plan period. Of this, investments in Railways by itself will increase from Rs 300 billion ($6.5 billion) in 2011-12 to Rs 900 billion ($17 billion) during the 12th Plan, Rs 1.9 trillion ($ 33billion) in the 13th Plan, and rising to Rs 4.6 trillion ($85 billion) in the 15th Plan period, all in constant 2012-13 prices.

Public sector investment in infrastructure cannot be reduced from the current levels as a proportion of GDP. It should actually rise marginally: the projections for the next two decades show public sector investment in infrastructure should go up marginally

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On the external capital front, there is a negative expectation about official net debt flows; hence, most of the new debt flows would have to be commercial, and thus, highly reliant on the maintenance of high credit ratings for India and the borrowing entities.

from 4 per cent of GDP during the 12th Plan period to 4.3 to 4.5 per cent of GDP in the next three Plans. This increase in public sector investment is primarily due to the increased investment proposed in the railways. Depending on private sector investment trends, there could also be a shift in sectoral composition of public sector infrastructure investments. Private sector investment is complementary to public sector investment rather than a substitute. This implies that public sector infrastructure investment will have to be increasingly commercially viable if public resources invested in infrastructure increase somewhat faster than GDP growth.

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

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

Thus, an important upshot of our exercise is that:

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

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

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

- Capacity development
- Safety enhancement in all sectors
- Use of information technology
- Environmental projection through more stringent fuel standards, etc
- Connectivity with and within the North East; and
- International connectivity

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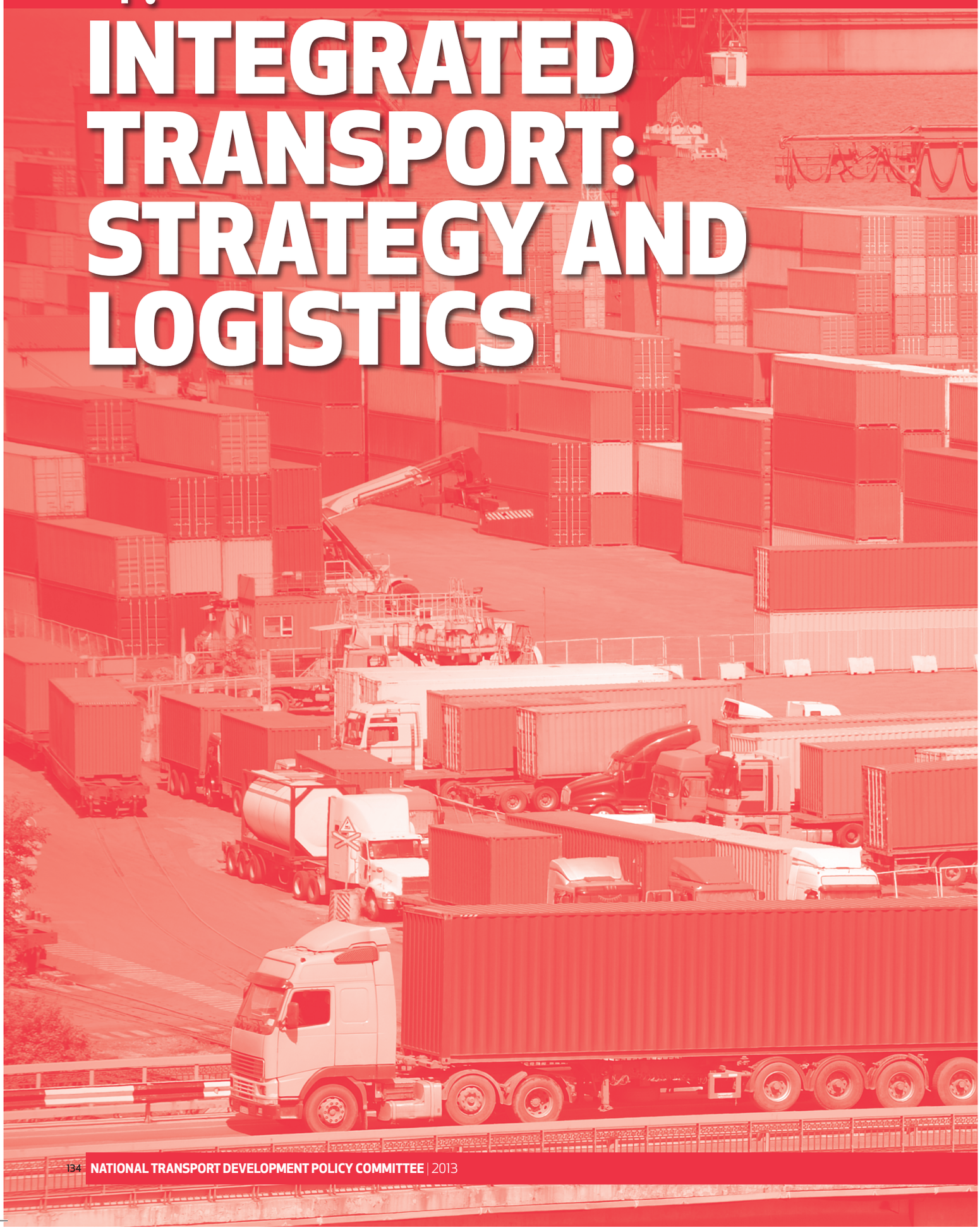
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4. INTEGRATED TRANSPORT: STRATEGY AND LOGISTICS



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4. INTEGRATED TRANSPORT: STRATEGY AND LOGISTICS

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

How do we get there? How does India deliver on a transportation system that meets the national purpose? What sets of strategies must be deployed? In this chapter, the Committee proposes an integrated approach to devising strategy for investment in transport infrastructure and service delivery. The approach is motivated by the view that transport—especially of a freighted good—is firmly integrated within the value proposition of the good; the contemporary supply chains and those of the future render them inseparable from any other production input. The perspective taken in this chapter is that it is modern transport practices that create and shape the market for many goods in today's globalised and integrated world. Consequently, this integrated approach to transport planning advocates considerations that go beyond ensuring the availability of a variety of transport modes and beyond accommodating easy intermodal transfers of passengers and freight, though these are important in their own right.

Instead, the integrated philosophy is about more than the simpler choices over intermodal transport that it is sometimes confused with. Choices within each transport mode—intra-modal or trans-modal choices—are also brought to the forefront of the planning exercise. The argument over the allocation of funds to road and rail is not limited to road and rail, but also includes deliberation on the minute detail of freight and passenger rail transport, to the economics of commercial and passenger vehicles on the roads, to the resource cost of freight transported via dedicated tractor-trailers versus generic bulk cargo trucks, to desired substitution from these modes to air and marine shipping, and to how all of these fit together. In short, the integrated approach to transport strategy considers the universe of transport modes, and in setting out choices between the modes, also considers choices to be made within the modes, and choices over the complementarity of modes. The philosophy emphasises both bottom-up as well as top-down thinking on transport to arrive at a desired complete and internally consistent strategy, and one that is best suited to deliver the holistic transport network described in Chapter 2, Volume II.

This chapter is divided into two halves. The remainder of this section sets out the theoretical foundations of the integrated approach, together with some India-specific observations. The second half then provides an extended look at transport logistics in

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Longer-term intergenerational transport infrastructure planning seeks to identify the deep secular, or structural, influences on the local and global economies in the early stages of their development, and tailor comprehensive development plans consistent with the resultant and desired traffic patterns.

India, and the benefit that this sector could draw from integrated transport planning. The purpose is both to consider the state of the industry domestically and around the world (an important topic for this Committee in its own right), and also to provide an illustration of the benefits that modern integrated transport strategy can bestow on the sector. The bulk of this second section is a discussion on the practical methods for planning efficient intermodal transport. Though the working example in this chapter is limited to the freight-carriage and logistics industries, there is no reason that similar thinking cannot be brought to bear on planning for all users of transport services.

THREE APPROACHES TO TRANSPORT STRATEGY

THE BOTTOM-UP APPROACH

For some politicians, policymakers, planners and administrators, identifying suitable transport investments will be motivated by an attempt to concentrate their spending focus over a defined period. For example, a civic agency or local government might reasonably proclaim 'bus rapid transit' (BRT) or 'rural connectivity' as their infrastructure development theme over the 12th Five Year Plan. Equally, political exigencies could favour the development of National Highways as the masthead road-building theme for one plan, and rural roads for another.

These 'bottom-up' investment themes certainly serve their purpose as short-term spending foci or as tools for communicating strategy, but they leave much to be desired in helping decide on the strategy itself. What are the macroscopic reasons for choosing one investment plan over another? What makes the various elements of an investment plan fit, such that, taken as a whole, the desired outcomes will be achieved? In effect, these bottom-up themes reflect project-centric, rather than network-centric, thinking. These projects are decision outputs, rather than the required inputs into the infrastructure investment decision framework. And even as outputs, they are not quite useful as they distract attention from what is really important: the outcomes. Will the transport system cater to projected traffic demand? What systematic reforms will be required to contribute to accessibility, mobility and connectedness? Will people and goods be able to move seamlessly from one transport mode to another? Will the system account for and be robust to structural, social, demographic, economic and environmental factors? In short, bottom-up, project-based thinking does not begin to answer the strategic questions on transport networks that governments and investment planners are really interested in.

However, the bottom-up approach is nonetheless the tool that is commonly used at present for determining many of the key ingredients that the strategy will ultimately rest on. As discussed later, these include traffic flows, projected demands for transport services and cost structures of alternative service delivery mechanisms for a given transport mode.

THE TOP-DOWN APPROACH

Other agencies and ministries might prefer a more top-down approach beginning with the identification of the important economic, geographic, demographic or industrial elements of the Indian or global socio-economic environment and the resultant impact on transport demand and supply. For example, an inescapable conclusion of the desired growth path for the Indian economy over the next 20 years is the requirement for more coal-fired thermal power plants[1]. This argues strongly in favour of improvements in the carrying capacity of railways for bulk coal and investment in ship-to-train connectivity to allow better movement of imported coal. This top-down perspective is considerably more macroscopic than the bottom-up view. However, even this 'bigger picture' is not quite big enough. The major shortcoming of this approach is that the successful identification of a macroscopic theme to motivate infrastructure development can be undone by shoddy project selection; or worse, by incomplete project selection. To continue the example above: suppose that the 'coal' motivator for a certain transport strategy is taken to hold support only for projects that boost rail capacity. Improvements in the intermodal connectivity at ports, which would be essential for efficient distribution of imported coal, are then neglected.

THE THIRD PERSPECTIVE: THE DRIVER OF INTEGRATED TRANSPORT PLANNING

The bottom-up and top-down approaches are better suited to planning for the short- and medium-terms. For long-term, intergenerational planning for transport infrastructure, a longer-term view on the local and global environment is necessary. In this worldview, strategies determined by booming economic sectors, modish financial ideas, latest technological developments, or 'hot' geographic regions are largely redundant. This perspective argues not so much for

1. Chapter 8, Volume II on Transportation of Energy Commodities.

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the picking of fair winds in one economic sector or transport mode, but for preparedness for wholesale changes to the national climate along all dimensions: demographic, social, economic, technological and environmental. In short, it seeks to identify the deep secular, or structural, influences on the local and global economies in the early stages of their development, and to then tailor comprehensive infrastructure development plans consistent with the resultant and desired traffic patterns.

Returning to the example, this third perspective turns the concept of the drivers of transport strategy on its head. Coal, or even thermal power, is not the theme. Rather, the secular trends are the industrialisation and urbanisation of the Indian economy over the coming decades, and investment for the transport of coal to generate power is only one infrastructure idea that stems from these. Industrialisation and urbanisation have such far-reaching effects that a more expansive and crucially, internally consistent infrastructure investment plan is called for. The urbanisation driver will certainly provide justification for boosting investment in the rail transport of bulk goods such as coal, but it will also support the case for better urban roads and mass rapid transit. It may call for the rebalancing of long-distance rail services away from passenger services towards freight services[2]. Similarly, an explicit acknowledgment of the role that transport must play in the government's distribution and development policies a theme likely to persist in India for some time can prove more fruitful than an ad hoc 'system' of opaquely redistributive taxes and subsidies that distort the transportation markets.

Thinking about these long-term influences on the transport market also helps in devising much-needed prioritisation frameworks for transport investment. Together, these individual infrastructure ideas that are each grounded in urbanisation or distribution or another theme will provide complete investment plans—i.e., integrated strategies—that address the goal noted at the start of this chapter: infrastructure that supports the desired pace of India's socio-economic transition at the lowest resource cost.

The defining attributes of these 'third'-perspective themes which will guide integrated transport planning are their long-term and largely irreversible nature; their far-reaching, game-changing effects on the economy; their indifference to business cycles; and their relative immunity to financial and economic shocks. Note that these are characteristics of the driving forces that underpin the strategy, and not of the components of the resulting investment plans.

Picking overarching future trends is as much art as science, based on divining relationships in patchy data, and extrapolating from that scant information, with fingers firmly crossed.

The challenges to using these long-term themes to motivate and shape infrastructure investment plans are several and severe. To define a fundamental driver requires the accurate and timely identification of structural trends that will persist for a substantial period. History is littered with bold predictions that never came to pass or were measurably less bold than their sponsors had anticipated. This is not unreasonable. Picking overarching new trends for the future is as much art as science, based as it is on divining relationships in patchy data, extrapolating from the same scant information set, and making assumptions about the future states of the world, all with fingers firmly crossed.

To repeat a point made elsewhere in this report, there is important endogenity in devising long-term plans and the resulting infrastructure. Trends are vulnerable to the response they inspire. For example, the suburbanisation (as opposed to the urbanisation) of American cities was a major long-term trend observed in the post-war years, with important implications for transport infrastructure and policy. The policy response was to make it easier for people to commute from suburban homes to downtown city centres by building more and better roads, and pricing fuel below social costs. However, the resulting environmental pollution, sub-optimal landuse, increased commuting times, thinning of group social capital, and general urban degradation has meant that the factors supporting the suburbanisation theme have reversed, and many American cities have seen a rebirth in the vitality of the downtown. Against these challenges are indisputable benefits. Infrastructure development plans that are the outcome of integrated strategies are more likely to be complete, consistent and robust, as the next sub-section shows.

THE THEORY OF THE INTEGRATED APPROACH

The Committee has adopted the classical view that the demand for transport services is derived from the demand for other goods and services. This is to say that without the existence of goods that are produced and consumed in different locations, there is no requirement for transport[3]. There must be both functional complementarity in that viable demand

2. Note that the emphasis is on rebalancing away from passenger services and towards freight services; growth in passenger services can still be commensurate with the fundamental drivers of demand. The integrated approach yields this kind of useful prioritisation.
3. It is most convenient to frame this discussion in the context of the movement of freightable goods. Logically isomorphic constructions can be made for the movement of passengers, but at the cost of substantial linguistic calisthenics. For example, one may argue that services rendered by the employees of a firm are 'produced' at their residences, but 'consumed' at their workplaces, thereby giving rise to the necessity for the daily commute. To avoid these awkward constructions, and in keeping with logistics as the focal example in this chapter, the remainder of this discussion proceeds by considering the movement of goods only.
4. Rodrigue (2006).

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and supply relationships exist, as well as spatial complementarity in that the demand and supply must originate at different geographical locations[4]. For example, raw materials must be sourced from location A, manufacture takes place at B, packaging at C, distribution at D, consumption at E, and waste disposal at F. In this manner, transportation services supply the missing link that allow the match of the demand for and supply of a good.

The derived demands for transportation can be further decomposed into those that are direct and indirect, with the former referring to those for the transportation services themselves. However, the supply of transportation also generates the demand for other goods, such as for fuels that must be moved to the point of consumption, and for warehousing along various intermediate and terminal points of the supply chain. These second-order demands are the indirect consequences of the demand for the actual utility-providing good.

There must be both functional complementarity in that viable demand-supply relationships exist, as well as spatial complementarity in that demand and supply originate at different geographical locations. Transportation services supply the missing link that allow the match of the demand for and supply of a good.

This classically obvious understanding of transport demand underpins much development of strategy and investment plans, and is fit-for-purpose. However, an alternative view that subsumes transportation into the supply-demand nexus—by rendering it an integral part of the manufacturing and consumption processes—provides useful theoretical basis for an integrated strategy for planning transport. This alternative view can be justified on the following grounds, and is especially pertinent when considering topics in logistics and freight movement[5].

The first argument reverses the link between the demand for a good and its transport. Under the traditional view, as noted earlier, the demand for a good gives rise to the demand for transport services. As scale expands, as more goods of a particular type and of several different types are transported, natural high-volume transit corridors develop between pairs of geographic nodes. Further, these nodes serve as hubs distributing to spokes, as warehousing junctions, and as interchanges allowing for the selection of the most efficient transport mode and gauge for each leg of the journey. As the transport system achieves scale economies and becomes more sophisticated, a definitive topography begins to take shape. Transport modes and processes are standardised—containerisation is a classic example—expanding supply chain capacities. In turn, these standardisations and efficiencies reduce costs, thereby making it feasible to transport other goods for which the freight was hitherto prohibitive. The net result is that it is the sophisticated freight and logistics network itself that creates the market for other goods, an upending of the traditional view.

The derived-demand perspective on transport essentially concludes that transportation costs are exogenous to manufacturing and consumption. A second argument against this view is that contemporary transport processes de-emphasise the costly maintenance of inventory in favour of tighter supply chains that synchronise raw material collection, manufacture, packaging, bundling and unbundling, distribution, and retail. Transportation thus becomes an intrinsic part of this modern system for supplying a market[6]. Specifically, this transportation is specialised enough to be called logistics, a term that has its origins in the military as the careful management of supply routes to a battlefield and associated processes. Firms that specialise in logistics are also beginning to blur the lines between transporter, transport arranger, and even manufacturer. These so-called third- and fourth-party logistics providers assume responsibility for the supply chain for a particular product to varying degrees. Fourth-party providers also then provide a host of auxiliary services that become an essential part of the product offering[7]. In this manner, transport is no longer an exogenous cost, and is no longer a service derived from the demand for another good, but is an embedded part of both that good's supply chain and its value proposition.

The third argument stems from the observation that an increasing number of logistics services are provided by integrated providers. Previously, separate agencies and enterprises would have been responsible for customs clearances, quarantine inspections, freight forwarding, trucking, shipping and final delivery, with delays and costs imposed by administrative and intermodal considerations. Industry consolidation, more flexible regulation, and technology have each combined to yield entities that anticipate and regulate the flows of freight. These integrators do not plan activities in response to a derived demand, but with respect to shaping and being shaped by customers' supply chain[8].

5. Rodrigue (2006) and Rodrigue (2011). This alternative view that argues against considering transportation as a derived demand is more difficult to motivate for passenger transport.
6. The advantages of such a demand-driven system are 'higher inventory turnovers, better customer service, as well as increased labour productivity and capacity utilisation which should transcribe in higher incomes, returns and lower operating expenses'. Rodrigue (2006, 2011: 1455), citing Lee (2003).
7. For example, UPS, the second-largest parcel carrier in the United States, not only delivers Toshiba laptops throughout the country, but is also responsible for after-sales customer service, for collection of faulty product, and for its eventual return and repair.
8. Rodrigue (2006).

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Box 4.1
Integrated Transport Networks

Historically, the coastal regions have benefited the most from economic growth and prosperity. The development levels invariably decline in areas further away from the coastline. Inadequate connections often make inland locations less competitive. Development of integrated transport networks would provide improved access to inland areas and spread the benefits of economic growth.

Development of growth centres away from the coastal areas is equally essential. Establishing dry ports in inland locations can stimulate this process. These ports would create the opportunity for the same economic stimulus seen at seaports. They would allow shippers to undertake consolidation and distribution activities as well as complete export/import procedures at inland locations that are at relatively short distances from farms and factories.

Source: Asian Institute of Transport Development: Regional Seminar on Intermodal Logistics, 2007.

Fourth, just as the industry has consolidated, so has the infrastructure it requires. Massive logistics parks are modern-day marvels of technology and efficiency. Huge quantities of freight seamlessly interchange from plane to truck, or from ship to rail, or any combination of these. The seamless interchanges rely on efficient tracking, common or mutually intelligible software systems across the modes, and on standardised equipment such as the shipping container. The logistics parks are hubs of administrative services like customs and quarantine, and of purpose-built inventory control facilities. They also become home to businesses that require efficient access to a variety of transport modes, and to the staff and ancillary services that are required to support these. Once built, it is not necessarily the case that the throughput of these parks, a measure of the demand for transport, is determined solely by the demand for final goods, as would be the case if transport services were derived from these demands. For example, the industrial plants, new townships and logistics parks that are being built on the backbone of revitalised modern road and rail transport facilities, and known collectively as the Delhi-Mumbai Industrial Corridor are integrated demand-engines in their own right. The logistics parks and the transport links provide the scaffolding on which the entire set of other facilities rests.

The fifth and final argument against the transport-as-derived-demand view is perhaps the most pertinent and immediate. It is often noted that our world is shrinking and that transport has made it so. However, more nuanced conclusions can be drawn from this tautology. At one level, transport has ceased to matter because modern logistics has ensured that the focus can remain on identifying the most efficient supply chains[9]. 'When transport costs are high, manufacturers' main concern is to locate near their customers, even if this requires undesirably small plants or high operating costs. As transportation costs decline relative to other costs, manufacturers can relocate first domestically, and then internationally, to reduce other costs, which come to loom larger'[10]. In these most efficient supply chains, inventory costs are driven down by ensuring that parts and products are delivered to wherever they need to be at a guaranteed time: too early is almost as problematic as too late[11]. This is relevant for low- as well as high-value products[12]. In this regard, transportation systems are synonymous with inventory management systems, and are hence integrated within the manufacturing process, and especially in the management of production time and time-to-market. For many goods, it is no longer possible to separate out transportation from any other manufacturing input.

The five arguments noted above make a strong case for considering the demand for transport to be integrated with the demand for any other good. There are substantial endogeneities and feedback effects that challenge the derived-demand hypothesis. This has both positive and negative conclusions for transport planning. On the plus side, this implies that transport planning has more power to engineer and channel economic growth in a manner that is in the national interest than might appear at first glance. On the other hand, it places substantial onus and technical demands on the decision-making authorities to devise and deliver on plans. Whether the net repercussions are positive or negative, the major conclusion to be drawn from these observations is that transport planning must be necessarily integrated within and across modes.

9. 'It is better to assume that moving goods is essentially costless than to assume that moving goods is an important component of the production process.' Edward Glaeser and Janet Kohlase, cited in Levinson (2007: 8).
10. Ibid.: 14.
11. Alternatively, the certainty of delivery at a definitive time is almost as important as compressing the delivery time.
12. Zara, a brand of the Spanish company, Inditex, has grown to be the world's highest-grossing clothing retail chain on the back of its sophisticated logistics. The label is widely acknowledged to get a new item of fashion from conception to shopfloor within two weeks, against an industry average of six months. Besides its skilled staff and choice of manufacturing locations that are close to its largest markets, the biggest contributory cited in Zara's success is the sophistication of its supply chain.

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Box 4.2

Management Structure and Pricing of Services

All human endeavour involves choices and nowhere is this more true than in commercial activity. Transport is an integral part of economic and commercial activity. As such, it also requires choices to be made between different modes of transport, such as rail and road. However, the sum of individual choices, even while maximising the welfare of an individual or a firm, may not maximise social welfare.

Despite the comparative advantage of rail over road in terms of social costs, its share in both passenger and freight traffic has been declining over the years. The reasons for this decline can be broadly categorised into pricing policies and non-pricing attributes related to rail and road modes.

Of the two modes, rail is a state-owned monopoly subject to price regulation, while the road transport market is privatised and competitive for freight traffic. The prices of freight transport service by trucking are determined by free market forces. However, for passenger road transport, both public sector undertakings and private operators supply the service under a regime of price regulation.

The pricing systems prevailing in the two modes are totally different. Rail transport, in its pricing, covers all costs, including that of the fixed infrastructure, whereas road pricing does not reflect the full normative cost of ground infrastructure and its maintenance. Besides, the road and fuel taxes have little or no relation with the true resource cost of various inputs.

In road transport, the freight and passenger segments operate as independent entities, while in rail, there is no such distinction. This difference in structural characteristics has critical implications in pricing of the products in the two modes. In road transport, there is no element of cross-subsidisation between the two products, while railways indulge in it with great profligacy.

Source: Asian Institute of Transport Development (2002).

INTERMODAL TRANSPORT SYSTEMS

Intermodal transport is the combination of at least two modes of transport in a single transport chain, ideally without a change of container for goods. With the multiplicity of modes, the cooperation and participation of several agents is required. On the demand side, owners, shippers, forwarders, shipping lines and logistics service providers each fulfil a particular set of service provisions, with terminal, rail, inland navigation, short-sea, road and intermodal transport operators involved in supplying the actual services. Terminal operators at ports, logistics parks, airports and other transhipment junctions are at heart of the intermodal system by transferring intermodal units between mainline transport networks and undertaking drayage.

The extra handling required of intermodal shipments adds to overall costs. However, these costs whether direct or indirect in the form of economic externalities, are usually a small proportion of the gains to be made by transporting goods on modes to which they are best suited for particular segments of the journey. Intermodal transport systems demand flexibility, reliability, cost-effectiveness and extensive collection and dissemination of information. Against this, they offer cost savings, reduced congestion, air pollution, noise and fewer accidents through the use of dedicated and finely tuned systems.

It is important to note that, in itself, the intermodal principle is not about advocating a particular modal mix. Within the context of a regional or national economic environment and the prevailing social and financial circumstances, different modal mixes are likely to prove apposite. Thus, the principle petitions for the discovery of the optimal mix, with a view that the various components can be integrated into an origin-to-destination supply chain that improves overall efficiencies of the transport system. By improving the connections between all modes of transport and integrating them into a single system, intermodality allows better use to be made of rail, inland water transport and coastal shipping which, by themselves, are not readily amenable to origin-to-destination supply chains but are excellent for certain segments therein[13].

The inefficiencies of a transport system are manifested in higher prices, longer journeys, reduced reliability, lower availability of quality services, type restrictions, higher risks of damage or pilferage and more complex administrative procedures.

13. Intermodality is, therefore, complementary to other transport policies such as liberalisation of transport markets, developing of national networks for a single mode, and the promotion of fair and efficient pricing. EC (2001).

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Table 4.1
Break-Even Distances, Rail and Road

COMMODITY	BREAK-EVEN DISTANCE (KM)	COMMODITY	BREAK-EVEN DISTANCE (KM)
Food Grain	222	Cement	160
Fruit & Vegetables	313	Livestock	162
Coal & Other Minerals	188	Iron & Steel	173
Fertilisers	167	Containers	307
Sugar	372	Other	307
Petroleum	126		

Source: RITES (2007-08)

Though multimodal systems seek to eliminate or dampen some of these outcomes through better modal mixes and efficient intermodal transfers, the good functioning of the system is determined by several critical enablers.

First, missing stretches of infrastructure within one mode or missing links between modes, however small they might be, can prevent seamless intermodal chains. They impose additional transfer and friction costs on operators. Inadequate access by rail, road or waterborne transport to existing transfer points can hamper the integration of these modes and transfer between modes.

Second, because the various component modes of an intermodal system are financed and managed separately, the responsibility for strengthening the links between them is unclear. Moreover, the existence of different forms of ownership and charges for the use of infrastructure and terminals does not enable transparent and coordinated infrastructure planning at local and regional levels. Intermodal transport is only as strong as the weakest link in the transport chain, a point made more forcefully in Chapter 2, Volume II, this report. The lack of standardisation and interoperability within and between modes poses significant problems. The wide variation of loading unit dimensions across modes, and the incompatibility of the transport equipment for road, rail, coastal and inland waterway traffic raises transfer and handling costs and necessitates cumbersome transhipment techniques. Simple standardisation technologies like pallets and shipping containers allow vehicles, vessels and wagons to be designed with complete agnosticism on the cargo carried. Further, the standardised handling equipment and the automation of handling procedures permit both easier and faster transhipment.

Unequal levels of performance and service quality mark the various component modes of an intermodal system. It is not much good if a coastal shipping system can deliver, and the road system remove, a certain defined quantity of cargo from a port, but the port's handling equipment can only process a small fraction of the required throughput. The differences arise from variations in the cost structures, but also from the industrial organisation, competition and liberalisation of a particular mode. Modes where operators are confronted with a high threshold for access to their infrastructure tend to generate monopolistic behaviour, resulting in a lack of customer-oriented operations and sub-optimal use of capacity. Next, because operators own their own fleets or even infrastructure, they often tend to subscribe to and promote only one mode of transport and disregard better options which may exist on other modes.

A final barrier to the efficient use of intermodal systems is the allocation of responsibility and liability. If the final receipt of an intermodal supply chain with many service providers is a damaged product, what is the appropriate measure for registering insurances and claims? The competitiveness of intermodal transport is also hampered by unequal administrative treatment and impermeable information. For example, transport documents are to a large extent still based on paper and differ according to specific modes—maritime, rail, road or air transport.

INTEGRATED TRANSPORT PLANNING IN PRACTICE: AN INDIAN PERSPECTIVE

As noted earlier, it is essential that an integrated transport strategy does not develop in mode-specific silos, and is tied to the agenda for national socio-economic development in an organised and sensible manner. The following discussion sequentially identifies the major steps in an integrated planning exercise, before focussing on general implementation

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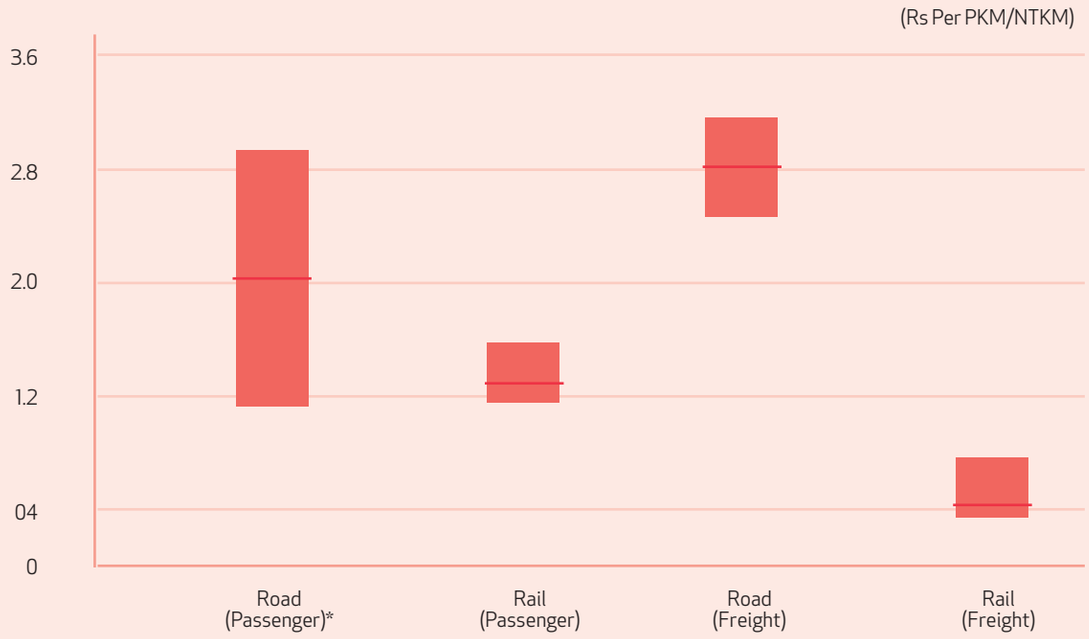
Box 4.3
Comparative Study of Rail and Road Modes

The use of transportation is not wholly a benign activity. It causes strain on nature by consuming scarce resources, emitting harmful pollutants and generating undesirable wastes. Different modes of transport cause varying levels of stress and consequent damage. Hence, there is growing recognition that the transport systems and modal choices should factor in the cost of environmental degradation and social damage, as it would promote both overall sustainability and sustainable transport.

It was in this context that the Asian Institute of Transport Development (AITD) undertook an empirical comparative study of rail and road modes with a focus on social sustainability. The empirical model simulates effects of intermodal substitution. It estimates all inclusive costs—financial, environmental and health damage caused by line-haul operations and related development of ground infrastructure. The results of the study are graphically depicted below:

SOCIAL COSTS OF ROAD AND RAIL

* In terms of social costs, railways have a huge cost advantage over road transport. The advantage is greater in freight traffic than in passenger traffic.
* Policy changes can induce shift of modal choice in favour of rail and in favour of public road transport over personalised transport.



* The option of 'bus only' is considered for road passenger transports.

Source: Asian Institute of Transport Development (2002).

issues and common pitfalls. As is true for this entire chapter, the focal example is the generalised movement of freighted goods and logistics.

TRAFFIC AND COSTS STUDIES

The first step is to identify past and expected changes in the pattern of traffic demand for various modes of transport[14]. These changes mainly occur due to two factors: the types of commodities that are moved through the system (themselves a function of the country's changing economic profile), and the costs at which the various modes of transport can accommodate the changing traffic patterns and volumes. The cost structures analysed should be resource costs, which are the sum total of the financial outlays by user and operator together with any external or shadow costs that are borne by society.

14. Puri (2012).

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These studies on expected traffic flows and cost structures support the taking of a long-term view, which is especially important as transport infrastructure takes time to develop, and is also expected to be serviceable over long periods[15]. These detailed studies should be kept current so that the resulting investment plans are always validated in the face of the changing growth and cost environment. As noted by Puri, traffic flows and costs studies must be carried out with respect to major commodities, type of route, length of haul and keeping in view alternative technologies.

It is critically important to use identical methodologies for estimating unit transportation costs to ensure fair comparison and allocative efficiencies in earmarking financial resources. To do this requires the development and availability of suitable accounting systems at the constituent units and agencies engaged in the development and operation of transport infrastructure and services.

These traffic flows and cost studies within and across modes make possible optimal decisions on mode-specific investment. The Planning Commission has sponsored several such studies in the past, but these have not been carried out at regular intervals[16]. An important outcome of this research on traffic flows and resource costs has been to build granular knowledge of the break-even distances for the efficient cartage of various commodities by different modes of transport, and especially by road and rail. The break-even distances can then be used in identifying optimal investment plans. For example, the latest available data for India suggest that road is superior to rail for hauling foodgrain from origin to destination at leads of about 220 km. At larger distances, rail is the preferred mode for mainline haulage despite any delays at intermodal nodes where the grain must be transferred from or to trucks for initial lading or final delivery. (See Table 4. 1 for break-even distances for other commodities.)

In 2007-08, RITES carried out the latest attempt at determining traffic flows and unit resource costs for rail, road, airways and coastal shipping. It generated analyses on commodity-wise freight and passenger transport across the entire country, estimating both financial as well as economic costs[17]. The traffic data was used to estimate the actual modal mix, and the costs data to establish the optimal modal mix based on break-even distances[18]. The several thousand pages of detailed analysis of individual segments of track and road and waterway can be distilled, somewhat baldly, into the following observations:

- Though there is a growing preponderance of freight carried between geographic regions, intra-regional freight volumes are perhaps twice as large and inadequately catered for[19].
- The result of these traffic increases is severe congestion on key rail and road corridors, and the creation of bottlenecks on the network pertaining to a particular mode and at junctions where freight is transferred between modes.
- There is a discernible gap between the actual and optimal modal mixes. According to RITES, a switch from the actual to the optimal modal mix will result in a 3 per cent increase in freight throughput at a cost saving of around Rs 380 billion or 16 per cent of the total cost expended on transport in that year.
- Beyond the general observation that there are substantial efficiencies to be gained in a switch from road to rail, the study identifies that these switching benefits are largest for the following commodities: Miscellaneous (78 per cent)[20]; Iron and Steel (61 per cent); POL (61 per cent); Fruit and Vegetables (53 per cent) and Cement (36 per cent).
- Technical advances and solutions to achieving the optimal modal mix are readily available in the form of technologies such as higher-powered locomotives, high-speed coaches and wagons, and multi-axle road vehicles, besides many innovations in logistics management and operations software. However, these are patchily and inconsistently deployed.
- The operation and management of different modes of transport is characterised by a varying mix of institutional frameworks, acting independently of each other. As such, the various modes have been developed as isolated entities seeking to further idiosyncratic modal interests.
- A lack of data, and especially for traffic on the highways, is a major limiting factor in the development of good transport policy.

Before proceeding to a summary of the recommendations of the RITES study, it is crucially important to note that RITES determines the desired modal mix on the basis of break-even costs based on resource costs. Consequently, the 'optimal' modal mix is theoretical insofar as it is not reflective of the government's development priorities or other allocative and distributive

15. The study has previously also noted that infrastructure decisions are difficult to reverse in general, and even more so at short notice.
16. The Committee on Transport Policy and Co-ordination carried out the first study in the mid-1960s. This was followed by three studies by RITES in 1976-77, 1986-87 and 2007-08. Ibid.: 16.6.
17. The nine commodities considered were coal, foodgrain, iron and steel, iron ore, POL products in liquid form, limestone and dolomite, cement, fertilisers and miscellaneous/others. Together, these nine commodities comprise 63 per cent of the total volume of 2,387 million tonnes carried by all four modes across the entire universe of 52 commodities.
18. A break-even distance refers to the point of indifference between two mode choices, such that the prospective user of a transport service is indifferent between them.
19. The study noted that freight traffic increased threefold on the railways, by a factor of seven on the roads and by 10 times on coastal ships. Combined with an increase in the distances transported, overall freight increased four times.
20. RITES studied 52 commodity groups and the final miscellaneous category includes parcels and comprised about 3 per cent of the total volume of traffic carried across all modes in 2007-08.

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Box 4. 4

The National Transport Policy Committee [1980]

The findings contained in the report of the National Transport Policy Committee of 1980 have naturally dated with respect to prices and technologies and the socio-economic agenda. Some recommendations, however, remain pertinent and perhaps more urgent than they were 33 years ago. This box summarises the thoughts of the Committee with respect to planning intermodal transport, and it is worthwhile beginning with the very last one:

For achieving the best intermodal mix, we suggest that appropriate investment decisions and use of pricing mechanism should have preference over regulatory measures and administrative controls.

The NTPC of 1980 was cognizant of the need to devise an investment strategy that was concomitant with the nation's development agenda of the day. In the late 1970s, the twin pillars of the agenda that the Committee focussed on were the employment potential and the energy intensity of the various modes of transport. To that end, the Committee studied the direct and indirect employment potential of different modes in substantial detail, before ultimately rejecting this as a basis for making decisions on intermodal transport. 'We hold the view that whatever importance employment generation may have in programmes of development, it has no role to play in determination of the intermodal mix in the transport system of the country. (Instead,) our policy aim should be to develop technologically as efficient a transport system as possible, so that production and hence employment generation programmes of other sectors are not jeopardised due to transport bottlenecks.'

The Committee placed heavier stock on the second pillar, arguing that the prevailing energy crisis in the country meant 'energy conservation should be given overriding consideration in determining the intermodal mix for the transport system'. They recommended achieving this by promoting modes that are more energy efficient and by selecting a modal mix that was compatible with India's energy resource endowment (i.e., coal, which favours rail).

Within the context of this development agenda, the Committee established the view that the central issue of transport policy is to allocate rationally and at minimum resource cost, the total available resources for investment between the various modes of transport. This is a view endorsed by the NTDPC.

The NTPC made a comparison of the costs of transporting units of freight traffic via road and rail to assess the relative advantages of these modes. The cost data and break-even points of 11 commodities were assessed, and for most of these, road proved more economical at distances below 300-350 km. The Committee also concluded that any increase in oil prices would only bias this break-even distance downward, and in favour of rail. Further, it was of the view that neither coastal shipping nor inland waterway transport had any important role to play in determining the optimal modal mix.

goals. Further work will be required to first, continually update the RITES results, and then to synthesise them with other goals of government policy in a non-distortionary fashion. On the basis of these observations, the authors of the RITES study recommend the following measures:

- An urgent increase in capacity is required for all modes, and especially in that of the railways. For freight, an equal focus to last-mile connectivity with ports and logistical parks as to dedicated freight corridors is essential.
- The development of domestic container traffic should be encouraged.
- The transport of several commodities can immediately shift to the more efficient mode (predominantly, rail) for the lion's share of the lead distance if multi-modal logistics parks aid intermodal transfer.
- The siting, profile and capacities of the multi-modal parks should be made conditional on a careful analysis of the patterns of traffic in the movement of commodities in the serviced hinterland.
- Recognising the important role that road transport will continue to play in the future, the study recommends further exploration of roll-on roll-off operations that deliver road-rail complementarity.
- Advanced research in mode-specific and mode-agnostic technology improvements is essential.

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Box 4.5
Ikea's Coffee Mugs and Tea-Lights

The Swedish firm Ikea has now become the world's largest furniture retailer. It also carries an extensive range of goods for the modern household, and its minimalist Scandinavian design sensibilities have become a de facto standard for interior design in many countries. Ikea is known for its focus on product design and on finely managing its supply chain with a relentless focus on cutting costs. It is the company that pioneered flat-pack designs for furniture. Every piece of furniture it sells is designed to be packed flat into the smallest space possible for shipping, lowering its distribution costs. (Separately, it has perhaps done more to promote Swedish cuisine than any other person or institution.)

One of the more prosaic products sold in its stores is the 50-cent coffee mug. The selling price of the 'Bang' mug is its great draw card, resulting in over 25 million mugs sold each year. However, it must still conform with Ikea's corporate policy on offering appealing product design and quality. Further, it should be profitable in its own right, rather than a loss-leader for the sales of other goods. The Bang mug has been re-designed three times with a view at making it more profitable. The first version fit 864 mugs on a standard shipping pallet. The subsequent redesign added a small lip to the mug making it sturdier and allowing around 1,200 to be packed onto a pallet. The third redesign shortened the mug making it stouter while adding a slightly different handle. The net result was the ability to pack an astonishing 2,204 mugs onto a standard pallet, the same space that had originally accommodated only 864 mugs. In a classic vindication of Ikea's 'Don't Ship Air' policy, overall shipping costs for the mug have reduced by 60 per cent, allowing Ikea to continue to profitably offer the mug at the same price for well over two decades. (It is perhaps relevant to add that while Ikea gets the supply chain right, by many accounts it fails to do the same on the distribution side. Tales of missed and delayed deliveries are legion.)

Another example of Ikea's decisions to avoid shipping 'air' can be seen in the overhaul of its logistics practices for transporting tea-light candles. Earlier, these candles were simply bundled randomly into a plastic bag, with bags being packed into cartons and cartons onto pallets. Efforts to re-arrange the candles with more care within the plastic bag yielded immediate payoffs with the volume of each bag reducing dramatically. This meant that about 40 per cent more candles could be transported within a standard shipping container. Perversely, this now yielded a container that was too heavy to comply with weight limitations on European flatbed trucks. Ikea solved this problem by deploying 'cluster supply' methods. Instead of the candles being directly shipped from manufacturer to Ikea warehouses, the firms were now encouraged to ship to suppliers of other Ikea products with lower weight-to-volume ratios, such as furniture. In effect, the furniture suppliers also became the receivers, packers and shippers of candle products by combining these with their own deliveries of (flat-pack) beds and couches.

Source: Material adapted from Chase et al. (2008) and EIA (2010).

- The study presents a strong case for a Central Transport Co-ordinating Agency, responsible for planning, monitoring and selective regulation of policies related to the development of the integrated transport system.

RECOGNITION OF MODE-SPECIFIC CHARACTERISTICS

Marginal unit costs for transport on the various modes will reflect several mode-specific characteristics. Acknowledgment and exploitation of these characteristics ensures that each commodity is transported on the most suited mode at every stage of the journey. For example, fixed costs are higher in the railways and so exhibit more dramatic increasing returns to throughput. Road transport proves nimblest at carrying small loads over short distances to easily accessible as well as remote destinations at relatively low total costs.

Costs at constant speeds—discounting for required accelerations and decelerations, are lower for shipping than for other means of transport. Together with the absence of corridor congestion—coastal shipping capacities are only constrained by the availability of ships and the efficiency of ports—this implies that shipping can be more efficient than even rail along coastal routes, and especially for time-insensitive cargo, especially if the costs of transhipment at the ports are minimal.

To fully exploit a transport mode, its weaknesses must be accommodated. Rail and shipping both ben-

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Box 4.6
The Criticality of Logistics Costs

Transport and logistics costs most often pose a barrier at least as large, and frequently larger, than tariffs. In fact, trade is affected more by the cost of transport than by the tariffs. A 2008 WTO report, Trade in a Globalising World, explains that spending on shipping for world imports in 2004 was three times higher than spending on tariffs.

The logistics costs in India are estimated to account for 12-13 per cent of GDP. In the United States, these costs vary between 8.5-9 per cent of GDP. A reduction in logistics costs by one per cent would yield an annual saving of $5 billion for Indian economy.

If the logistics costs are brought down to the levels that prevail in the United States, this would result in about 4 per cent reduction in prices of Indian goods making them more competitive globally. At the same time, this reduction in costs would mean large reduction in inventories, and consequently in working capital.

Source: Asian Institute of Transport Development: Regional Seminar on Intermodal Logistics, 2007

Box 4.7
Indicators of Performance of Logistics Services

The performance of logistics services can be gauged by the following indicators, that are somewhat specialised to the use of international maritime shipping for mainline transport. Analogous indicators can be easily drawn up for rail or road as the main transport mode in an intermodal chain.

1. Timeliness
    - Total time for trade-related procedures
    - Customs inspection clearance time
    - Technical control clearance time
    - Time for trade document procedures
    - Inland transport time
    - Verification of container security
    - Vessel turnaround times
    - Vessel waiting times to obtain berths
    - Time to resolve customs appeals
2. Cost
    - Total cost for trade-related procedures
    - Port- and terminal-related charges
    - Total cost for trade document procedures
    - Border control costs
    - Inland transport costs
    - Additional costs to verify container security
3. Complexity and risk
    - Total number of documents per trade transaction
    - Criteria for customs inspection
    - Percentage of containers inspected
    - Level of customs inspected
    - Damage or pilferage as percentage of values of container
    - Shutdown of port due to natural disaster and labour dispute (days)
    - Whether the port is a signatory to customer security initiative
    - Percentage of containers electronically scanned
    - Percentage of containers physically inspected
    - Speed of inland transport

Source: World Bank (2005) and Planning Commission (2010)

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efit from a more flexible and extensive road network that ensures last-mile and intermediate connectivity. The obvious limitation is that transfers between these modes must be efficient.

Finally, consideration of mode-specific characteristics must also reflect their differential environmental impacts, energy intensities and lifecycle costs[21]. The energy intensity of different transport modes is influenced by the terrain traversed, choice of locomotive power, efficiency of deployed engines and the care with which they are maintained, amongst many others. This important element of the decision process for deciding on the optimal modal mix thus needs to be carefully pieced together, again in the context of actual and planned traffic movements by commodity. Further, given the scarcity of energy, there is cause to weight this criterion more heavily in the decision-making exercise.

IDENTIFYING DISTORTIONS AND THE ROLE OF PRICE AS A RESTORATIVE MEASURE

The unit costs of freight transport are not indicative of the true marginal costs of transport, given the common observation that the transport sector in India is rife with market failures. As elsewhere, these market failures are the result of positive and negative externalities of transport demand and supply, of the networked nature of transport infrastructure which necessitates high upfront costs and so promotes monopolies, and due to characteristics that render transport at least a partial public good in the strict economic sense[22]. However, government policies have either not adequately addressed these market failures, or have presented solutions that have exacerbated the problems. Several examples of these distortions are discussed in the last section of Chapter 2, Volume II, of this report, and we only summarise these here:

- New capital works have generally been favoured over proper maintenance and repair. This has resulted in a mismatch between the actual and rated capacities of the mode.
- Network enhancements have been alltoofrequently driven by political rather than business or even social welfare considerations, resulting in haphazard and inefficient route expansion.
- Improved accessibility and transport links to remote or uneconomic locations have been based on decisions clouded by popular demand for a particular transport mode rather than by sound economics.
- Differing tax regimes across the states exacerbate inter-state border formalities and inefficient geographical arbitrage in production and distribution locations.

To fully exploit a transport mode, its weaknesses must be accommodated. Rail and shipping both benefit from a more flexible and extensive road network that ensures last-mile and intermediate connectivity. And transfers between these modes must be efficient.

Finally, a complex web of subsidies, tariffs and taxation policies applies to transport in India[23]. Adjusting the pricing of transportation is a standard tool for redistribution policy. These highly managed prices are not informative for making market decisions and for influencing modechoice. Examples of the deleterious impact of these policies abound:

- More vehicle-kilometres are driven than they would be if motor fuels were priced at market
- Demand has skyrocketed for diesel vehicles, with severe environmental implications, given the generally high-sulphur diesel fuel available in India
- Freight tariffs cross-subsidise rail passenger fares, distorting both markets
- Taxes on aviation fuel and services are only loosely tied to economic fundamentals or any market characteristics that they are intended to correct

In short, prices are rarely indicative of the full marginal social costs incurred, thereby creating a role for the State to play a decisive role in determining the prices and the quantity and quality of transport infrastructure and services through appropriate policy measures. These policies and the resulting prices influence the selection of choice of mode of transport and the particular technologies deployed within a mode. However, this is not to say that the sound economic prescription is for the state to determine prices independently of the fundamentals that drive the transportation market. Instead, the main objective of transport policy may be restated as the creation of the appropriate technical and economic conditions so that each mode of transport is employed and priced within the system in a manner determined by its resource cost advantage.

OTHER POLICIES TO AID INTEGRATED TRANSPORT STRATEGY

India's transport network is best viewed as a 'network of networks' that can be classified based on (a) network standards and technology, (b) geographical hierarchy, and (c) mode choice. Each of these classifications yields useful insight into what makes a good network, and the policies required to support this.

21. Lifecycle costs are considered more fully in Chapter 7, Volume II.
22. Transport networks exhibit increasing returns to scale and cost structures comprising massively front-loaded construction expenditures and near-zero marginal costs, implying that natural monopolies are the most efficient market structures. (Air and maritime ports function as standalone nodes and, depending on market structure, may not always be best characterised by natural monopolies.)
23. See Chapter on Fiscal Issues (Chapter 9) in this volume.

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Table 4. 2
The World's Top Trade Lanes

A: TOP TRADE LANES IN TERMS OF VALUE OF GOODS CARRIED, $ BILLION (AIR AND OCEAN) 2009			B: TOP TRADE LANES IN TERMS OF VALUE OF GOODS CARRIED, $ BILLION (AIR AND OCEAN) 2030		
1	China-USA	291	1	China-USA	594
2	China-Japan	208	2	China-Japan	337
3	Japan-USA	147	3	China-Korea	281
4	China-Korea	141	4	China-India	264
5	Germany-USA	119	5	China-Germany	201
6	Germany-UK	113	6	Japan-USA	190
7	China-Germany	102	7	China-Singapore	178
8	UK-USA	98	8	China-Indonesia	170
9	Japan-Korea	70	9	Germany-USA	167
10	UK-Netherlands	68	10	China-Malaysia	162
11	Korea-USA	66	11	China-West Africa	151
12	UK-France	63	12	Germany-UK	144
13	Hong Kong-USA	58	13	UK-USA	144
14	China-Singapore	56	14	China-Thailand	141
15	France-USA	55	15	China-Brazil	136
16	China-Australia	54	16	India-USA	125
17	Netherlands-USA	52	17	China-UK	121
18	Japan-Hong Kong	46	18	China-UAE	120
19	China-Netherlands	44	19	India-Netherlands	119
20	UK-Belgium	43	20	India-Singapore	116

Source: Calculations by DHL based on data from Roland Berger Consulting, and estimates of growth of bilateral trade.

Transport network standards apply in a physical sense, e.g., narrow, metre or broad gauge railway; and also as a matter of policy, e.g., trucking permits for carriage of freight in a state. Differential standards along various parts of a network must walk a fine line between being fit for the purpose at hand and supporting overall network functionality. For example, it is not feasible for all roads to be of a single uniform width. But equally, the standards that apply to rural roads, and State and National Highways, must agree for the smooth performance of the overall road network. Clear and stable network standards reduce operational uncertainty and transaction costs, and so raise the productive efficiencies of transport services that are deployed on the network. Transport standards can also include the use of new technologies such as common databases to track and trace shipments, or containers that aggregate and standardise the movement of diverse objects. Networks that span various geographies local, regional, national and international should be mutually coherent in terms of the specifications and standards employed.

Next, issues related to intermodal connectivity reign supreme and comprise a theme that is developed in much detail in the next section of this chapter. Each type of transport network and mode has strengths and weaknesses. Weaknesses are minimised and the usefulness of each transport mode maximised when it is possible to switch between modes seamlessly and at low cost. To note useful examples in the Indian context: rail efficiency and usefulness increases when coal can be transported via truck on good roads from pithead to railhead, and thence on a standardised gauge track to a power plant. Logistics on the best highway network can fall prey to interstate border formalities and idiosyncratic permit and tolling protocols that prevail on different parts of the network.

SUMMARY

To summarise, the prescription for achieving an integrated transport strategy as defined earlier proceeds as follows: (a) establish traffic flows and unit transportation costs across the various modes for the various commodities; (b) identify existing distortions in the market for transport; (c) identify other government development and distribution priorities and the role of transport in these matters; (d) use these facts to arrive at the desired optimal

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modal mix; (e) install sufficient capacity and maintain both old and new infrastructure to ensure that no mismatch between actual and rated capacities; (f) use economically sensible pricing policies that are determined either by the market or by independent tariff-setting authorities to encourage a mode-choice driven by efficient markets; (g) install nodal infrastructure and promote technologies that reduce the costs of mode- and gauge-transfer.

LOGISTICS AND INTEGRATED TRANSPORT

Given a list of cities and the distances between these cities, what is the shortest route between them that would visit each city exactly once, before returning to the origin? This simple question, known as the 'travelling salesman' problem, is difficult enough to have withstood the combined assault of mathematicians and computers for the better part of a century. It is one of the six remaining 'Millennium Problems' with the solution carrying a prize of $1 million. It is also the fundamental problem that the modern logistics industry attempts to solve everyday: how does one ensure that the hundreds of components in a supply chain are exactly where they need to be at a specified time at the lowest possible cost? And though proof of the shortest route that the salesman must take remains a mathematical quandary in the general case, operations research has done exceptionally well in identifying heuristics and writing software to develop practical solutions to this fundamental problem of logistics.

These solutions have been so successful that the past three decades have seen massive overhauls in supply chains and business practices. As a rough approximation of the contemporary business standard, firms no longer give exceptional thought to locating their factories near customers or suppliers to simplify transport requirements and minimise costs. Instead, they seek to partner with desired suppliers and logistics providers the world over to manage product assembly, product quality, inventory and distribution. Modern logistics has redrawn the transport map of the world in favour of extremely high-volume land and sea transport corridors, and built enormous interchange complexes catering to varied transport modes and providing complex warehousing facilities for many industries and commodities.

The term 'logistics' is somewhat slippery to pin down exactly. Its origins lie in the French military practices of organising troop movements and maintaining supply links with deployed battalions. In modern business practice, a leading industry body defines logistics as 'that part of the supply chain management that plans, implements, and controls the effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements'. Various other textbook definitions tinker with this at the margin, but the broad agreement is that logistics deals with the careful management in time and space of the movement of components and resources with respect to a larger business agenda.

Logistics differs from transport insofar as the former is an elemental part of the production process, while the latter is merely a matter of distribution of material or finished product.

The six operational objectives of a logistics system have been described as (a) rapid response based on anticipated need, and supported by flexible and robust technology and transport systems; (b) minimum variance to ensure certainty of delivery in time and space; (c) minimised inventory to reduce storage costs; (d) movement consolidation to reduce transport costs; (e) product quality; and (f) support for life-cycle activities such as returns, repairs and disposal.

As such, in the context of the movement of goods, logistics differs from transport insofar as the former is an elemental part of the production process, while the latter is 'merely' a matter of the distribution of raw material or finished product. In short, effective logistics can make a 'better' product, whether measured by quality or cost. Meanwhile, effective transport can only ensure that said raw material or product is actually made available at a desired location.

Logistics costs to the economy are variously estimated at around 9 per cent of GDP for the United States through to approximately 11 per cent for Japan, 12 per cent for France and Korea, and 18 per cent for China[24]. Cost estimates for India do not appear to be as robustly calculated, and various studies have provided a range of 12 to 15 per cent of GDP[25]. The high level of coordination required between the many fragmented and specialised participants in the logistics industry in India is sometimes cited as a cause for the relatively high proportion of logistics expenditure in GDP. In one panel study, it is noted that a 0.5 per cent decrease in logistics costs (relative to GDP) leads to a 2 per cent increase in trade and a 40 per cent increase in the range of products that are exported out of a country[26].

24. International Transport Forum (2012) and Sanyal (2006). China's relatively high share of logistics spend in GDP can be explained by the facts that (a) the share of the service sector in the economy is lower relative to India's (b) a large expanse of terrain is dominated by deserts and mountains; and (c) with the bulk of the population centres and growth centres located on the East Coast or in Eastern China, the nature of West to East flows (mainly bulk goods) is very different from that of East to West flows (mainly consumer goods). This requires the use of different trucking technologies and also results in many containers returning to their origins unladen. See Gupta et al. (2010).
25. Essential questions on whether firms choose to outsource logistics functions and warehousing will affect the accounting of logistics costs.
26. World Bank (2007).

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Table 4.3
Logistics Performance Index
[Top Ranked Countries]

THE TOP 10 PERFORMERS ON THE 2012 LPI						
	2012		2010		2007	
COUNTRY	LPI RANK	LPI SCORE	LPI RANK	LPI SCORE	LPI RANK	LPI SCORE
Singapore	1	4.13	2	4.09	1	4.19
Hong Kong, China	2	4.12	13	3.88	8	4.00
Finland	3	4.05	12	3.89	15	3.82
Germany	4	4.03	1	4.11	3	4.10
Netherlands	5	4.02	4	4.07	2	4.18
Denmark	6	4.02	16	3.85	13	3.86
Belgium	7	3.98	9	3.94	12	3.89
Japan	8	3.93	7	3.97	6	4.02
United States	9	3.93	15	3.86	14	3.84
United Kingdom	10	3.90	8	3.95	9	3.99

Source: Logistics Performance Index Results (2012).

That said, it should be noted that measuring logistics costs is fraught with difficulty and that international comparisons may not be entirely robust. Broadly, however, studies on logistics costs focus on the following areas: (a) customer service including parts and service support and the handling of returns; (b) transport costs and warehousing including storage and site selection; (c) inventory management including packaging and reverse logistics; (d) lot-quantity costs including materials handling and procurement; (e) order processing costs and (f) information systems costs including those related to communication, forecasting and planning[27]. These cost headlines also provide an excellent summary of the scale and scope of the modern logistics industry in shaping business practices.

The remainder of this section looks at the state of the logistics sectors in India and internationally. Briefly, these sections show that relative to international counterparts the Indian logistics sector demonstrates a lack of scale, scope, flexibility and dynamism, and exhibits a yawning urban-rural divide. The performance of the sector is hampered by restrictive regulation, poor mainline infrastructure, inefficient inter-modal transfers of freight, fragmented industrial organisation, and skill shortages amongst several other factors. The application of an integrated strategy for transport infrastructure development should ameliorate many of these deficiencies by creating a dynamic intermodal transport system. The final sub-section of the report identifies the components of this strategy and their expected effects.

THE INTERNATIONAL LOGISTICS LANDSCAPE

HIGHLIGHTS FROM THE STATE OF THE ART

The city of Louisville (population c. 750,000) in the state of Kentucky in the United States has two disproportionate claims to fame. It is home to the Kentucky Derby, country's most famous horse race, and perhaps its most watched two minutes of sporting activity each year. Its airport is also home to the WorldPort, the centralised sorting facility of the United Parcel Service of America (or UPS) that is the second largest provider of logistics services in the United States. Together with Federal Express's (FedEx) global sorting facility at Memphis, Tennessee, called the SuperHub, these two logistics giants deliver over seven billion packages every year, more than one for every person on the planet, for combined net revenues of around $100bn.

The sorting facilities at Louisville and Memphis are modern-day marvels[28]. Between 11 pm and 4 am every night, the WorldPort and the SuperHub transform into the two busiest airports in the world, with around 200 aircraft movements each. At peak times of the year,

27. Lambert et al. (2006).
28. The location of these processing facilities is not accidental. Both Louisville and Memphis airports are in central United States, about two hours' flying time from most major population centres. There is a ready pool of labour to staff these facilities, and the airports are largely free of adverse weather for much of the year.

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Table 4. 4
Domestic Logistics Performance: Time and Cost

	EXPORT TIME AND COST						IMPORT TIME AND COST					
	PORT & AIRPORT SUPPLY CHAIN			LAND SUPPLY CHAIN			PORT & AIRPORT SUPPLY CHAIN			LAND SUPPLY CHAIN		
	DISTANCE (KM)	LEAD (DAYS)	COST ($)	DISTANCE (KM)	LEAD (DAYS)	COST ($)	DISTANCE (KM)	LEAD (DAYS)	COST ($)	DISTANCE (KM)	LEAD (DAYS)	COST ($)
Germany	150	1	1,500	868	5	1,784	150	1	1,500	483	4	1,145
US	206	2	680	346	3	745	126	2	603	273	3	729
South Korea	300	2	572	300	3	500	300	3	707	300	3	500
Brazil	150	2	612	83	3	439	150	2	274	150	5	750
Malaysia	73	3	285	172	2	298	84	2	285	105	2	298
China	162	3	454	215	3	645	133	4	353	171	3	637
South Africa	364	2	1,861	553	3	1,442	320	3	2,000	474	4	1,732
India	626	3	918	197	3	1,043	375	3	1,097	241	4	921

Source: Logistics Performance Index, World Bank (2012).

Table 4. 5
Domestic Logistics Performance: Procedures

	PERCENTAGE OF SHIPMENTS MEETING QUALITY CRITERIA	NUMBER OF IMPORT-CLEARANCE AGENCIES	NUMBER OF EXPORT-CLEARANCE AGENCIES	NUMBER OF FORMS: IMPORTS	NUMBER OF FORMS: EXPORTS	CLEARANCE TIME (DAYS) WITHOUT PHYSICAL INSPECTION	CLEARANCE TIME (DAYS) WITH PHYSICAL INSPECTION	PERCENTAGE OF IMPORTS PHYSICALLY INSPECTED	PERCENTAGE OF IMPORTS WITH MULTIPLE PHYSICAL INSPECTIONS
Germany	80	1	1	2	2	0	1	3	2
US	93	3	2	4	2	1	3	7	3
South Korea	97	1	1	2	1	1	1	3	1
Brazil	70	3	3	2	3	2	5	6	2
Malaysia	71	2	3	2	2	1	1	6	3
China	69	3	3	6	5	2	4	17	5
South Africa	89	2	2	2	2	1	2	5	2
India	59	3	3	6	5	2	4	35	16

Source: Logistics Performance Index, World Bank (2012).

airplanes takeoff and land every 45 seconds, each disgorging thousands of parcels containing documents, pharmaceuticals, internet shopping, human hearts, and thoroughbred cars and horses. Arriving planes are offloaded in around 20 to 30 minutes, before being refuelled and laden with cargo for a subsequent destination. The packages that these planes carry are sorted at the rate of around 400,000 per hour before being re-routed on dozens of kilometres of conveyor belts to their onward aircraft. In the time that they enter and leave the facility, any given package will be automatically scanned some 20 times. More than 99 per cent of these are delivered on time, regardless of weather, distance, or the size of package[29].

As measured by the number of aircraft in its fleet, FedEx may be considered the world's largest airline. This fleet of 684 jets serves nearly every country on the map almost every day of the week. It employs 290,000 people and maintains a fleet of 75,000 trucks for overland transportation and final delivery. US Customs and border protection agents are based at the SuperHub clearing cargo arriving from other countries.

As impressive as this nocturnal picture of packages, conveyor belts and aircraft that power global trade is, it remains only half the story. Over the past decade, both firms have dedicated increasing resources towards remodelling themselves as fourth-party logistics suppliers. UPS and FedEx will no longer just deliver packages for a firm, but they will also assemble a bespoke order, organise returns and refunds, and provide customer service. For

29. Schactman (2012).

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Box 4.8
Integration of Logistics Services

One of the major weaknesses of transport infrastructure in our country has been the mismatch at the interfaces of the various modes. As a result, the system, despite upgradation in some segments, continues to operate at sub-optimal levels. For example, while size of the container ships has substantially increased, corresponding facilities for evacuation of the containers from the ports have not kept pace. It is, therefore, essential to plan in an integrated manner across the entire movement chain.

A recent development in the transport sector has been that of extending traditional service boundaries. For example, railways are combining with the port terminals to establish a unified movement chain. Ocean carriers are integrating into ports, inland terminals and landside transport links. At the same time, multimodal operators are increasingly integrating into the reverse of this chain. This vertical integration may lead to emergence of monopolies which are inherently inefficient. A regulatory oversight is therefore called for.

Source: Asian Institute of Transport Development, Regional Seminar on Intermodal Logistics, 2007.

example, all mobile phones imported into the United States by Sprint, a major telecommunications provider, are carried by UPS aircraft from factories in Asia, stored at UPS facilities in Louisville before being assembled by UPS staff into orders for individual stores. Sprint has devolved the management of its supply chain almost completely to UPS, allowing it to focus on the core business of selling mobile phone service.

These massive logistics facilities have attracted other business to the area, businesses that have located nearby solely for immediate access to the most sophisticated logistics in the world. For example, some biotechnology firms market products with an extremely narrow range of tolerance on temperature, moisture and external contamination. The repeated scanning of each package ensures that both manufacturer and end-user are always aware of the integrity of the product and whether it was handled appropriately during transit or is no longer fit for use. Several of these firms have chosen to locate their entire production facilities in the vicinity of the WorldPort and the SuperHub so that they may rely on the bespoke logistics provided by UPS and FedEx. Because of the concentration of biotechnology firms in the region, the US Food and Drug Administration has also chosen to deploy a dedicated team to inspect local facilities. This reduces certification and compliance costs, causing other biotechnology firms to seek to relocate to this area.

Modern technology and operations research have played a similar role in improving efficiencies at the world's largest container ports. The standard shipping pallet and container are themselves humble technological marvels. Ships stacked with as many as 12,000 containers are offloaded and reloaded by giant automatic overhead cranes. The unloading and loading sequences, often undertaken simultaneously for greater speed, are determined by sophisticated software. The software guides automatic vehicles along routes selected for the greatest efficiency. The vehicles move containers from shipside cranes to another set of cranes which stack them depending upon when and how they are scheduled to be loaded onto trucks and trains for onward carriage. Meanwhile, the shipside cranes reload the ship in stacks seven-high with each placed precisely in a pre-determined location for easier unloading at the destination port. Each of these technologies helps to reduce the amount of time that ships spend in port, shortening the distribution cycle and reducing costs.

As with FedEx and UPS, the largest shipping lines such as AP Moeller-Maersk and CGA CGM are diversifying from merely providing transport services to also playing an active role in working with manufacturing companies in planning their supply chains and distribution networks. Business practices at terminals operated by these firms have resulted in substantially shorter transportation times even as vessel steaming speeds have generally slowed over the past decade to aid greater fuel efficiencies. These shorter—and crucially, more predictable—times have combined with newer technologies to allow goods to be made in regions with the greatest comparative advantages and subsequently permitted more extensive distribution channels.

THE STATE AND FUTURE OF THE GLOBAL INDUSTRY[30]

In a reflection of the integration of economies and production systems, global logistics expenditure is expected to near $2.9 tn by 2015[31]. As

30. A substantial portion of this survey is based on a paper provided by DHL India to the NTDPC.
31. Based on calculations by DHL on Datamonitor Global Logistics Industry data and trends in regional logistics expenditure. Does not include spending on bulk carrier and tanker shipments.

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Box 4. 9
Load Exchanges

Load exchanges are popular in many countries. For example, in the United Kingdom, the Haulage Exchange allows couriers, truckers and other transporters to post details of available capacity or freight requirements. Details on sizes, dates and the nature of the goods to be shipped are also entered. Software automatically matches available capacities with loads awaiting shipment, alerting both trucker and shipper, and then allowing them to negotiate on the actual terms. The use of such exchanges reduces the incidence of empty return loads, lowers costs and increases revenues, decreases fuel use, and is an environmentally sound practice. The exchanges essentially serve as the marketplace by aggregating and disseminating information. More recently, some exchanges have expanded to include information on runs that are scheduled in advance, allowing firms booking space on the vehicles to better plan their transportation requirements in advance.

The exchanges also serve other functions that help rationalise the industry. By building cross-platform software systems, they make information dissemination easier, and encourage firms to collaborate profitably. The exchanges lower the barriers to entry to the market by making it possible for new firms to seek more customers, and to make runs with smaller loads. The exchange also serves as a de facto quality control over the member firms, which is a useful function in an industry with several new or small-scale participants. In the future, it is inevitable that the software systems for the exchanges will be updated to link with GPS and other tracking information sources, allowing for increased certainty over shipments.

Source: Company websites and EIA (2010).

Table 4.2 illustrates, no bilateral trade route with India featured amongst the world's largest in 2009. By 2030, however, Indian trade routes with the United States, China, Netherlands (reflecting trade with the EU), and Singapore (reflecting trade with ASEAN region) are expected to be amongst the top 20 trade lanes in terms of value of goods shipped by air and ocean freight.

Another important conclusion to draw from Table 4.2 is that by 2030, Asia-related trade lanes are expected to account for almost 75 per cent of the value of goods traded on the top 20 busiest routes. Further, intra-Asian trade is expected to emerge as a major driver of international logistics revenues, accounting for a share 43 per cent of the value of goods shipped in the top 20 trade lanes. This suggests that India's external and internal logistics networks should be especially cognizant of the requirements of trade with other Asian countries in terms of the volumes, values and characteristics of goods traded. Air cargo is becoming increasingly a mode of choice for many exporters and importers, especially in trade routes characterised by geographically diverse supply chains. Global freight movement by air stood at 216 billion route tonne-kilometres (RTKM) in 2011, constituting a doubling over a decade, with a value of around $10.8 tn[32]. Exports that depend on critical imported intermediate components for their production, and are sensitive to changes in retail market sentiment are especially dependent on air cargo, as are products that are perishable and require time-sensitive, temperature-controlled environments. Important sectors like high-end textiles, electronics, engineering parts and components, and pharmaceuticals are dependent on air cargo for successful trade. The imported content of manufactures in these sectors is high, and exports too rely on quick access to offshore markets.

The air cargo industry comprises freight forwarders, dedicated cargo airlines, passenger airlines that supplement earnings by carrying belly cargo, and other arrangers of transport services. As compared to the express industry, generalised air cargo goods are delivered at lower speeds and lower prices by taking advantage of flexibility of resources such as by scheduling freight space on passenger aircraft as and when it becomes available. It is considered to be better suited to relatively low-value and high-volume products that must nevertheless be transported by air.

The express air industry on the other hand consists of dedicated providers of end-to-end air logistics services. The aim is to simplify and expedite the process of air transport by organising collections, usually arranging transport on its own aircraft, handling customs clearances as well as the payment of duties and taxes, as required. Value-added express services are also available, such as the ability to track shipments and by offering proof of final delivery. The express industry therefore requires access to airside

32. Estimated by DHL and based on Boeing World Air Cargo Forecast 2011 estimates of share of air cargo in total freight movement, and world merchandise trade figures available in the World Bank Development Indicators database.

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In India, many more clearance forms are required to import a shipment than other countries, and a substantially higher share of all shiments are subject to at least one, and sometimes several, inspections. These bureaucratic hurdles need reduction.

facilities to meet the global standards of speed and reliability for goods that are typically higher-value and more time-sensitive than those shipped by generalised air cargo.

EVALUATING THE LOGISTICS INDUSTRY AROUND THE WORLD AND MAJOR GLOBAL ISSUES

The World Bank's Logistics Performance Index (LPI) contends that a country's logistics performance is strongly reflected in the reliability of its 'supply chains and the predictability of service delivery available to producers and exporters. Supply chains only as strong as their weakest links are becoming more and more complex, often spanning many countries while remaining critical to national competitiveness.' This publication, issued every two years since 2007, has become the standard tool for measuring the pervasiveness and resilience of these modern supply chains as measured by delivery time, cost, flexibility and reliability. It is intended to be a single indicator that evaluates the contributions that government services, investments and policies make to the extant state of the logistics industry. It measures the efficiency of the border clearance process in terms of its speed, simplicity and predictability; the quality of transport infrastructure; the ease of arranging competitively priced shipments; the competence and quality of logistics services; the ability to track and trace consignments; and the frequency with which shipments reach the consignee within the scheduled or expected delivery time[33].

India ranked 46th in 2012, and the highest amongst a peer group of middle-income countries which include the Philippines, Indonesia and the Ukraine. (See Table 4.3 for the best performers.) Indeed, it ranks higher than Mexico and performs almost as well as Brazil and Thailand, leading the authors to conclude that India is amongst the most over-performing of the non-high-income countries. The LPI's cautions in interpretation, however, would seem to particularly apply to India. Being a large and diverse country it is unlikely that there is uniformly strong logistics performance across the nation. Instead, the results are more likely to be boosted by islands of excellence with most commerce originating and terminating at the metro cities.

Throughout, whether a country is high-, middle- or low-income, the low LPI score indicates that market participants are dissatisfied with the state of transport infrastructure, and especially with rail infrastructure. Within the South Asian region, however, roads and highways are considered the dominant limiting factor to better logistics performance. Relative to the satisfaction with infrastructure, logistics service providers are generally considered to deliver better performance, no matter which country they operate in.

Table 4.4 presents data on procedural issues such as customs and border control. The LPI notes that time taken in shipment can be especially reduced at the stage when goods are presented for import clearance. Delays at this stage are associated with red tape, excessive and opaque procedural requirements, and physical inspections. As shown in Table 4.5, at least some of India's logistics performance can be explained by the facts that many more clearance forms are required to import a shipment than in other countries, and a substantially higher share of all shipments is subject to at least one, and sometimes several, inspections. Low-income countries' export clearance protocols are long and complex vis-à-vis those for imports, and relative to those in other countries. The resulting long leads reduce the international competitiveness of exports from these countries.

On the whole, the best performing regions in logistics are the OECD countries (though there is marked variation between them), and the export-oriented developing countries of East Asia. The OECD countries exhibit streamlined processes to import and export container and other traffic with much standardisation of information and communications technologies. These standardisations encourage cross-border trust and result in faster processing times. Generally, supporting infrastructure like warehousing and cold storage and intermodal transfer facilities are quickly constructed and considered central to the building of the logistics network. Meanwhile, in fast-growing East Asia the rapid expansion of exports has resulted in huge increases in port and other transport infrastructure capacity. Against this, and as expected in transition economies, the supply and distribution chains in these counties are long with many intermediaries leading to operational inefficiencies, duplication and fragmentation, suggesting further room for improvement.

33. The LPI is constructed by statistically aggregating the opinions of logistics professionals from companies responsible for moving goods around the world. Several countries have demonstrated massively better logistics industry performance over the past three editions of the LPI. For example, Morocco's ranking jumped from 113 in 2007 to 50 in 2012 on the strength of a rapidly implemented strategy that made use of the country's proximity to Europe, and by effectively harnessing private enterprise to focus on improving the procedural elements of intermodal freight transport. Meanwhile, the Index rankings have spurred South Africa, Indonesia and Malaysia into setting out national logistics strategies and reporting on the performances achieved.

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Table 4.6
Cargo Dwell-Times at Airports Around the World
[Hours]

AIRPORT	EXPORT DWELL TIME	IMPORT DWELL TIME
Singapore	6	4
Incheon	3	5
Dubai	3	4
Hong Kong	4	6
Delhi	36	129
Mumbai	48	96
Bengaluru	36	48

Source: Working Group Report on Air Cargo Logistics in India, Ministry of Civil Aviation.

THE EVOLUTION OF THE LOGISTICS INDUSTRY

In concluding this section, it is useful to provide a sketch of the evolution of the logistics industry. This is the path that governments, manufacturing firms and service providers in other countries have already beaten down, and a highly plausible one that Indian counterparts will follow as the economy develops and grows. Consequently, the following taxonomy of service provision may be helpful in understanding the extent and continuing evolution of the industry. Traditional logistics services providers arrange for transport and warehousing, with freight forwarders and courier companies being prime exemplars[34]. As experienced arrangers and coordinators of transport services, freight forwarders rationalise and organise the supply of ocean- and air-freight services on behalf of small and medium trading firms. Fragmented trading and transport industries as well as complex customs procedures and non-harmonised regulations mean that there is a continued need for mediation of type provided by freight forwarders, as is the case in India presently.

As transportation industries consolidate and modernise, as physical infrastructure is improved and expanded, and as regulatory processes are streamlined and harmonised to global standards, third-party logistics providers will supplement traditional logistics services in India. This has already happened in the developed economies. Third-party logistics providers (3PL) supplement the basic services with inventory management, packaging and labelling, product return and offer an end-to-end service. Manufacturing firms seek to outsource their logistics needs to these third-party providers to take advantage of their expertise and networks, or because they do notprocess sufficiently large volumes to justify dedicated logistics infrastructure, and to reduce the costs associated with arranging transport themselves. 3PL providers offer industry-custom supply chain solutions such as testing, inspection and reverse logistics. The end-to-end control over cargo is critical, and 3PL providers rely heavily on developing efficient processes, such as in backhaul management and route optimisation, and on harnessing technologies such as GPS and RFID[35].

With a $165 billion market, Europe is the largest regional market for 3PL, followed closely by Asia at $158 billion in second place. India is a relatively small market for 3PL, with an estimated size of $1.5 billion, or just 0.3 per cent of the world market. At around 10 per cent, 3PL penetration in India is far lower than in industrialised economies (Europe at 40 per cent; United States at 55 per cent; Japan at 90 per cent)[36]. At present, Indian firms tend to aggressively outsource domestic transportation and fleet management, given the high levels of asset specificity, and customs brokerage functions due to regulatory complexity. The practices in Indian industry reveal that warehousing, transportation, custom clearing and forwarding are the most frequently outsourced activities[37].

Finally, though a precise distinction is often unclear, some third-party logistics firms have transformed into the so-called fourth-party service providers by working closely with the manufacturing firm to devise integrated supply chain management solutions, providing consulting services to match supply with demand, and assisting with network and cost

34. The size of the freight forwarding industry in India was about $4 billion in 2006, and has since doubled to about $8 billion by 2011. It is expected to cross $13 billion by 2015. (DHL submission to the NTDPC.)
35. KPMG (2012).
36. Sahay and Mohan (2006).
37. Ibid.

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Box 4.10
Modern Terminal Facilities

When one looks back over the development of the global economy, there are three major features that stand out. One is the increasing use of technology; the second is the increasing amount of capital employed in any economic endeavour; and the third, as a result of the first two, the enormous increase in the scale of goods produced and distributed.

This has led to an ever-increasing need to transport more and more quantities and volumes of goods. Indeed, in case of mineral traffic, it is figuratively akin to 'moving the mines'. This explosion in scale has brought to the fore the critical importance of facilities for loading and unloading of goods at either end of the transport networks. Indeed more often than not, the capacity at the terminals determines the capacity on the transport columns.

All over the world, goods sheds of yesteryears have given way to new facilities often called freight centres, logistics parks, dry ports, etc. These termini are designed to perform multitude of logistics services including even that of consolidation, packaging and distribution of goods. They also act as nodes for multimodal transport and are well endowed with transport connectivity.

These developments imply a need for significant investment in scaling up of facilities and technologies at the existing and new terminals across the movement chain. It is equally necessary to include logistics parks as an essential component of the emerging economic corridors. To give fillip to the related infrastructure, there is a convincing case for granting an industry status to the logistics and warehousing sector.

Source: Asian Institute of Transport Development, Journal of Transport infrastructure, Volume 16, 2009.

optimisation[38]. The firms complete the distribution channel for firms too, by not just delivering products to customers but by also providing installation, assembly and minor repairs.

GAPS IN THE INDIAN LOGISTICS SECTOR

The current state of the logistics sector in India can be crudely characterised as largely unsophisticated, lacking in organisation, somewhat neglected by policy, and hamstrung by a shortage in skills. This is manifest in the observed inefficiencies of the sector. There are, however, significant pockets of excellence. For example, the automobile manufacturing industry and local service providers have developed transportation, inventory management and warehousing systems to rival those of the international gold standards. On the whole, a blunt appraisal of the sector's future reaches the inevitable conclusions that it is of both enormous potential and of critical importance to the nation's ambitions. This section explores the present structure of the industry as a prelude to the reforms proposed in next subsection. Detailed status reports on physical infrastructure in the form of roads, railways, ports and airports are available in Volume III of this report. Here, the focus is on industry trends, service provision and on gaps in those pieces of physical infrastructure that are dedicated for logistics purposes.

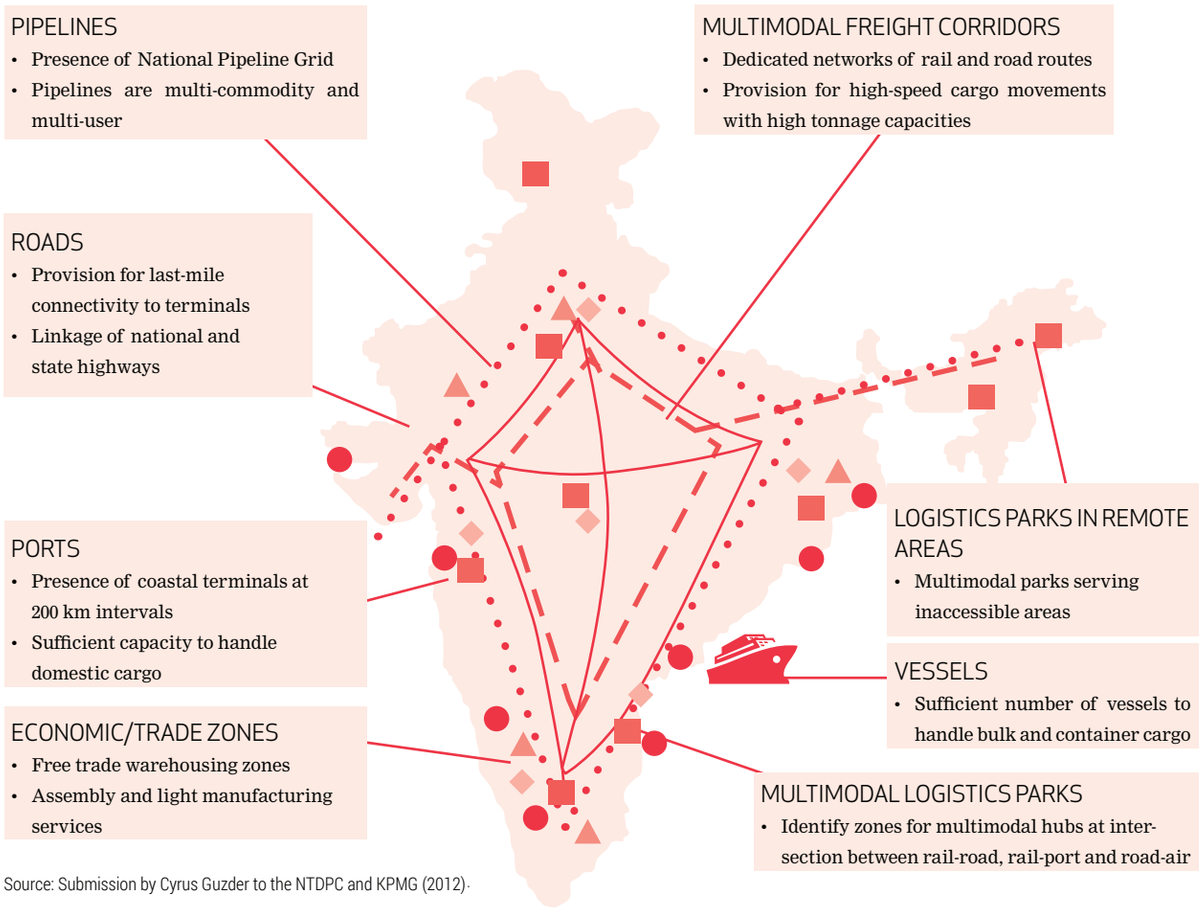
A common observation to be made of Indian logistics flows is that they are highly concentrated along certain corridors that link the largest metropolitan cities. This leads to the conclusion that transport and logistics infrastructure along these corridors should receive priority funding and development. However, it is tempered by observing that the causality is likely to run in the other direction as well. The infrastructure and availability of services along these corridors is already, though relatively, superior to that connecting with the more minor urban centers. This means that the observed concentration of traffic patterns is likely to be overstated with significant transhipment at the metropolitan cities for distribution into the wider hinterlands. This offers additional impetus for the founding of investment decisions on the basis of detailed origin-destination traffic studies as noted in the previous section.

Another common complaint related to logistics movements is the absence of last-mile links. Ports connect insufficiently well with the rail and road networks. The rail and road networks do not themselves offer efficient points of interchange for each to be harnessed to its best advantages, resulting in suboptimal energy usages and higher costs as rail's last-mile disadvantages prove debilitating. On the whole, as noted in one study on Indian logistics, the country's exports are rendered less competitive due to higher transit times and reduced reliability, and imports priced higher at the shop front, with the overall burden amounting to 4.3 per cent of GDP every year[39].

38. KPMG (2012).
39. Gupta et al. (2010).

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Figure 4.1
The Desired State of Indian Logistics Infrastructure



Source: Submission by Cyrus Guzder to the NTDPC and KPMG (2012).

With logistics services being primarily a private sector undertaking, the government's rle is largely restricted to deciding policy and providing infrastructure. Government may choose to provide this infrastructure of its own accord, in partnership with the private sector, or merely by enabling private investment. Meanwhile, as elaborated below, in nearly every sector related to logistics, the prevailing regulations are unclear, overlapping, or stifle needed efficiencies.

As for service provision by the private sector itself, logistics in India has been driven by the objective of reducing transportation costs that have been inordinately high due to regional concentration of manufacturing and warehousing, the geographic diversification of final distribution, as well as inefficiencies in infrastructure and accompanying technology. In turn, the regional concentrations have been motivated by the differential taxation and regulatory regimes of the states. Meanwhile, the reliability of services provided is considered to be low, with long fulfilment times and requiring a high degree of customer engagement, resulting in concomitant increases in the variable costs of freight transport.

THE DECLINING SHARE OF RAIL IN FREIGHT TRANSPORT

The abiding story of freight transport in India has been the steady and unceasing decline in the share of traffic carried by rail versus that transported by road. It is a well-known story (Chapter 2, Volume II). However, given that one of the most important recommendations of this report is the urgency of arresting this decline, the story is one that is worth repeating briefly. In 1951, around 90 per cent of India's freight traffic was carried by rail. Though the first decade of the new republic saw only a modest decline in rail's share, the next 20 years were less forgiving, and the gap had narrowed to a 60-40 split in favour of rail by 1981.

The decline has since accelerated. The liberalisation of the economy, the growth of markets in tier-II and tier-III cities, the expansion of trade, the dramatic increases in investment in the highway network, the subsidies extended to diesel fuel, and the discriminatory pricing of rail freight vis-à-vis passenger

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transport have all conspired to now leave rail with a roughly 30 per cent share of freight movement today. Other factors also contribute to the second-class treatment of freighted goods on Indian rails. The prioritisation of passenger traffic over freight means that the latter suffer elongated and uncertain travel times. As noted previously, the certitude of a pre-defined delivery schedule is almost as important in logistics as total transportation cost. Railways' inability to provide these guarantees results in substitution away to the higher cost but time-bound road-based alternatives.

In the absence of more flexible practice, customers usually engage point-to-point trucking services on a full-load basis. Further inefficiencies result when for short- to medium-haul distances, trucks are forced to return to base, empty.

Further, most rail terminals used for loading and unloading of freight are antiquated with limited options for accessing and evacuating cargo. There is reduced flexibility in carrying certain kinds of products[40]. The accommodation of freight on Indian railways has exhibited a marked preference for commodities that generate sufficient traffic to warrant dedicated full rakes. For higher value goods requiring transportation in lower volumes but to a more regimented schedule, Indian railways' container services have proved less attractive than they might have been.

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

INDIA'S TRUCKING INDUSTRY AND ROAD FREIGHT

The transportation of large volumes of freight Indian roads are typically done by an unorganised trucking industry. About 75 per cent of trucking firms own small fleets of less than five trucks, with only 11 per cent operating more than 20 trucks[41]. These trucks are usually all-purpose, used for transporting everything from agricultural produce to steel products to higher-value electrical items. Poor maintenance and low-quality spare parts rapidly reduce operational efficiency of trucks. Light trucks and double-axle trucks dominate the Indian trucking industry as narrow and badly maintained roads have traditionally been forgiving only of smaller and nimbler vehicles, and as regulations prohibiting the overloading of vehicles have been poorly enforced. The small vehicle sizes and rampant overloading mean that Indian trucking costs are amongst the lowest for bulk and heavy goods, but the cost for relatively lighter products—electronics, pharmaceuticals, chemicals, etc.—is substantially higher.

In the absence of more flexible practices, customers usually engage point-to-point trucking services on a full-load basis. Further inefficiencies sometimes result when for short- to medium-haul distances, trucks are forced to return to their base without a load. (See Box 4.9 for examples of how load exchanges can help eliminate empty backhauls.) There is relatively low penetration of tractor-trailer units, of flatbed trucks suitable for container carriage, and of specialised vehicles for refrigerated transport. On the whole, the industry is intensely competitive with low barriers to entry for either operator or driver, a high degree of substitutability, and significant bargaining power vested with the purchasers of trucking services. The capital required to enter the market is small, the licensing regime is not overly strict, and only basic skills and qualifications are requisite[42]. Service quality in terms of keeping to schedule and ensuring safety are not made priorities.

A few hundred logistics firms count amongst the larger fleet operators, offering an extensive network, limited transhipment at their own facilities, and limited value-added services like track-and-trace technologies. To varying degrees, these firms now offer warehousing and container rail transport, cold-chain logistics, and single-window cargo management solutions. Finally, a few industrial sectors, such as automobile manufacturing, have circumvented the limited trucking options available by operating their own fleets of dedicated transport or by working closely with more sophisticated logistics providers to develop their own supply chains and distribution strategies.

Once on the road, the rickety trucks face problems that are not limited to potholed roads or clogged highways which reduce their speeds to about a third of that achieved by developed-world counterparts. On a trans-national journey, they are stopped at multiple checkpoints for inspections, payments of tolls and taxes, octroi and so forth. It is well-acknowledged that many of these payments have no legal founding, and unjustly add to the transportation costs. The 11th Five Year Plan notes: 'Vehicles moving on interstate routes remain stationary about 40 per cent of the time in the process of being thus inspected. The World Bank has estimated that truck delays at checkpoints cost the Indian economy anywhere between

40. 'Special wagons are not easily available for carrying specialised products. For example, special types of steel required for automobile production have to be carried by trucks as the existing wagons do not offer the kind of protection that these high value products require. While customers are allowed to request for new wagon designs, the process of getting these wagon designs approved by railways is cumbersome.' Deloitte and ICC (2012).
41. CRISIL (2009).
42. KPMG (2010).

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Rs 9 billion to Rs 23 billion'[43]. These delays result in Indian trucks being used, on average, for about 60,000 to 100,000 km per year, a figure that is less than a quarter of that in developed countries.

The high degree of competition within the trucking industry places pressures on the prices charged. Margins are then recovered by cutting costs, such as by hiring drivers with suspect licenses, overloading, compromises on maintenance, each of which contributes to a high incidence of accidents and mechanical failure. Regulations on licensing, overloading and vehicle roadworthiness are ineffectually enforced, contributing to rapid deteriorations in road quality, reduced speeds, driver fatigue and accidents[44].

The high degree of competition within the trucking industry places pressures on the prices charged. Margins are then recovered by cutting costs, such as by hiring drivers with suspect licenses, overloading, and compromises on maintenance.

PORTS, COASTAL SHIPPING AND INLAND WATERWAYS

Container traffic at India's ports is the second largest but the fastest growing category of freight processed. In 2011-12, the major ports, which handle nearly all of India's container trade, loaded, unloaded or transhipped 120 million tonnes of container cargo[45]. Though container traffic has grown rapidly, the total quantities processed are still well short of international benchmarks. In processing larger quantities of container shipments, ports are hampered by many factors. First, inadequate drafts and port capacities prevent the largest container ships from calling at Indian ports[46]. Second, relatively little transhipment traffic is directed by shipping lines for processing at Indian ports. Third, poor road and rail connectivity to several ports hampers the efficient removal of all freight, but especially of containers. Fourth, the relatively small numbers and extent of inland container depots mean that much of the traffic must be cleared on-site upon landing at coastal ports. Clearance procedures for customs, security and bio-security, are slower and more involved than international standards, with physical inspections often called for, increasing cargo dwell-time at ports and raising costs. Fifth, limited availability and use of material handling equipment and the latest automation technologies at the ports also slows vessel turnaround times, reduces the certainty—and hence the usefulness—of time-bound freight movement, and also increases the time that ships must idle at sea before berths become available. Sixth, charges related to payments for container and port terminal operations, to port authorities, container freight station operators, and a host of other services are a part of the comprehensive cost burden borne by shippers to India. These costs tend to be relatively higher than comparator countries in Asia, especially when put in the context of the quality of services available. Each of these factors is explored more fully in the chapter on Ports and Shipping (Chapter 4, Volume III). Together with high prices for marine fuel (relative to that used for land-based transport which is subsidised), these factors combine to ensure less-than-desirable use of coastal shipping[47]. Finally, container traffic on inland waterways is negligible with neither barges nor docking facilities available on the major routes[48].

FREIGHT MOVEMENTS BY AIR

Indian airports currently handle 2.4 million tonnes of cargo, and are expected to handle about 7 million tonnes by 2020, representing a CAGR of 14.7 per cent[49]. Transhipment of air cargo through Indian airports is expected to become an important business. The transhipment share is assumed to become 5 per cent of total international air cargo volumes handled by Indian airports by 2015-16, and to increase by one percentage point each year thereafter over the next two decades[50].

Indian airports, including the new airports developed in Delhi, Bengaluru and Hyderabad, have not adopted the best practices for enabling express logistics. These best practices are marked by the availability of dedicated and exclusive handling facilities for express operators, including aircraft parking and transit bays adjacent to on-airport warehouses and the audited delegation of the handling processes to the express air cargo industry. In the absence of these dedicated facilities, the dwell-times for air cargo at Indian airports are substantially higher than in other countries. These high dwell-times are a direct consequence of the following infrastructural deficits: a shortage of landside truck docks, vehicle holding areas and air side operational space; insufficient entry gates; inefficient and insufficient handling equipment and trolleys; the absence of specialised storage and handling facilities for hazardous, radioactive, valuable or perishable cargo; poor quality roads that link airports to cities and the hinterland; an emphasis on physical checks on entry and exit of cargo from bonded areas at the expense of technological solutions; and finally, a lack of on-airport support services such as warehousing and packaging facilities.

43. Planning Commission (2010: 25).
44. Ibid.
45 Chapter on Ports and Shipping in Volume III of this report.
46 Recommendations for major ports in Chapter on Ports and Shipping in Volume III.
47. Present capacity estimates for container shipments along coastal routes are for around 14,000 containers per month, almost all of which is along the West Coast.
48. There is minimal traffic of around 200 containers per day on National Waterway 3 in Kerala. (See chapter on Ports and Shipping in this report.)
49. Ministry of Civil Aviation, Government of India.
50. Working Group Report on Air Cargo Logistics in India, Ministry of Civil Aviation.

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Box 4.11
Freight Facilities at Hong Kong Airport

Hong Kong International Airport (HKIA) was the world's busiest cargo airport in 2012, just holding off Memphis from the top slot. In 2012, total cargo throughput was in excess of 4 million tonnes carried on 51,000 flights, or about 140 each day. (In comparison, the total international cargo throughput of all Indian airports was around 1.2 million tonnes in 2011-12.) With Hong Kong pressed for usable real estate, it is notable that the entire airport is situated on an island that is largely reclaimed from the sea.

The Asia Airfreight Terminal is designed to handle 1.5 mn tonnes of cargo per year on 8 hectares with a gross floor area of 17,000 square metres. It is equipped with a fully automated cargo handling system with special facilities for dangerous or radioactive cargo together with specially-trained staff, and for perishable goods required cold rooms or freezers. It boasts 97 workstations for build-up and break-down operations, together with transfer vehicles, scissor lifts and cargo hoists.

Several value-added services are available at the terminal including:

- Cargo security screening to ensure compliance of shipment with air carriage security regulations;
- Re-labelling and re-packaging of bulk shipments into smaller ones or vice versa;
- Scheduled release of empty unit load devices such as pallets and containers to allow freight forwarders to better plan logistics;
- Import shipments arranged at truck docks at pre-arranged times;
- Advanced pallet and container handling systems that automatically store and retrieve from nearly 5,000 bulk cargo positions and 1,750 built-up cargo positions;
- Collection and delivery of unit-load devices (such as pallets and containers) from throughout Hong Kong.

On more than 95 per cent of all occasions, the terminal achieves stringent standards on truck queuing time (less than 30 minutes), export cargo reception (less than 15 minutes), import cargo collection (less than 30 minutes), and release of empty containers and pallets (less than 30 minutes). It achieves all of these at a mishandling rate that is about 1 in 20,000 unit-load movements.

The AAT is not the only freight facility at HKIA. The DHL Central Asia hub is capable of processing up to 30,000 packages and 40,000 pieces of mail every hour on a total land area of 3.5 hectares. Hong Kong Air Cargo Terminals with a design capacity of 2.6 mn tonnes of cargo per year, occupy 17 hectares, with direct connections to other urban conurbations in the Pearl River Delta. Further, there are air mail centres run by Hong Kong Post, dedicated cargo terminals run by Cathay Pacific and other airlines, a marine cargo terminal that provides one-stop multimodal service links with 18 ports in the Pearl River Delta.

By 2030, HKIA expects to process nearly 9 million tonnes of cargo, and its latest master plan already argues for the construction of a third runway and expansion of the airport island.

Source: DGCA, Hong Kong Airport and facility websites.

On the procedural front, the following regulatory shortfalls can be identified. The important agencies that regulate trade in food, drugs, chemicals, biological matter and textiles do not have dedicated facilities or laboratories at airports in most cases. Staffing at these agencies has not kept pace with the volumes and varieties of products now traded that must be inspected. Next, operators of cargo terminals must maintain separate licenses for handling areas that process inbound or outbound cargo, and for transhipment cargo. Customs clearances are not available around-the-clock or on demand, and the pricing model for these services imposes high threshold costs on air cargo operators, discouraging volume efficiencies.

WAREHOUSING

Until a decade ago, warehousing in India was synonymous with basic four-walled structures with sub-optimal sizes, inadequate ventilation and lighting, poor hygiene conditions, and marked by the absence of racking, inventory management, or technology solutions[51]. By one estimate, 433 million square feet of warehouse space existed in India in 2009. Of this,

51. KPMG (2010).

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only 8 per cent was organised with nearly 30 per cent under direct public administration and 44 per cent under in-house private management.

These warehouses are of poor quality and inadequate for meeting the specialised needs of modern manufactured products and business processes. The large majority of publicly administered warehouses are used for long-term storage of food, and to fulfil shorter-term requirements for public distribution schemes for grain. The absence of cold-storage facilities, and especially ones that are integrated along the food supply chain, together with insufficient protection from pests, thefts and the elements results in an enormous amount of stored grain that is lost or spoiled. With a renewed focus on ensuring food security as the marquee development priority, India can ill-afford this continuing wastage. The absence of scale in the warehousing industry prohibits both the cost-effective adoption of new technologies resulting in lower productivity, and the provision of value-added services like specialised packaging and temperature-controlled environments at competitive prices. Further, the absence of enforceable and enforced quality standards and benchmarks in creating new facilities, hampers efficiency.

Finally, differential retail and consumption tax rates across the states prevent warehouses to be located optimally from a supply-chain perspective; instead, the warehouses often migrate to the lowest-tax jurisdictions. The mandates wielded by various regulatory authorities over warehousing are often in conflict, and the regulations themselves require clarification. For example, the rules related to the storage and handling of pharmaceutical products are governed by Schedule M of the Central Drugs and Cosmetics Act of 1945 (with amendments in 2010), while the norms that define compliance with these regulations are designed by state-level food and drug administrations. In most states, such norms insist on physical separation of inventory, not by product, but by client (i.e., by pharmaceutical producer or distributor), with separate security and personnel for every client. Essentially, this entails the setting up of several separate smaller warehouses within a larger warehouse. In turn, this results in some logically perverse outcomes: the same class of pharmaceuticals requiring the same temperature controls but manufactured by different firms must nevertheless be maintained in distinct storage areas; product-specific skills and management is discouraged and separate personnel must be maintained for the same class of products preventing scale economies from developing.

Differential retail and consumption tax rates across states prevent warehouses to be located optimally from a supply-chain perspective; instead warehouses often migrate to the lowest-tax jurisdiction.

THE FUTURE OF INDIAN LOGISTICS

India's growth ambitions require supportive logistics policies and service environments as essential enabling factors. In the near term, the driving factors for the anticipated growth in logistics can be found in forecasts of growth in international trade and interstate commerce (Chapters 2 and 3, Volume II). In the more distant future, the expected growth in logistics can be hung on the long-term secular themes defined in the first section of this chapter.

THE FUNDAMENTAL DRIVERS

Perhaps the most important amongst these is the country's changing demographic profile with the attendant urbanisation, industrialisation, and concentration of industry. It is anticipated that over 60 per cent of India's urban population will be concentrated in 20-25 urban clusters by 2030[52]. Urbanisation and clustering will also lead to the development of specialised industrial agglomerations and satellite cities to serve these clusters. The clusters will need dedicated freight corridors such as the Delhi-Mumbai Industrial Corridor currently under development with high-speed connectivity to key ports and urban centres. These corridors and access routes will help to keep the cost of supplying goods and services to these urban centres low or manageable. In pratical terms, establishing the desired logistics strategy to accommodate this urbanisation trend will involve (a) identification of existing, evolving and planned urban centres; (b) identification of sites for a clustering of warehousing and storage facilities to service these hubs; (c) creation of dedicated cargo routes for speedy access of supplies into local wholesale markets and (d) use of intra-city transportation for supply to retailers.

At the same time, the logistics industry and infrastructure will also have to keep pace with the increasing sophistication of manufacturing processes and outputs which will require their own dedicated logistics systems. Existing infrastructure will become obsolete as international standards are introduced in a competitive service-oriented environment. For example, existing, small 'godowns' will need to be replaced by larger, modern warehouses incorporating global standards such as taller designs, modular racking systems, palletisation and the usage of automation and information technology. The growth of specialised industries will necessitate value-added

52. KPMG (2012). The report of the Working Group on Logistics from the Planning Commission suggests the following 15 locations as suitable for situating logistics parks: Ludhiana, Rewari, Mumbai, Kolkata, Chennai, Bengaluru, Kishangarh, Ahmedabad, Hajira, Vadodara, Vapi, Durgapur, Nagpur, Hyderabad, Sriperumbudur.

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services, such as cold chain warehousing, packaging and track-and-trace services. In short, the new profile of domestic and international trade will require commodity- and geography-specific storage and transportation assets. The non-availability of such required assets will hinder the investment potential of trade in other parts of the economy.

As noted earlier, India's logistics sector is currently constrained not only by insufficient or inadequate infrastructure, but perhaps even more so by the misuse of transportation modes for the wrong type of commodity and limits on the free use of transportation modes in others. At present, raw materials form the bulk of cargo movements in India (around 60 per cent), but have a relatively low value per unit of volume. These need to be moved from point-to-point over long distances. The movement of raw materials entails effective handling at logistics terminals and seamless multi-modal transportation, such as the movement of coal by coastal shipping, rail and road. For these goods, the importance of timely delivery is superseded by the requirements of ensuring low costs and secure shipments. On the other hand, capital goods and goods used for manufacturing have a moderate value per unit volume, and consumption is often concentrated in and around urban clusters. The goods are shipped over medium distances and transportation priorities are efficient, on-time delivery, together with the possibility of tracking shipments and the use of specialised vehicles or carriers. Finally, consumer goods account for a relatively small proportion of cargo volumes, but have a high value per unit of volume. These need to be moved over short distances and require high degrees of customisation in terms of transportation modes and in terms of storage and transportation assets based on the characteristics of the cargo. The timeliness and reliability of movements take precedence over maximisation of transport asset utilisation.

The desired 'end state' is an overlay of transport networks, with natural transition nodes where quantities are aggregated and disaggregated for more efficient transport on the best mode for a commodity for a particular stage of the journey

The volumes for all of these classes of goods will grow, with the transport of bulk goods achieving such critical importance that it is addressed separately in Chapter 8, Volume II. The optimal movement of freight by matching of cargo category with transportation mode will be crucial in a scenario of expanding volumes across categories. Lopsided utilisation of transportation infrastructure such as road and rail, as is the case currently, stresses networks in addition to inflating costs and turnaround times. A need exists to incentivise optimal selection of modes to reduce congestion and enable smooth movement of cargo. The government also has a normative and prescriptive role to play; for example, by directing that bulk goods only be moved by rail, coastal shipping and inland waterways.

THE DESIRED END STATE

The desired 'end state' is an overlay of transportation networks, allowing for the efficient transportation of each commodity type as well as natural transition nodes where quantities are aggregated and disaggregated for more efficient transport on the best mode and gauge for a particular stage of the journey. A brief synopsis of this desired 'end state' is captured in Figure 4.1.

In practical terms, these desired outcomes are a reversal in the mode-share between rail and road, making inland water transport and coastal shipping more attractive, achieving seamless transfer between transport modes and gauges, and hubs for processing, storage, transhipment and onward distribution. Specifically, it is desirable to bring rail's mode-share of freight transport equal to that carried by road (50:50), to increase the share of liquid bulk cargo transported via the pipeline from 55 to 80 per cent (as is the international average), and to substantially increase the mode-share of coastal shipping and inland waterway transport from the currently discouraging share of 6 per cent. This rebalancing from road to rail and the more effective harnessing of the lesser-used transport modes—pipelines and water—can serve to reduce India's transport fuel requirement by 15 to 20 per cent and cut logistics expenditure by 0.5 to 2 per cent of GDP, together with providing non-financial benefits in the form of reduced air pollution and increased energy security.

In summary, the desired state of the logistics infrastructure in India can be encapsulated as follows. First, roads must provide for last-mile connectivity to rail-yards and maritime ports, and there should be good links to the national and state highway networks. Second, dedicated rail freight lines should parallel the corridors of the major movements of goods shipments across the country, and should be worthy of consideration as the premier mode of transport for all but the highest-value commodities above defined break-even distances. These lines should provide for high-speed cargo movements with high tonnage capacities. To support the efficacy of these corridors, roads should link readily with rail, and especially at specialised transhipment junctions or logistics parks. Meanwhile, major ports capable of servicing bulk carrier and container ships with the large beams and drafts that are commonly deployed on international routes should be located relatively evenly along India's coastline. The ports should also possess sufficient capacity to handle domestic cargo.

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THE ROAD (AND RAIL) TO INTEGRATED INTERMODAL TRANSPORT

The first section of this chapter identified the theoretical underpinnings of an integrated logistics policy for freight transport, motivating this by the key observations that logistics are inseparable from the value proposition of a good. To achieve freight transport that is timely, reliable, and cost-effective, a set of policies and practices must be instituted to ensure that the most efficient transport mode is chosen for each commodity or class of product, and at each step of the journey to which it is best suited. This section details the policies and practices that will deliver the desired outcomes. There is natural overlap between the policies and practices that can be recommended to achieve multi-modal efficiencies for the carriage of freight, and those recommended for an individual transport mode. Here, only the former are set out, occasionally in abbreviated form, with the caveat that these must be read in conjunction with the extensive mode-specific documentation in Volume III.

ROADS AND TRUCKING

For a rebalancing of the multi-modal transport system in India, it is critical that the road sector become more efficient as well as less dominant. The focus should there be on maximising its advantages over other modes that lie in its extensive reach, its last-mile superiority, and its nimbleness and flexibility to deliver smaller volumes at higher frequencies to more destinations. In short, the structure of movement of freight over roads will best serve the country if its performance is maximised over short distances between urban centres, ports, airports, inland container depots and logistics parks, and the surrounding hinterland.

In the future, Indian trucking must become more adept at processing less-than-truckload (LTL) consignments, which are conventionally defined as those weighing-in at less than 10,000 pounds (or 4500 kg). The handling required to provide this service is greater than that needed for full truckload shipments[53]. To maintain the safety and integrity of different shipments, truck carriages will need to feature modern design elements including segregation, compartmentalisation and specialised locking systems. The driver of the vehicle must acquire trucking as well as inventory management skills. With multiple loads being loaded and unloaded at multiple origins and destinations, such trucking services place special demands on the service provider. They must develop route configuration systems as well as devise processes for handling and ensuring compliance for different kinds of shipments. LTL services are likely to prove a boon to small and medium manufacturing enterprises, which may not ship sufficient volumes on certain routes to justify full truckload shipments. LTL services will also require substantial consolidation within the industry, as efficient service-provision can only be achieved with an extensive network, with a large and differentiated fleet of vehicles, and substantial investment in back-office management.

For a rebalancing of the multi-modal transport system, it is critical that the road sector become more efficient and less dominant. The structure of movement of freight over roads will best serve the country if its performance is maximised over short distances between urban centres and the surrounding hinterland.

Though the government may choose to encourage this consolidation with a standard arsenal of industry tax holidays and other subsidies, it is preferable instead to resolve other regulatory hurdles and market failures such that the required consolidation may eventuate organically. These regulatory hurdles include simplifying the documentation required of truck movements, and reducing unjustifiable excise duties on multi-axle trucks[54]. It should also be noted that multi-axle vehicles cause less damage to roads than two-axle trucks. These vehicles offer cost reduction not merely in terms of lower line-haul costs per tonne-km but in terms of increased loading and unloading efficiency and in maximising transfer of loads between vehicles and modes. Since the benefits in terms of lower road damage do not accrue to the user, lower excise and differential taxation on multi-axle vehicles is justifiable. As noted earlier, prevailing road conditions, lax oversight on overloading, and the constrained liquidity of a fragmented trucking industry have each resulted in a preference for smaller all-purpose trucks, rather than for more sophisticated multi-axle vehicles.

It should also be noted that larger vehicles increase the costs associated with empty backhauls. This lack of demand has perhaps been the largest cause for domestic suppliers shying away from manufacturing this class of trucking vehicle. More recently, however, the situation is changing and some domestic manufacturers have begun to bring the more sophisticated vehicles to market.

Industry consolidation will also help as well as be influenced by another operational measure designed to improve efficiency: the use of the tractor-trailer. These trucks separate the payload from the propulsion mechanism, allowing a single tractor to pull multiple trailers. Fewer engine-units are required, and idling time for these during loading and unloading is reduced. System flexibility improves as a single tractor can be used to haul different types of specialised trailers or containers. Finally, there is better

53. DHL, in submission to NTDPC.
54. Goods vehicles with three or more axles are subject to a 12 per cent central excise, against a zero excise on smaller trucks.

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Box 4.12
McKinsey's National Integrated Logistics Infrastructure Policy

McKinsey, the consultancy, have suggested a blueprint for India's national infrastructure policy through to 2020. The aims of this policy are threefold. First, it seeks to ensure an efficient logistics infrastructure that supports a balanced modal mix, furthers economic growth, and minimises environmental impacts. Second, the suggested policy is designed to engender better agency cooperation at the state and central levels, and between these levels. Finally, the policy seeks to provide logical impetus for the allocation and division of spending on infrastructure, skills development, and technologies.

Specifically, the suggested policy sets out the following measurable objectives by 2020:

1. To increase the share of rail in freight traffic to 45 per cent
2. To limit annual economic losses to $100 bn or to under 4 per cent of GDP
3. To reduce energy consumption by 1 per cent and greenhouse gases by 20 per cent relative to the current levels
4. To achieve on-time and on-budget delivery of projects
5. To achieve intermodal coordination

To these ends, the policy consists of the following 10 elements:

1. Accelerating the number and construction of rail DFCs. McKinsey suggest that the development of the two in-progress DFCs (between Delhi and Mumbai, and Ludhiana and Kolkata) should be expedited, with funding sourced from private enterprise as well as from the rail budget.
2. Strengthening coastal freight corridors. The policy aims to boost coastal shipping along both the East and West coasts by creating transhipment hubs, encouraging state-owned companies to use coastal shipping, and deploying new technologies for processing both bulk and break-bulk cargo.
3. Increase and accelerate the number of expressways of lengths between 100 km to 300 km to support the main NH network along heavily-trafficked routes.
4. Initiate a comprehensive last-mile road building programme to support rail and port infrastructure, and multi-modal logistics parks.
5. Initiate a last-mile rail programme to support mining and industrial activity and agricultural markets.
6. Develop 15 to 20 multimodal logistics parks at intermodal junctions, preferably where DFCs and National Highways intersect near major centres of population. These parks should be provided with land, utilities and facilities to ensure seamless transfer of goods between modes, together with office space, hotels, warehousing, etc.
7. Prioritise systematic investment in road maintenance to achieve the most from the existing asset base.
8. Encourage widespread adoption of automatic tolling by establishing technology standards, and a nationwide clearing house and payments system for operators.
9. Expand human resource capacities and skills-sets, including new colleges, certification standards, and licensing.
10. Enable better equipment, technologies and set common standards.

Source: McKinsey (2010).

operational flexibility in optimising routes, reducing fuel consumption, and reducing transit times, all of which lead to lower fuel and operating costs, reduced wear and tear of roads, as well as a lower carbon footprint per unit of freight carried.

For full deployment of tractor-trailer model, it is desirable that all state regulatory authorities permit the separate registrations of tractor and trailer units, and there does not appear to be any prohibition in the Motor Vehicles Act (2000). There is a need to develop a well-defined law applicable nationwide covering the differential legal obligations of the owners of tractor and trailer units. A national electronic register of trailer ownership, locations, payload and destination will add to the flexibility of the system, by allowing owners of tractor units to plan multiple routes in advance. Further down the line, fleet or load exchanges could be set up to bring transport suppliers and customers together.

The electronic collection of tolls under a single technological standard together with a clearing-house for the various toll operators to reconcile collections and dues will enormously reduce waiting times at toll plazas. The technologies can be readily adapted to collect taxes and fees as well. To incentivise the uptake of this technology, conforming vehicles should be given preferential access and clearance through toll plazas and other checkpoints, a facility

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that is only incompletely offered at present. Nationwide recognition of mechanisms for factory-sealed or customs-inspected containers can reduce the need for en-route physical inspections. The rollout of the smart-card based national electronic vehicle registration system (VAHAN) and the national smart-card based commercial driver's license (SARATHI) should be expedited and made compulsory for operators seeking one-time physical inspections of shipments and for operating tractor-trailer units.

RAIL

There are two initiatives with enormously far-reaching effects that will be most instrumental in reversing the decline of rail's mode-share in the transport of freight. First, the network of dedicated freight corridors (DFC), already commissioned and under construction, must be speedily completed. The corridors will do much to improve the speeds and reliabilities of both freight as well as passenger trains. The focus on freight will also allow the network to service the urban agglomerations and industrial belts where cheaper rail-freight service is most beneficial and most needed. It is critically important that work begins forthwith on the four corridors which have been identified but have yet to receive implementation go-aheads.

Below, this chapter argues for the sustained development of containerised cargo movements. To this end, the freight corridor designs must support efficiency measures such as double-stacking, and terminals and junctions designed for processing containers. The chapter on Railways (Chapter 1, Volume III) discusses the additions in physical capacity and network augmentations required in more detail. Here, we emphasise that mineral and feeder routes connecting mines, power stations, industrial centres and logistics parks to the DFCs will be critical to the success of the dedicated network.

Second, the large-scale cross-subsidisation of passenger services by the exorbitant charges on certain categories of freight is not justifiable as it deflects freight traffic which should be carried by the railways to road thus preventing the railways from carrying types of loads over distances that are in keeping with their comparative advantage. Instead, Indian Railways should set freight tariffs in accordance with market conditions, but subject to independent regulatory oversight in recognition of the monopoly of service. Cost-based commodity-specific pricing regimes may be instituted.

Once the financial viability of the freight network stabilises and upon completion of the DFCs, measures could be taken to increase the participation of private players for owning and moving rolling stock. Under this scenario, private agents own and lease wagons to end-customers, a practice widespread internationally but only incipient in India. The wagons

Indian Railways should set freight tariffs in acordance with market conditions, but subject to independent regulatory oversight. Cost-based commodity-specific pricing regimes should be instituted.

can be specialised for the movement of liquids, auto components or other commodities. The government may wish to introduce or strengthen regulations over service agreements and guarantees on the security of cargo from the service provider to reduce customers' financial risks over rail transport such as those covering delay, non-delivery or damage of goods in-transit.

Beyond these measures, the speed of freight on the network and unit transportation costs can both be improved by the induction of new high-power locomotives capable of hauling longer, heavier, trains and new wagons with higher payloads-to-tare ratios.

PORTS, COASTAL SHIPPING AND INLAND WATER TRANSPORTATION

Transportation by water is extraordinarily efficient. Fuel consumption for every tonne-km of freight shipped is only 15 per cent of that by road and 54 per cent of that by rail. Emissions, too, are lower as compared to rail or road transport. Coastal shipping is also more suited to handling bulky consignments. With efficient terminal infrastructure, networks, and vessels, coastal and inland carriage of goods by ship can be half as expensive as by rail and up to 80 per cent cheaper than by road.

It is desirable to increase the mode-share of water transport. To do so requires that the availability of sufficient terminal and vessel capacities, improved cargo handling efficiencies at terminals, an increase and regular maintenance of draft in harbours and IWT channels, and more skilled labour to participate in the sector. The required initiatives in physical infrastructure are thus as follows:

- Improved road and rail connectivity with the ports and to inland container depots, dry ports, and logistics parks. The use of shipping is especially vulnerable to poor hinterland connectivity, and natural dependencies exist with rail and road transport networks.
- Smaller new ports at regular intervals on the coast to increase the number of origin-destination pairs, and make coastal shipping more attractive for smaller cargo volumes.
- Increases in the number of vessels transporting bulk and container cargo on Indian coasts, with a range of capacities to suit cargo loads of varying sizes.
- Improved superstructure, through expansion of associated back-up container stack areas, transfer bays, rail transfer facilities for seamless

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New airports may be considered, dedicated only to cargo flights. The economic zone around the terminals should facilitate acquisition of space to allow for truck docks, warehouses and temperature-controlled storage facilities, with service roads and entry gates linking the processing area.

rail evacuation, gate terminals for proper road evacuations, operational buildings, modern container handling equipment such as quay-side container handling gantry cranes, yard rubber-tyred gantries, reach stackers, terminal tractors, etc., in the terminal areas[55].

- Augmenting associated back-up value-add complementary facilities like CFSs, warehouses, assembly and packaging facilities, cargo consolidation areas, processing and distribution centres at off-dock locations to minimise port congestion and for easier intermodal transfers.
- Dedicated berths for processing container and bulk cargoes, together with modernisation of associated material handling equipment.

On the policy front, the following initiatives should prove advantageous to the use of water transport:

- Co-loading of domestic and international cargo on coastal vessels. Such co-loading is already permissible on Indian-flagged vessels travelling wholly between Indian ports. The facility should be extended to foreign-flagged vessels that often carry considerable spare capacities on coastal routes and to vessels travelling between Indian and foreign ports.
- Centralisation of governance of inland waterway transport under a single agency.
- A standard policy on minimum drafts and regular dredging and maintenance to ensure compliance.
- Mandatory consultations between port authorities, metropolitan and civic agencies, and Indian railways in planning expanded port infrastructure to ensure better rail and road connectivity with the ports. This can be possibly be coordinated through a high-power group, headed by a minister or a secretary along with senior representation from Ministries of Shipping, Roads and Railways (Chapter 4, Volume III on Ports and Shipping).

A common IT platform for message exchange between shipping line, port authority, terminal operator, freight forwarder, and container freight station operator will help communications, planning and scheduling of both, ship arrival as well as clearance and onward despatch once cargo is landed. Inspection agencies supervising the imports of certain cargoes such as textiles and pharmaceuticals should be supplied with additional staff, with subsequent streamlining of processes to ensure time-definite clearance. Where appropriate, the agencies may choose to accept the clearance documentation issued by regulatory agencies in the country of export or by other credible third parties. Physical inspections should be made on the basis of official judgment and defined criteria in accordance with a formal Risk Management System rather than as a matter of course.

AIR CARGO AND FREIGHT

An important task in ensuring better processing of freight at India's airports is the setting up of dedicated terminals or private bonded facilities for air cargo at all metropolitan airports. Alternatively, consideration may be given to new airports that are dedicated only to cargo flights. These hubs are crucial to the development of the generalised logistics and express air service industries. The economic zone around the airport terminals should facilitate the acquisition of space to allow for truck docks, warehouses and temperature-controlled storage facilities and should be zoned as such. Service roads and entry gates linking to the processing area should be designed and constructed with a view towards anticipated volumes of trucks required to remove air cargo.

Delhi in the North; Navi Mumbai, Nagpur and Pune in the West, and Bengaluru and Hyderabad in the South are ideal locations for air cargo hubs given strong intermodal links, and demographic or geographic advantages. The establishment of these hubs will require investment in real estate, buildings, and in material handling equipment with provisions for stacking, palletisation and conveyor movement of containers. Data capture and piece-level control are critical in supply chain management, and bar coding and scanning systems, radio frequency identification tags, etc., are essential for updating track and trace systems.

Space limitations or advantages in intermodal connectivity may merit the situating of bonded facilities at off-airport sites. Procedures and systems should be overhauled such that cargo can be shifted to these bonded areas with customs processing occurring thereafter. These customs-free zones can be set up within the framework of existing laws governing SEZs (Special Economic Zones) by demarcating and recognising warehousing areas within or near airports. These changes will permit the easier movement of cargo to international destinations without customs examination and assessment in India. Further, it ought to reduce airport congestion and cater to increased scale in trade.

Customs clearances should be available at all times at the largest airports with the heaviest traffic volumes. The cost-recovery model used for setting fees

55. Planning Commission (2010).

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for customs clearances should be abandoned in favour of a more rationalised fee structure, perhaps funded by a cargo services fee as is the case for passenger screening and clearance. Important regulatory agencies for inspecting shipments of food, pharmaceuticals, textiles and biological matter should have on-airport offices. Private laboratories should be certified and licensed to conduct mandated tests. The regulatory agencies and laboratories should be integrated into a common information technology system shared with customs, airports and cargo service providers. Finally, there does not appear to be a persuasive argument for persisting with a separate license for processing transhipment cargo.

PIPELINES

Pipelines are an important means of transport, as they do not require the return of 'empties' to the starting point and as such are ideal for unidirectional traffic. They are insensitive to surface conditions such as storms and inclement weather. Besides being environmentally friendly, operating costs are low and inflationary influences have a small impact on transport costs. Pipelines are highly under-used in India today with a mode-share in total cargo transport of less than 5 per cent and in liquid bulk cargo of around 55 per cent. This is lower than in many other countries.

Existing pipeline networks are localised in nature, with limited reach and absence of arrangements for multiple users. This adversely impacts recovery of investments and is reflected in the inadequacy and age of existing pipeline network. Possible initiatives in physical infrastructure are thus as follows:

- A National Pipeline Grid could be established along the lines of the National Electricity Grid. Disparate pipeline networks could be integrated to allow for efficient flow of products across long distances[56].
- New technologies permit upstream and downstream products to be transported in the same pipeline (such as crude oil, gasoline and naphtha). This can lead to further economies.

With the majority of pipelines under non-governmental ownership and administration, policy plays a bigger role than the provision of infrastructure. The following policies are likely to result in the desired boost for pipeline transport:

- Facilitate the investor in obtaining multiple permissions/clearances that are required for setting up pipelines.
- Fiscal and tax incentives for investing in pipelines could be introduced.

India will requitre about 25 logistics parks over the next 20 years. These should be situated close to population centres, at junctions of several transport modes, on the grounds of ports or airports, or in their immediate vicinity.

INTERMODAL TERMINALS AND LOGISTICS PARKS

In this discussion, the terms intermodal terminal, multi-modal transhipment hub, dry port, inland container depot and logistics park are all subsumed into the latter for brevity. However, it is recognised that each of these concepts is somewhat different in terms of the breadth of services provided and connecting infrastructure required. That said, each of these facilities encompasses the following functions in some measure:

1. To serve as a transhipment hub where quantities are aggregated and disaggregated;
2. As a waypoint to manage inventory, store goods and compile economically viable shipments; and
3. As a point of interchange between gauge and mode of transport.

'The use of large warehouses, shared equipment and manpower at these transhipment points lowers operating costs. Transportation costs can also be reduced with improved utilisation of transportation equipment with flow aggregation (over various modes), as additional distance is typically offset by scale benefits'[57]. Together with the ancillary activities and services such as inspections and certification, customs clearances, offices and hotels, logistics parks are enormously important cogs in processing domestic and international trade in a well-functioning economy.

India will require around 25 logistics parks over the next 20 years[58]. These should be situated close to population centres, at the junctions of several transport modes, and serve a large catchment area. A logistics park may be sited on the grounds of a coastal or inland port, or airport, or in the immediate vicinity of these facilities. To minimise the potential for administrative and procedural delays, it is ideal if the former approach is followed where possible. In some instances, it may be worthwhile to set up a new logistics park in conjunction with a new port or cargo airport or rail-freight handling facility. In either case, shorter processing and transhipment times may be expected, and the essential conveniences offered by ready and reliable freight transport are

56. For example, the linking of the Mathura-Jalandhar pipeline in the North with the Kandla-Bhatinda pipeline in the West; and the linking of the Barauni-Kanpur pipeline with that between Kanpur and Allahabad.
57. McKinsey (2010).
58. Essentially every major urban conurbation will require one, and some will require two. For example, the National Capital Region will be well-served by a logistics park that services freight travelling on National Highway 8 and the Western DFC; as well as by another serving freight travelling on National Highway 2 and the Eastern DFC.

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The functional agenda and operational remit of every logistics park should be delineated separately. This should then be evaluated independently. Each park should aim to provide efficient and low-cost transhipment and client-oriented value-added services.

likely to encourage many time-sensitive businesses to locate in or near the park.

The guiding principles underpinning investment in logistics parks are the same for all other infrastructure spending as proposed in this report. Here, we only reiterate the important principle of network-centric thinking in planning infrastructure, and the major observations from the Indian experience that have thwarted this principle. As detailed in Chapter 2, Volume II these are (a) network enhancements have been driven by political rather than business or even social welfare considerations; (b) capacity augmentations that have often only resulted in pushing bottlenecks to elsewhere in the network; and (c) a generalised lack of intermodal thinking in planning infrastructure. When deciding on investment in logistics parks, the following 'good' practices may help in ensuring that these observations are not made in the future of parks constructed today.

First, logistics parks should possess sufficient space and be provided with room for future expansion, with the dimensions of the space determined, again, by estimates of traffic flows and patterns. The particular functional agenda and operational remit of each park should be delineated separately. This should then be evaluated independently to determine if sufficient market potential exists, if efficient intermodal terminal operations are possible at the chosen site, and if it links to transport networks that are of sufficient quality. Each park should aim to provide efficient and low-cost transhipment services and client-oriented value-added services. The hub potential of the park should be determined, whether in regional, national or international terms. The legal and operational restrictions on the functioning of the park should be identified in advance, and feasibility studies should pay particular attention to integration with urban master plans, regional development plans, land and building costs, and acceptance by existing users or neighbours of the designated site.

Logistics parks, by their inherent nature and particularly in current context, appear to be ideal candidates to be developed through suitable public private partnership (PPP) formats. The keywords that seem to characterise these parks today is bulky investments, huge land parcels, short project turnaround, efficient operations, tremendous commercial potential and innovation. These are best addressed and harnessed by the private sector. One of the serious constraints, however, is the availability of land and the fair price of acquisition, which is where the role and support of the public sector shall continue to remain important.

Where space proves to be problematic near urban centres, existing intersections of the highway and railway networks can be expanded by building terminals around the handling areas. These constructions are increasingly seen in Europe (e.g., at Basel/Weil and in Budapest which handle only containers, semi-trailer and swap-body traffic). The size of the terminals should further be determined by the number and length of transhipment tracks, the number and type of handling devices such as cranes and reachstackers, the types of semi-trailer, container and other traffic catered to, the storage required, and the desired opening hours and other preferences of customers.

Land use plans should be mandatory for new parks. A land use plan serves as a guiding document for the development and expansion of intermodal facilities and the lands where these facilities are located. Such plans are required in most developed countries with intermodal freight transportation systems. They should communicate the long-term goals of the operator, regulator and governing agency while strengthening future initiatives. Land use plans can be centralised to include location-specific goals that enable customers, stakeholders, municipalities and government agencies to understand the governing principles that the managing authority uses to manage land and water assets.

In seeking to provide efficient transhipment facilities and value-added services, the terminal building should offer good and safe working conditions for staff, safe drayage, high security against theft and terrorist attacks, and minimisation of environmental effects. The design of the park should be heavily influenced by expected traffic volumes and commodities processed, with consideration to specialised terminals for processing standardised cargo. Provision should be made for the short-term storage of cargo and the long-term storage of empty shipping units or rolling stock if required.

Other design principles that may be followed are as follows. Terminal designs can be modularised and standardised to limit investment costs[59]. All terminals and infrastructure along a particular high-density freight corridor should conform with a set of minimum design rules. The standards should be subject to regular benchmarking and quality certification processes, as well as more formal regulatory review if the standards are enshrined in law. Railway access to transhipment areas should be from both

59. The standardisation of the terminal buildings themselves is at the vanguard of the debate on the design of logistics parks. So far, there has been little progress outside Switzerland and Austria, though the idea is now under the EU's considered attention.

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sides to reduce shunting effort and operational costs. Transhipment areas with loading tracks should be compatible with train lengths to reduce shunting requirements further. Terminal management systems for intermodal or railroad-only terminals consist of the following components and modules: train processing; road truck transhipment; regulatory compliance; crane work station and movement optimisation; mobile data captures, tracking and routing; storage and additional services; statistical analysis; and billing. For each of these systems, a single national standard should be decided on and deployed.

On the implementation front, the Working Group on Logistics recommends that the identification of locations for logistics parks should be undertaken by consulting companies such as RITES which should take into account the views of industry collectives[60]. Consortia of companies should be invited to undertake the establishment of the parks on the understanding the Central Government will provide road and rail connectivity and the State Government will assist in the acquisition of land as well as in the supply of utility services.

Planning Commission argues for a new central body with a charter and mandate that is dedicated to the development of the logistics industry, a view that the NTDPC endorses[61]. Pre-emptively called the Central Logistics Development Council (CLDC), its goal will be to serve as an advisory and recommendatory body that seeks to decrease logistics costs through integration of transport services. The Council should consist of representatives from the logistics industry, MoRTH, MoCA, Ministry of Railways, representatives of State governments, CII, financial institutions, insurance companies, and academic bodies. The CLDC will collect and disseminate information, conduct research, advise the government, with funding from the industry. The CLDC will also advise regulatory authorities or create guidelines for self-regulation of some elements of the logistics industry.

The CLDC would spearhead the development of logistics sector. The development process would particularly involve participation of, and coordination among multiple ministries/departments and organisations. It is therefore advisable that a Nodal Ministry be designated for CLDC. Since logistical hubs are already planned as a key ingredient to the ambitious Delhi-Mumbai Industrial Corridor, piggybacking on the high capacity Dedicated Railway Freight Corridor (DFC), the Ministry of Railways could possibly act as the Nodal Ministry. Alternatively, considering the logistics parks as purely trade facilitation and processing centres, the Ministry of Commerce (as in case of China) may be found equally suitable.

The shipping container has become the dominant hold-all for break-bulk cargo. It has allowed new sourcing, manufacturing, and inventory management processes. Managers treat containers as 'warehouses in motion'.

UNITISATION OF CARGO: CONTAINERS AND PALLETS

Of all the technologies that have revolutionised the movement of global freight, few have had as much impact as the humble box. Until the arrival of the container, each vessel was laboriously loaded and unloaded by hand, a process that could take weeks. Longshoremen handled on each piece of cargo that went into a ship's hold, stuffing bags and opening crates. The inefficiencies of the system are obvious. Goods are prone to pilferage and spoilage from unprotected storage in the holds. Ship turnaround times go up several times with each article or each non-standard container requiring handling, and the idiosyncrasies hindering mechanisation of the process.

Since first being introduced in coastal shipping along the Eastern coast of the US in 1958, the shipping container has become the dominant hold-all for break-bulk cargo. Container dimensions have been standardised internationally, allowing ships, cranes, trucks, and storage areas to be constructed especially for handling these. Modern ships now carry a total of nearly 1.5 billion tonnes of cargo around the world in 560 million containers[62]. Some vessels boast capacities of 12,000 to 15,000 containers. Modern automated cranes can load and unload nearly 150 containers an hour, each container placed in the exact onboard space and ashore so as to maximise logistical efficiencies. The resulting decline in costs has created new markets for goods, and in a geographic reorganisation of global manufacturing. The decline in shipping times has allowed new sourcing, manufacturing and inventory management processes. Indeed, predictable shipments based on the container have allowed managers to treat containers like 'warehouses in motion. By precisely timing the arrival of components, manufacturers move items from containers directly onto assembly lines or store shelves, bypassing warehouses entirely'[63].

The containers themselves have been re-engineered to new purposes. Refrigerated containers ('reefers') are used for perishable products and containers lined with bladders are used to transport liquids. The versatility and standardisation of the shipping container—the key to its maritime success—has made it ubiquitous for overland freight transport as well. Flatbed trucks are designed to accommodate

60. Planning Commission (2010).
61. Ibid.
62. Curry (2013).
63. Ibid.

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India must rapidly adopt the use of standardised containers and pallets for moving both overland and maritime freight. Associated handling equipment like forklifts, cranes and specialised flatbed rail wagons must become ubiquitous.

one or two containers for last-mile delivery or for longer hauls. Freight trains now increasingly move break-bulk (and some bulk) cargo in containers stacked singly or doubly on dedicated wagons. (The 'humble box' has even found a purpose in retirement as a ready-made low-cost housing solution.)

An equally humble technology that can lay claim to revolutionising freight movement is the pallet, a wooden construction of several planks nailed together. Instead of devising optimal methods for lifting and transporting different objects over short distances, the pallet 'unitises' these operations. Forklifts and warehouse cranes and trolleys can be engineered with the single purpose of moving a pallet, and with complete agnosticism about the characteristics of the payloads actually carried. Some goods never leave their resting place atop a pallet from the moment they exit a factory door until a customer selects them from the same pallet in a retail store. As Box 4.5 notes, companies have redesigned product lines to better suit the standard pallet. In many countries, companies lease pallets to industry, taking on the responsibilities of delivering and retrieving these.

India must rapidly adopt the use of standardised containers and pallets for moving both overland and maritime freight. Associated handling equipment such as forklifts, cranes, scanning and inspection equipment, tractor-trailer units, and specialised flatbed rail wagons must become ubiquitous technologies in use at ports, logistics parks, handling yards, and by road, rail and shipping service providers. The 'unitisation' of freight movement will result in enormous time and cost savings. Financial incentives should be set in place to retire old equipment and inaugurate new technologies. De facto standards for pallets and containers should be officially endorsed and implemented by all state-owned enterprises. It is important that there is no variation between domestic and global standards.

HUMAN RESOURCES AND SKILL DEVELOPMENT

As noted earlier, Indian logistics is slowly but inevitably moving away from the traditional model of transportation services and storage, characterised by small, independent, unorganised providers who focus on a particular transport mode. It is transforming into a new system wherein third-party logistics providers devise end-to-end transportation solutions for manufacturing firms, arranging transport across all modes, and providing value-added services like packaging and reverse logistics. Further down the road, it is likely that the nascent fourth-party logistics industry will grow further, with firms specialised in supply chain management and in matching supply and demand, further reducing costs and lead times.

The transformation of the industry is, however, dependent on the transformation of the skill sets possessed by the current corps of freight transport professionals, and on a substantial boost in their numbers. By one estimate, the 10-million-strong current corps of drivers, handlers, operators, managers and other freight service professionals will need to double by 2020. This includes a requirement for over five million drivers, 100,000 warehouse managers, and 70,000 coastal seafarers.

DRIVERS, HANDLERS AND EQUIPMENT OPERATORS

The drivers of the future will be required to not just be expert users of their increasingly sophisticated equipment, but to also be au fait with ancillary technologies such as route guidance systems, electronic data entry, and log book management. They will need to be fully aware of any special handling required by a given load of cargo. Further, they will need to fulfil their duties with precision and efficiency to play their role in a supply chain that is intolerant of delay or uncertainty. As such, their driving skills, including defensive driving, will need to be of the first order. They will also need to be trained in vehicle maintenance, freight loading and unloading, and be certified to prevailing safety standards. Their required skill sets will include reading, writing and communication, together with basic technological familiarity, basic knowledge of taxation, permit and license regimes, and the technical nous to manage specialised or hazardous goods in transit.

Truck drivers should be certified to a high, common standard across the country that takes into account these skill requirements. Training institutes should conduct courses in the operation of light and heavy goods vehicles, together with refresher courses and re-certification offerings on handling specialised or hazardous goods.

Meanwhile, a large corps of operators trained in latest material handling equipment technologies will also be required to load, unload and organise cargo. These operators include forklift and crane operators, drivers of haulage trucks at terminals, and so forth.

MANAGEMENT

This chapter has called for heavy investment in multimodal logistics parks. It is intended that these massive facilities will process a large amount of container

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and break-bulk cargo. Beginning at the top, park managers with extensive operational and managerial skills will be required. Training programmes for these managers should include specific courses on sourcing, contracting, multi-modal operations and tracking technologies. The managers will also need to be comfortable operating a facility at which many different activities take place, ranging from rail and road transport to customs processing and warehousing to retail and travel. The success of a logistics park will be determined to a large degree by the management team's successes in juggling the competing needs of many different service providers, and in finding efficient synergies wherever possible—these synergies are the charter responsibilities of the logistics park.

Service providers based in the logistics parks may choose to locate some of their senior supply chain management professionals there. Whether based at the parks or elsewhere, the supply chain professionals will need to manage contracts and relationships, select suppliers, understand information, financial and material flows. They will be required to have extensive knowledge on the construction and operation of new facilities such as warehouses and distribution centres. Further technical skills will be required for sophisticated demand and supply planning, and for matching the two to relatively low tolerances.

The major challenge that the industry will face in recruiting these managers will lie in legitimising and publicising the potential of a viable professional career in logistics. At present, 'skills gaps arise from the structure of the industry in India. Small sized entrepreneurs have limited intent or capability to scale and build manpower capabilities. The industry gaps in good management practices are deeply set, as the logistics industry itself has still not emerged as an attractive sector for professionals. [The gaps] in core technical skills arise from the unorganised and fragmented structure in the industry'[64].

As international borders come to be drawn in ever-lighter shades of grey for the sourcing of components and final assembly, an increasing number of firms will need to become masters at managing their supply chains. To do so, executives at these firms and their logistics advisors and providers must work together to manage flows of material and information while maintaining the integrity of both. They must create and monitor new plants, warehouses and distribution centres and also deal with the links in the supply chains. These supply chain management professionals will be required to have skills in managing information, generalised industry knowledge, customer relationship management, advanced planning and optimisation, and in demand planning.

The major challenge that the logistics industry faces in recruiting managers will lie in legitimising and publicising the potential of a viable career, since it has not emerged as an attractive sector for professionals.

There exist very few formal training institutions or professional certifications for use as credentials of competency. In conjunction with industry, government should design curricula at the master's level for combined training in operations research, supply chain management, cost accounting and planning, each with a focus on logistics. Besides the academic study of these subjects, the goal of the training programmes should be to develop the following practical skills: (a) the coordination and planning of logistics operations in support of business efficiency; (b) planning and management of product supply chains including forecasting skills and inventory management; (c) the acquisition, operation, and maintenance of material handling equipment; (d) facilities management; (e) knowledge of safety, labour, customs and transport documentation and regulations.

RECOMMENDATIONS

This section collates the major recommendations stemming from the discussion and analysis in this chapter. Again, the focus remains on identifying actionable remedies to existing problems relating to the planning and implementation of integrated transport strategies, with particular emphasis on the movement of freighted goods. Required investments in physical road, rail, aviation and shipping infrastructure are detailed in the respective sectoral chapters.

1. Government must adopt an integrated transport strategy guided by inter-generational drivers of patterns of transport demand. The characteristics of these drivers are their long-term and largely irreversible nature; their far-reaching, game-changing effects on the economy and so on transport; their indifference to business cycles; and their relative immunity to financial and economic shocks. The proposed Office of Transport Strategy should give proper consideration to determining and monitoring these long-term drivers such as urbanisation, demographic change and changes in the mix of industrial activity.

2. The overall aim of the integrated strategy should be to uncover an optimal modal mix.

64. NSDC (2009).

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Rules and regulations governing the carriage of goods by road, rail, air, sea or any combination of these should ensure equal administrative treatment. All imports should have the same documentation requirements.

This desired mix should reflect the full resource costs of each transport mode for each type of commodity transported over various distances and terrains. It should also reflect the government's distributive and allocative agenda clearly. To this end, traffic and costs studies must be carried out periodically, with due regard for the specific characteristics of each transport mode and commodity. These studies can be organised and analysed for attendant interventions by the proposed Office of Transport Strategy to guide transport gradually towards a modal mix that is both, efficient and rational.

3. In itself, the intermodal principle is not about advocating a particular modal mix. Instead, it is highly likely that from the optimal modal mix, a persuasive case for intermodal transport will be made. The inefficiencies of an insufficiently intermodal transport system are manifest in higher prices, longer journeys, reduced reliability, lower availability of quality services, type restrictions, higher risks of damage or pilferage, and more complex administrative procedures. The critical enablers to address these inefficiencies and to yield an intermodal transport system are:
   a. Missing stretches of infrastructure within one mode or missing links between modes should be completed. From its studies on traffic flows, the Office for Transport Strategy should assume the important role of identifying the missing links. It should be provided with the mandate to direct central, state and local authorities responsible for implementing infrastructure to liaise with each other in constructing the missing links.
   b. With ministries individually responsible for the construction and upkeep of roads, railways, airports, ports and waterways, and other transport infrastructure, the allocation of responsibility for ensuring good intermodal links or for the construction of multi-purpose facilities is not clear. The Office for Transport Strategy should again pay special attention to these important links and facilities, and be provided with powers to direct authorities to attend to their construction.
   c. With multiple handling and transporting agencies in an intermodal chain, the allocation of liability is not clear. At present, rules governing liability are determined by the Multimodal Transport Act of 1993 (amended 2002), which in keeping with international guidelines maintains that the multimodal service provider has 'presumed fault'. The liability rules could be strengthened on the following fronts: limiting the jurisdiction over disputes to tribunals or courts with special knowledge of transport issues; clarifying the arbitration procedures including the setting up of a defined tribunal and appellate instead of leaving these important details unspecified as at present; and most importantly, by ensuring that the service provider is accountable for loss and compensations regardless of where in the transport chain the loss was deemed to occur.
   d. Rules and regulations governing the carriage of goods by road, air, sea, rail or any combination of these should be amended to ensure equal administrative treatment. For example, imports arriving by air or by sea should be subject to the same documentation requirements, as should inter-state movements of parcels by road or rail. It is recommended that an inter-ministerial panel examine the various acts governing the carriage of goods by the various modes with a view to harmonising registration and licensing of service providers, processes regulating the handling of goods, and documentation requirements.
   e. Information is generally impermeable with little interoperability of information and management systems that govern the movement of goods. An inter-ministerial group should agree on a common data standard, in consultation with industry, and provide for immediate collection and dissemination of the data to service provider APIs.
   f. There is insufficient unitisation of cargo in the form of the use of shipping containers and pallets. The Government should adopt the common standards on these shipping units and then ensure that goods transport on all modes can accommodate these units both on rolling stock as well as on fixed infrastructure.

4. Pricing for transport services and for associated inputs like fuels should be de-politicised and set by market or by independent regulatory authorities. Where prices are set by independent authorities, they should be responsive to changing economic fundamentals in a timely fashion to minimise adjustment costs. Good pricing is simple, clear, prevents market distortions, guides consumption and investment

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decisions appropriately, and is sustainable over the long run. Pricing in the transport sector should conform closely to the cost of services and actual resources used in its production, having regard to scarcity values of these inputs.

5. Better attempts must be made at establishing the true nature and extent of transport externalities, the relative incidence of cost and benefit, and how these fit with the government's wider distributive and allocative agenda.

6. Subsidies should be limited to those areas where their retention on societal considerations is overwhelmingly justified. Wherever subsidies are retained, they must be made as explicit as possible so that they are clearly identifiable to ensure transparency. The instruments of pricing, taxation and subsidy should be used to develop an economically rational intermodal mix and to promote operational efficiencies. It is ideal if policies on these are not absorbed into the government's generalised toolkit for fulfilling its distributive and allocative agenda.

7. With respect to the movement of goods on road transport vehicles, the following recommendations are made:
   a. Growth and consolidation of the industry must be encouraged organically by reducing the documentation, administrative and state-border clearance burden required of truck movements and by reducing excise duties on multi-axle trucks.
   b. Provisions in the Motor Vehicles Act (1988, as amended) should be effectively implemented. Recommendations made by the Sundar Expert Committee reviewing the Act should be carefully considered. Provisions relating to the overloading of trucks, the unhindered movement of trucks with national permits, and those relating to the registration of tractors and trailers should be uniformly implemented and stringently enforced.
   c. Tolls should be electronically collected under a single technological standard together with a clearing-house for the various toll operators to reconcile collections and dues.
   d. Nationwide recognition of mechanisms for factory-sealed or customs-inspected containers will reduce the need for en-route physical inspections.
   e. Truck drivers should be certified to a high, common standard across the country that takes into account the skills such as reading, writing and communication, together with basic technological familiarity, basic knowledge of taxation, permit and license regimes, and the technical nous to manage specialised or hazardous goods in transit. Minimum standards should be formulated at the central level, with all state licensing authorities required to issue licenses in compliance with these.

The speed of freight on the railway network and unit transportation costs can be improved by inducting high-powered engines capable of hauling longer heavier trains, and new wagons with higher payload-to-fare ratios.

8. With respect to the movement of goods on rail, the following recommendations are made:
   a. The network of dedicated freight corridors must be speedily completed.
   b. Freight corridor designs must support efficiency measures such as double-stacking of containers, and terminals and junctions should be designed to process unitised cargo.
   c. The participation of private agents in owning and leasing wagons to end-customers and in packing and processing rail freight in unit loads should be encouraged by building rail lines to private facilities and by accommodating rakes originating and terminating at logistics parks (see below).
   d. The speed of freight on the network and unit transportation costs can both be improved by the induction of new high-power locomotives capable of hauling longer, heavier, trains and new wagons with higher payloads-to-tare ratios.

9. With respect to the movement of goods via sea, the following recommendations are made:
   a. Ports should provide due emphasis on improving superstructure, by expansions of associated back-up container stack areas, transfer bays, rail transfer facilities for seamless rail evacuation, gate terminals for proper road evacuations, operational buildings, modern container handling equipment such as quay-side container handling gantry cranes, yard rubber-tyred gantries, reach stackers, terminal tractors, etc., in the terminal areas.
   b. Smaller new ports should be constructed at regular intervals along the coast to increase the number of origin-destination pairs and to increase the attractiveness of coastal shipping.
   c. Restrictions on foreign-flagged vessels from plying coastal routes as part of their international operations should be relaxed to allow them to carry bulk/general cargo

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A National Pipeline Grid can be built along the lines of the National Electricity Grid. Disparate pipeline networks can be integrated to allow efficient flow of products over long distances.

and transhipped exim containers, including empty containers to make use of the considerable spare capacity on these ships. This would enhance domestic mobility for India cargo. Stricter or absolute Cabotage could continue for import and export of crude, critical energy cargoes and defence equipment/parts.

d. A common IT platform should be developed for message exchange and tracking between the various private agents, marine and landside service providers, ports and government agencies.
e. Inspections agencies supervising the imports of certain cargoes should be supplied with additional staff, with subsequent streamlining of clearance processes.
f. Physical inspections should be made on the basis of official judgment and defined criteria in accordance with a formal Risk Management System.

10. With respect to the movement of goods via air, the following recommendations are made:
    a. Dedicated terminals or private bonded facilities for air cargo should be set up at all metropolitan airports. Alternatively, consideration may be given to new airports that are dedicated only to cargo flights.
    b. Customs clearances should be available at all times at the largest airports with the heaviest traffic volumes. Important regulatory agencies for inspecting shipments of food, pharmaceuticals, textiles and biological matter should have on-airport offices. Procedures and systems should be overhauled such that cargo can be shifted to off-airport bonded areas without prior clearance.
    c. The regulatory agencies and laboratories should be integrated into a common information technology system shared with customs, airports and cargo service providers.

11. With respect to the movement of liquids and gases via pipeline, the following recommendations are made:
    a. A National Pipeline Grid could be established along the lines of the National Electricity Grid. Disparate pipeline networks could be integrated to allow for efficient flow of products across long distances.
    b. Facilitation in obtaining multiple permissions/clearances those are required for setting up pipelines would be helpful.
    c. Fiscal and tax incentives for investing in pipelines could be introduced.

12. In recognition of the importance of warehousing and logistics parks to the logistics sector, the following recommendations are made:
    a. Around 15 to 25 logistics parks should be established. These hubs should be located at major transportation hubs, including at the origin and destination points of DFCs, and at major industrial centres or near major urban conurbations. The parks should have sufficient space to serve as waypoints to manage inventory, provide storage, and should also have excellent links to the road and rail networks, and possibly to airports and ports depending on the local economy and geography.
    b. The parks should have provision for ancillary activities and services such as inspections and certification, customs clearances, offices, hotels and others.
    c. Logistics parks should possess sufficient space and be provided with room for future expansion, with the dimensions of the space determined, again, by estimates of traffic flows and patterns.
    d. The hub potential of the park should be determined, whether in regional, national or international terms. The legal and operational restrictions on the functioning of the park should be identified in advance, and feasibility studies should pay particular attention to integration with urban master plans, regional development plans, land and building costs, and acceptance by existing users or neighbours of the designated site.
    e. Land use plans should be mandatory for new parks and should communicate the long-term goals of the operator, regulator and sponsoring agency.
    f. To provide efficient transhipment facilities and value-added services, the terminal building should offer good and safe working conditions for staff, safe drayage, high security against theft and terrorist attacks, and minimisation of environmental effects and impacts.
    g. All terminals and infrastructure along a particular high-density freight corridor should conform to a set of minimum design rules.
    h. Railway access to transhipment areas should be from both sides to reduce shunting effort and operational costs.
    i. Terminal management systems for intermodal or rail-road only terminals consist of the following components and modules: train processing; road truck transhipment; regulatory compliance; crane work station and movement optimisation; mobile data captures, tracking and routing; storage

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and additional services; statistical analysis; and billing. For each of these systems, a single national standard should be decided on and deployed.

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

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

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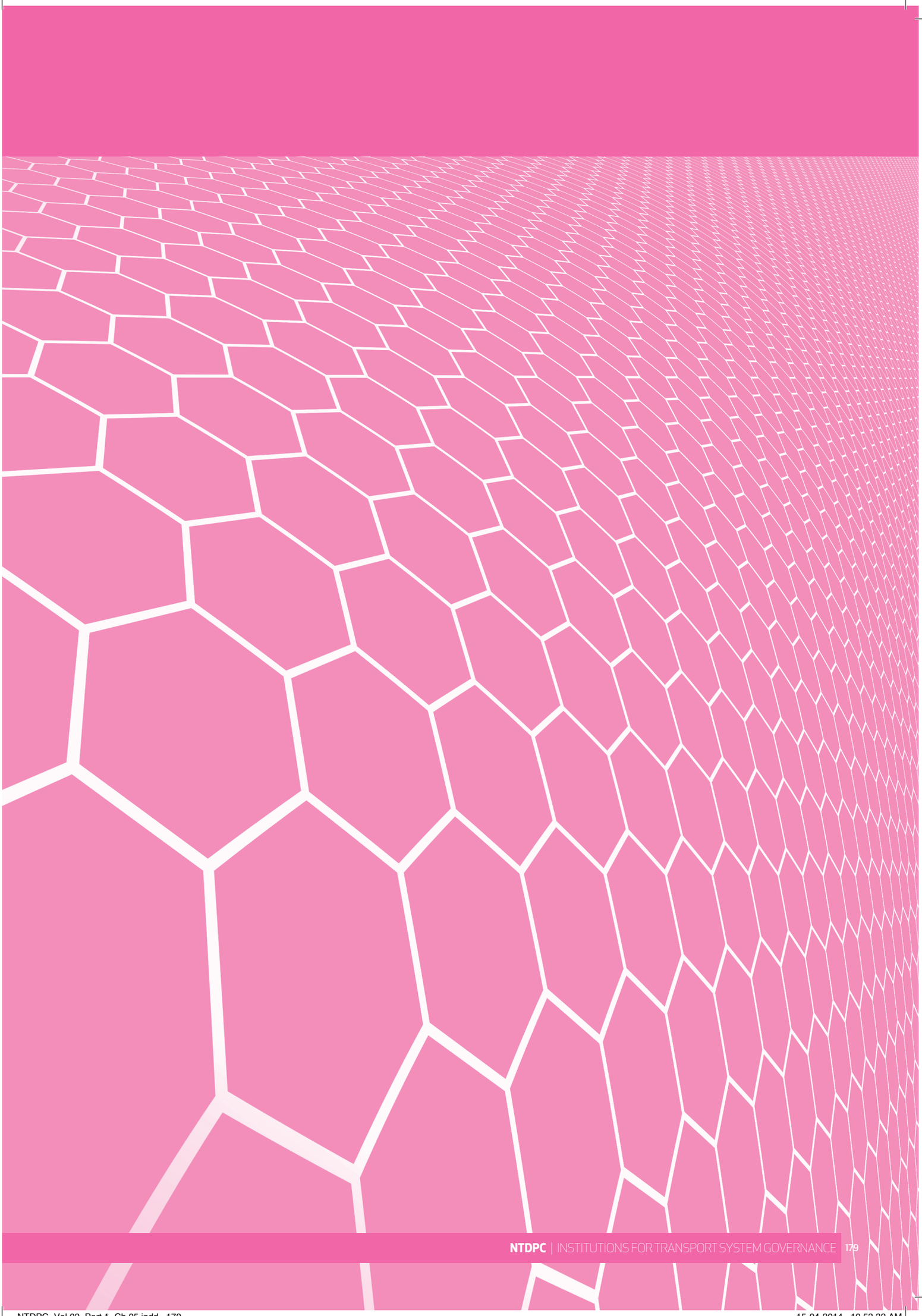
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5. INSTITUTIONS FOR TRANSPORT SYSTEM GOVERNANCE

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5. INSTITUTIONS FOR TRANSPORT SYSTEM GOVERNANCE

India's transport system does not meet the country's current needs, much less the future requirements for goods and passenger transport as the country grows. The physical infrastructure is congested in nodes—ports, inland container depots, and urban streets—and inadequate in others such as rural roads.

India may be the pre-eminent economy in South Asia, but it is also the one country in the region that does not yet have a deepwater seaport. Freight delays are an oft-cited constraint on the investment climate, one of the obvious handicaps for efforts to develop the manufacturing sector or leverage domestic energy resources for power generation, and a key contributor to India's relatively concentrated economic geography. The transport system is also energy-inefficient, with nearly 70 per cent of cargo moving by road rather than rail or inland waterways.

India's urban transport and mobility needs are changing quickly as its cities grow in population and geographic size. Transport choices about how to do so will set the tone for the energy efficiency and livability of India's cities. Public transport and non-motorised transport (bicycles and walking) continue to play an important role in urban mobility, but use of personal vehicles (two wheelers and cars) is increasing as incomes rise. India will need to invest strategically in public transport and pedestrian infrastructure to retain a sustainable mix of transport. Congestion in the denser city cores already appears to be motivating more businesses to locate in peri-urban areas, which in turn places greater stress on water, sanitation, and other infrastructure that is still in development. The cost per kilometer of short-distance shipping within urban areas can be multiples of long-distance rates.[1] Idling in traffic also increases air pollution that in turn affects human health, crop yields, and the climate. The World Health Organisation (WHO) declared diesel exhaust a carcinogen in 2012; and recent scientific research finds that black carbon, the dark particles found in particularly high concentrations in diesel exhaust, is second only to CO_2 in driving global warming.[2]

India's transport system must evolve rapidly to support growth over the coming decades. Although the near-term projections for India's growth have dropped to 5-6 per cent, the country should return to 8-10 per cent growth over the medium and long run, with a consequent increase in the circulation of goods, people, and raw energy supplies (Chapter 3 on Macroeconomic Growth Backdrop: Transport Investment Requirements 2012-32). More than this 'committed usage,' India must also build up the transport system to sustain much higher growth in manufacturing that is necessary to generate employment

1. World Bank (2012).
2. Bond et al. (2013).

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for its expanding young workforce. The transport infrastructure is obviously also important for encouraging balanced regional growth in manufacturing-related employment.

The weaknesses of the transport system interact with other constraints on growth. Limited connectivity creates an artificial 'scarcity' of land; for example, driving up prices and affecting firm competitiveness. Improving transport also lowers the costs of trade between various regions, affecting the efficiency of the internal market and the prospect for income gains from specialisation in products where there is a regional comparative advantage.[3] Lowering the cost of trade also affects the returns from investments in human capital and, by implication, can reduce incentives for skilled workers in rural yet transport-linked areas to migrate.[4]

India needs to develop institutional capacity not only to achieve economic growth, but also to support goals such as energy security and environmental sustainability.

The domestic and global fiscal resources for this upgrade are constrained. India will need to ensure maximum socio-economic return on high capital investment, both to ensure sustainable public investment as well as attract private finance. It will also need to build an institutional environment to ensure effective use of private finance and support public-private partnerships (PPPs) that increase the efficiency of infrastructure delivery. Private finance does not eliminate public financial support for infrastructure; it merely shifts the timing of commitments and the distribution of contributions across users and taxpayers. The real gains from PPPs come from sharing risk across parties with different abilities to mitigate them and from tapping into public and private comparative advantage in project management, innovation, and technology adoption.

In any case, finance is necessary but not sufficient. The country will also have to develop the institutional capacity to be more strategic in decision-making about investment in and regulation of transport infrastructure in order to not only achieve economic growth but also support other development goals such as energy security and environmental sustainability. 'Transport policy' will need to address the way that passengers and freight are transported, beyond simply meeting the demand for some form of mobility.

This report makes recommendations for national transport policy for the long term, with a perspective of about 20 years. In addition to making policy prescriptions for this long period, it is also making projections for the kind of investments that will be required in each sector. It also provides a set of recommendations for inter-modal transport and logistics arrangements (Chapter 4, Volume II on Integrated Transport: Strategy and Logistics). All of these policy recommendations and investment projections are being made utilising the best information available at the present time (2013). The Committee is very cognizant of the fact that 20 years is a long-term horizon over which to make such prescriptions and quantitative projections. We have been witness, for example, to a complete revolution that has been brought about by information technology and the advent of the internet during the last 20 years. The world in 2013 is very different from what it looked like at the turn of the 1990s.

It is certain that we will witness many technological changes in transport in the coming 20 years that will make our current expectations obsolete. Moreover, we have also seen very large variations in the price of energy over the past two decades. No doubt, we will see similar variations over the next 20 years as well. The recent advent of shale oil and gas has materially altered the expectations with respect to energy prices that existed just five years ago. Similarly, concerns with climate change could become even more serious than they are today. Our work on the Transportation of Energy Commodities (see Chapter 8, Volume II) has been predicated on the continued large scale dependence on coal as the predominant energy source for the production of power in India. It is possible that in view of the climate change concerns related to expansion in the use of coal, there could be significant changes in power production strategy. We therefore believe that it is of utmost importance that India develops an institutional mechanism to adapt its overall transport strategy on a continuous basis.

This chapter on Institutions for Transport System Governance is devoted to suggesting such a mechanism so that the recommendations and projections of the NTDPC can be adapted to changing circumstances and conditions, be they related to technological developments, price changes or environmental concerns. For such institutional arrangements to work, it is essential that technical capacities are developed to make continuous technocratic arrangements and adaptations: hence this Committee's emphasis on institutional development for transport governance and the need for significant capacity development. This chapter lays out a framework for moving from the current approach to transport development as a collection of investment projects and sector-focused policy and regulation to system governance. To begin with, we define transport system governance as an institutional system for generating and regenerating policy and investment strategies. 'Good

3. This effect is a well-known theoretical result; Donaldson (2013) shows empirical estimates of the income gains from lowering transport-related trade costs.
4. Michaels (2008) shows that the US Highway system increased the skill premium in rural areas with higher human capital endowments, and lowered in areas with lower levels of human capital, consistent with the Hecksher-Ohlin model of trade.

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governance' is an investment, policy, administrative, and regulatory framework that supports and motivates a supply response to emerging demand for mobility and freight services, and enables a strategic and proactive response to transport planning for policy goals including environmental sustainability, socio-economic inclusion, and energy security.

'Integrated Transport Governance' does not mean setting up new monoliths, but rather creation of circulatory systems for statistical information, user feedback, and constructive interaction between levels of government and agencies focused on particular modes of transport.

The remainder of the chapter focuses on the subset of transport governance issues concerned with integrating policies and investments across modes and levels of government. We look at the status quo in India's transport system in comparative international perspective. India's current structure of separate ministries for each mode of transport is an anomaly in global practice. Transport governance is also unusually centralised, compared to peer countries and there are limited institutional mechanisms for intergovernmental coordination in integrating networks and developing important nodes such as airports and ports. Local government, particularly urban local governments' limited role in regional transport decisions is also somewhat unusual. Most global cities of sizes comparable to India's metros and Tier One cities have far more autonomy to shape their transport infrastructure for development.

Next, we outline a reform agenda for system governance. There are changes needed over the next decade which will be essential foundations for the country's longer-run transport governance. All involve significant institutional restructuring with associated capacity-building needs that cannot be achieved overnight, but must begin now. A set of critical interventions could be initiated immediately to work toward this transformation and help guide transport investment and policy in the interim.

These interventions at each level of government include:

Union Government Moving toward a single 'Ministry of Transport' by building the infrastructure for intermodal coordination of investment, and more integrated assessment of investment and policies. We envision a more consolidated national transport governance under a newly created **Office of Transport Strategy (OTS)** that is primarily concerned with building the foundation for an integrated energy-efficient national infrastructure, reducing externalities from sub-national transport decisions, and leveraging transport as a contributor to national equity goals. Although the Union government may play a substantial role in financing transport infrastructure, incentives embedded in funding should limit themselves to these roles and, following the principle of subsidiarity, other transport responsibilities should be left to state and urban local governments.

The Office of Transport Strategy should build the foundation for an integrated national infrastructure, reduce externalities, and leverage transport for national equity goals.

State Increasing state-level authority over and capacity for integrated network planning, prioritisation and project implementation, particularly for airports, urban transport and roads other than National Highways. States may also be given greater authority (and central resources) to maintain National Highways. Greater decentralisation of transport planning, within guidelines for environmental impact, inclusion, and other national goals, is in keeping with the principle of subsidiarity. It could improve the transport system's responsiveness to socio-economic and technical change in three ways. First, in the classic theories of federalism, lower level governments are assumed to have an informational advantage in understanding and responding to varied subnational concerns. Second, competition between states for investment and skilled labour can create strong incentives for performance, and third, state-level authority allows for greater experimentation with new approaches and technologies. All of these mechanisms rely on sub-national governments having the ability to identify, analyse and respond to the socio-economic needs of their constituencies.

Metropolitan/Urban India may have as many as 70-80 or more cities with populations of more than one million by 2030. Their needs, and especially those of the six or seven 'megacities' that will be more populous and economically larger than many countries in the world, cannot be handled by national or even national-state collaboration. Unified Metropolitan Transport Authorities (UMTAs) with statutory authority, independent finances, and expert staff with access to relevant data need to be created quickly in India's largest cities, and over time, with State support, in the next tier of cities. The national government has required larger cities to develop transport plans as part of the terms for national funding of urban infrastructure policy and national policy urges cities and states to form integrated transport planning units, but the institutional basis for metropolitan transport investment, management, and regulation remains nascent. Effective integration of transport investment across modes and between infrastructure and its use requires regular access to the information and skills of an expert body, as well as a governance structure that motivates attention to regional needs and enables integration of transport

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Our goal is governance that motivates all parts of the system to focus on increased mobility and freight capacity at the least possible economic and environmental cost.

with regional planning. We therefore join the High Power Expert Committee on Urban Infrastructure, numerous experts, and civil society in recommending full implementation of the 74th Amendment and creation of the metropolitan planning committees that it envisions. The UMTAs could ultimately be integrated with these metropolitan authorities. Two additional mechanisms could be formation of autonomous transport planning 'centres of excellence' undertaking education, research, and evidence-based advocacy in all cities of at least a million (see Chapter 5, Volume III on Urban Transport). We also recommend allocating funding to support innovative experiments in 'passenger-facing' integration that reduce as many obstacles to multi-modal mobility as possible and thereby focus attention on the gaps in infrastructure and services. As in our recommendations for states, national funding to metropolitan agencies for urban transport should generally limit conditionalities to outcomes rather than approaches to urban transport.

However, all these initiatives will be empty shells unless India builds the human resource and organisational capacities to develop clear, feasible transport plans, implement them, and develop appropriate research strategies to monitor their progress. India must accelerate investment in training more transport planners and build systems for ongoing updating of skills. Human resource development must include not only an immediate push to fill the current gaps, but also a process for ongoing, continuous learning. India's transport planning institutions and their staff must be both motivated and able to experiment and learn from these efforts, adapt to new constraints, and take advantage of new technologies. Research that documents performance, identifies gaps, and develops solutions on an ongoing basis also plays a key part of sector governance. Such documentation and analysis of the relationships between public policies and outcomes is particularly important for coordinating efforts–and warning of undesirable side-effects of particular policies–in complex federal systems.

We conclude by summarising the institutional design rationale for the recommendations. Overall, the recommendations seek to reshape strategy, planning, and implementation across several dimensions: modes of transport investment, physical infrastructure and policies that affect the efficiency of use, and different national, regional, and local-scale systems. Our aim is to encourage governance that motivates all parts of the system to focus on the goal of increased mobility and freight capacity at the least possible economic and environmental cost. Projects and processes are a means, not an end.

DEFINING TRANSPORT SYSTEM GOVERNANCE

'Transport System Governance' is the combination of market, political, and administrative processes that define options for transport investment and use; prioritise among these options; implement the plans through law, regulation, community action and other means; and undertake research to measure the impacts of the transport investments and policies, and provide feedback for system improvement. The 'transport system' comprises various forms of physical infrastructure as well as the policies regulating access to and use of the facilities. Airports, container depots, ports, roads, rail, and inland waterways are part of the same network on which people and goods circulate; traffic laws, environmental regulation, competition regulation, and other policies create the incentives for investment in and operation of the airlines, buses, trucks, cars, ships, and trains that provide the flow. As 'governance,' it ideally includes various feedback loops: from market demand to investment, from political aggregation of preferences to policy choice, and from research to definition and evaluation of cost effective technology, policy, and investment options.

Any institutional strategy for transport governance must recognise that it is transport users' decentralised decision-making within the guidelines of policy and physical restrictions of infrastructure ultimately determine the extent and distribution of transport services available. Physical infrastructure and the policies governing its access and use create a framework for investment and location decisions as well as use of the network, but do not and cannot fully determine the quality of the system.

Government typically sets the terms of access to infrastructure in order to prevent monopolisation of fixed facilities (e.g. roads, railroad tracks, airports, ports) and to maintain incentives for service providers to minimise costs for high-quality service. It generally undertakes this role using a combination of three instruments: public sector development and management of fixed facilities; public-private partnerships with contractual provisions limiting the private partner's ability to restrict access to the facility; and regulation of private providers of fixed facilities. Maintaining competitive access to infrastructure facilities does not require public ownership, construction, or operation of infrastructure.

Governments also generally design and enforce safety regulations for services operating on the physical infrastructure (airlines, bus transport, etc). The market is unlikely to create sufficient incentives for safe operation, because passengers and freight users cannot

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readily observe many of the maintenance actions and technical decisions related to safety, nor is there likely to be sufficient competition to allow users to exercise choice to create market pressure for safety. This includes creating and enforcing norms for network use such as speed limits, and traffic rules–a classic coordination role (see Chapter 12, Volume II on Safety).

Policy is important for ensuring that the transport system meets social goals such as environmental sustainability, energy efficiency, and social/economic inclusiveness. There is a range of instruments for achieving these goals, including direct siting and construction of physical infrastructure, subsidies for investments in physical infrastructure, subsidies to service providers, pricing policies, and specific purpose transfers to transport users, among others. Fiscal policies that affect the price of essential inputs for transport, such as fuel, may be designed for a variety of policy goals (such as revenue maximisation) but also affect the transport systems' impact through their influence on individuals' choices about forms of transport in which to invest.

While private investors have sited and built trunk infrastructure in the past (including, especially, railways in the 19th century, since access could be more readily controlled than for roads), governments typically undertake high-level design of the network as part of regional planning for economic development. While each of the components of a transport system could be built and operated privately (possibly under regulation to create competitive access), the public sector is more likely to internalise the externalities that each component creates for other parts of the system, the environment, and energy use. The government's roles in creating the physical network and regulating its use are intertwined, since both affect the potential flow rate of goods and passengers. Public sector institutions can also leverage their scale and relative consistency of structure to provide unique opportunities for accumulating knowledge, experience, and institutional memory over the long term.

The government's role in recognising and creating incentives to internalise externalities from transport investment is particularly important for urban infrastructure. There is a strong and long-lasting relationship between land use and transport as well as significant long-run environmental externalities of transport infrastructure when traffic densities are high. Freight and passenger links to surrounding regions determine the urban economy's contribution to national development. Transport also has social spillovers for equity, access to human-capital enhancing services (health and education), and labour market functioning. Gaps in the transport network can generate significant and long-lasting inequality by distorting firm location decisions and labour markets. Limited access to transport networks may motivate higher concentrations that

Transport has strong social spillovers. Gaps in the transport network can generate significant and long-lasting inequality by distorting firm location decisions and labour markets.

may then be self-reinforcing, while congestion in economically vibrant areas may drive excessive dispersion. The government's role in providing finance for transport is especially important in rural areas where traffic and freight flows are not likely to be high enough to attract private investment.

Finally, much of the transport system's physical backbone is also publicly financed. Pure private investment would fall short of the optimal level of transport investment, given the positive externalities from transport development. Many parts of the transport system are also difficult to exclude people from, so would be difficult to finance based on user fees alone. Public finance, whether through broad taxes, carbon dioxide and fuel taxes, or other more focused benefit-linked means such as transport service taxes or user fees and land-based financing, is thus the only option.

In short, the public sector's role is to create an enabling environment for competitive public or private provision of energy-efficient, socially and economically inclusive mobility services.

The NTDPC is meant to provide a framework for institutional design and policy action. The market's role in transport system governance is in the background as a set of transactions and investment decisions that respond to policies that set the context for seeking profits and returns on investment.

Today's transport policy is important, particularly since the modal and spatial distribution of investment will affect the possibilities for freight and passenger flows for decades. However, tomorrow's policy is also important and India must begin to develop the institutional capacity to make these decisions without resorting to unusual arrangements such as the NTDPC. India's transport system will affect and be affected by a various 'known unknowns' in the coming decades:

- Variation over time and across regions in economic growth, driven by exogenous shocks (e.g. monsoon variability) and endogenous but spatially varying factors (e.g. state-level reforms).
- Urbanisation that could be concentrated in concentric rings around existing major metros or could agglomerate across a number of smaller urban areas. Transport investments will play a large role in shaping these patterns, but also have to anticipate and respond to the shifts.

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Any institutional strategy for transport governance must recognise that transport users' decentralised decicion making within policy guidelines and physical restrictions of infrastructure ultimately determine the extent and distribution of transport services available.

- Electricity requirements and the means by which they are met: patterns of investment in transmission and generation that affect requirements for fuel transport, energy pricing and fuel choice (see Chapter 8, Volume II on Transportation of Energy Commodities).
- Global energy prices and fiscal policy choices that in turn affect choices about shipping and mobility.
- Technology change that alters costs of transport at various scales, energy requirements for transport, and/or dematerialises communication (e.g. substituting video/voice for mobility; data transmission and decentralised production for freight shipping).

Our emphasis on the institutional system is distinct from the more common approach of stating a policy goal. The Urban Transport Working Group of the NTDPC, for example, argues that India's urban transport planning must move toward an overall approach of 'Comprehensive Mobility Planning,' aiming to increase accessibility ('the ability to reach desired goods, services and activities') rather than simply increase mobility and manage traffic. The planning regime should be capable of designing and implementing programmes to 'Avoid' (reduce demand for trips through IT investment, land use planning, and other means); 'Shift' (shift mobility from personal vehicles to more energy and space-efficient public and non-motorised transport); and 'Improve' (increase fuel efficiency, reduce emissions) in addition to the traditional functions of planning, siting, constructing, and maintaining urban transport infrastructure. These goals are hard to argue with, but the challenge is how to encode these systemic goals in specific departments' operational, tactical decision-making for the next decades, in ways that allow decision-makers to adjust the means of meeting them to administrative capacity, budget constraints, technology opportunities, demographic change, new information on environmental and social impacts as more data on these points emerge, and other local factors.

SUMMARY

India's transport system will affect and be affected by various 'known unknowns' in the coming decades, including variation over time and across regions in economic growth, urbanisation, energy use and energy markets, and technology change. 'Transport system governance' is the combination of market, political, and administrative processes that will enable the country to respond to these changes. The 'transport system' comprises various forms of physical infrastructure as well as the policies regulating access to and use of the facilities. As 'governance,' it ideally includes various feedback loops: from market demand to investment, from political aggregation of preferences to policy choice, and from research to definition and evaluation of cost effective technology, policy, and investment options. Any institutional strategy for transport governance must recognise that transport users' decentralised decision making within the guidelines of policy and physical restrictions of infrastructure ultimately determine the extent and distribution of transport services available.

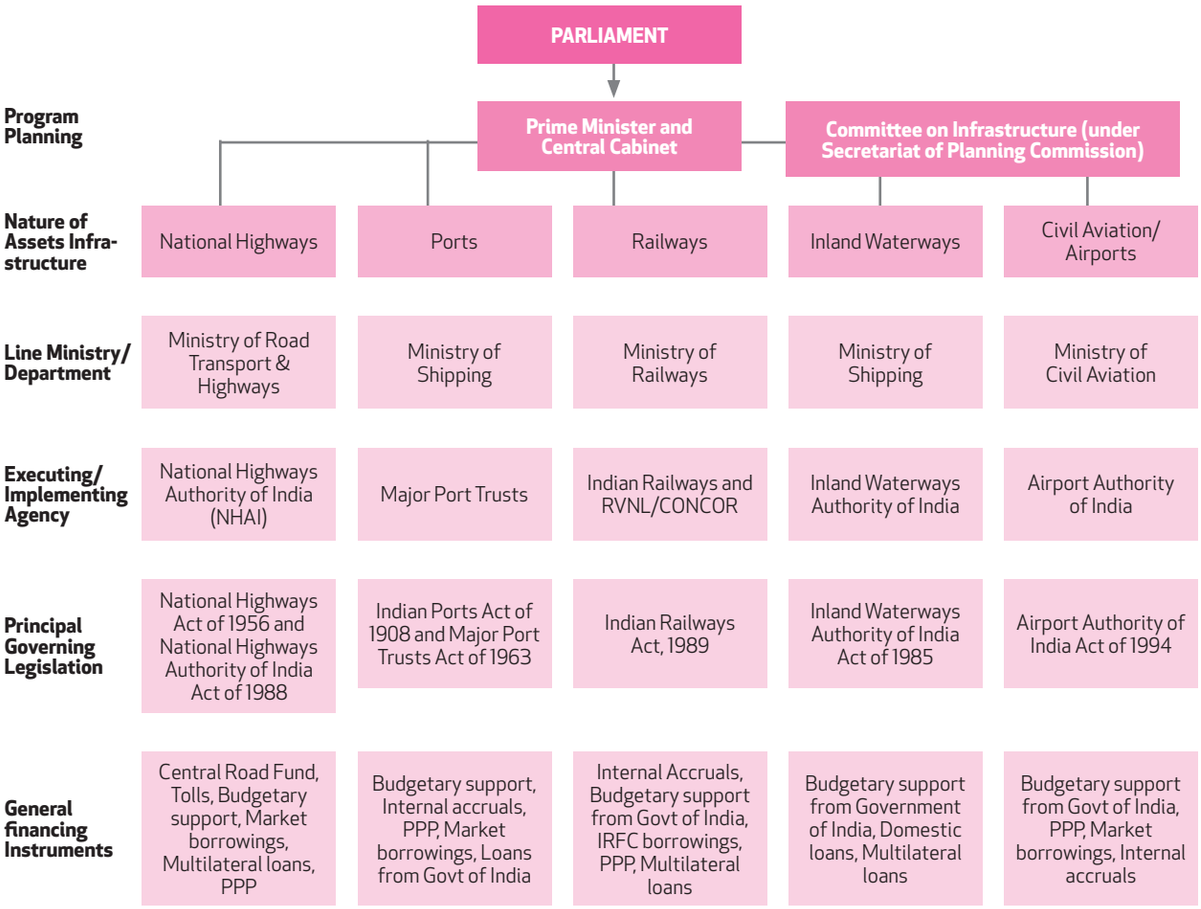
The NTDPC is meant to provide this framework for institutional design and policy action. Policy is important for ensuring that the transport system meets social goals such as environmental sustainability, energy efficiency, and social/economic inclusiveness. The government typically sets the terms of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

TRANSPORT SYSTEM GOVERNANCE IN INDIA: 2012

India's transport policy environment is fragmented between modes and level of government, with infrastructure investment planning, policy-making, regulatory oversight (to the extent that it exists), and financing strategies scattered across and within levels of government. The country is unique in having separate national ministries for each mode of transport. India's intergovernmental division of responsibilities is somewhat more centralised than in other geographically large federations, and the country lacks the govern-

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Figure 5.1
Institutional Arrangement in Central Government



Source: NTDPC Research.
Note: CONCOR=Container Corporation of India; IRFC=Indian Railways Finance Corporation; PPP=Public Private Partnership.

ance infrastructure for intergovernmental coordination around the points where the pieces of the transport system link together. It also has an unusually complex urban policy environment, with limited metropolitan-level fiscal or administrative powers to coordinate transport infrastructure or policy in denser areas.

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

OVERVIEW

Annex 5.1 summarises the country's transport policy oversight across levels of government, focusing on the agencies involved in investment and operations of transport.

Figure 5.1 is a snapshot of the national government agencies involved in India's transport governance. The degree of fragmentation has evolved and generally increased over time. Oversight of rail and ports, at the time the major modes of transport, were initially combined under the Department of War Transport, carved out of the Department of Communications in 1942. Road planning was initially left to another descendant of the Department of Com-

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India's transport policy environment is fragmented, with infrastructure planning, policy making, and financing stragies scattered across and within levels of government

munications, the Department of Posts and Air, but assigned to the Department of War Transport in 1944 'in view of the imperative need for close coordination of effort between the authorities concerned with Railway Development and those concerned with the development road communications and transport.'[5] The Ministry of Railways was carved out of the Department of War Transport soon after Independence, in 1951, in accordance with Section 27-A of the Indian Railways Act. The remainder of the Department became the Ministry of Transport & Communications, and some transport-related functions under other ministries (such as Maritime Shipping & Navigation under Commerce) were assigned to this ministry. Assignment of responsibility to departments was reorganised again in 1966, under a renamed but still integrated Ministry of Transport and Aviation.

Two Ministries (Rail and Transport) became three in 1967 when the Ministry of Transport and Aviation was bifurcated into the Ministry of Shipping and Transport and the Ministry of Tourism and Civil Aviation. There was a brief re-consolidation in 1985, with the creation of a new Ministry of Transport with the Ministry of Shipping and Transport absorbed as a Department, but this Department (Surface Transport) became a Ministry again in 1986. The Ministry of Surface Transport was later divided into two Ministries: Shipping, and Road Transport and Highways in 2000. These were merged in 2004 to be two departments of a single Ministry of Shipping, Road Transport, and Highways, but subsequently redivided and currently stand as a Ministry of Shipping with responsibility for Ports and a Ministry of Road Transport and Highways.

The Planning Commission's Transport Division (PCTD) currently functions as the main coordinating body on transport investment as part of its efforts to combine State Plan requests, the broad Plan vision as well as the recommendations of sector working groups and Mid-Year Reviews. Transport infrastructure investment, particularly decisions on programmatic approaches or financially large projects is also a subset of the work overseen by the Planning Commission Secretariat on Infrastructure and the Cabinet Committee on Infrastructure.

The Transport Division's stated mandate[6] includes:

- Addressing policy issues concerning railways, roads, road transport, shipping, ports, inland water transport and civil aviation for improving efficiency and making these sectors more responsive to the present and future requirements of the country.
- Addressing intermodal issues for improving coordination among different transport sectors and ensuring that each sector works according to its comparative advantage and efficiency.
- Organising Quarterly Performance Review Meetings for different transport sectors to monitor progress of transport sector projects according to Plan priorities and targets.
- Carrying out zero-based budgeting in consultation with various transport sector ministries to improve efficiency and utilisation of resources according to Plan priorities and objectives.
- Work relating to Parliamentary Committees for different transport sectors.
- Examining Five Year and Annual Plan proposals received from the states, Union Territories and North Eastern Council in respect of transport sectors.
- Discussions with the representatives of the state governments and Union Territories to review physical targets, programmes and outlays of Five Year and Annual Plans of states and Union Territories.
- Examining the proposals of state governments for provision of Additional Central Assistance.
- Participation in various workshops and seminars relating to the transport sector.
- Formulation, appraisal and monitoring of Five Year and Annual Plans.
- Mid-term review of Five Year Plans.
- Providing inputs for the Working Group Reports on the various transport sectors; preparing Steering Committee Report on Transport Sector.

The first two lines of the mandate imply long-range intermodal planning, but several practical features of the PCTD's context complicate the execution of this task. First, the Planning Commission's larger mandate focuses on capital investment. The policy frameworks for optimising use of the facilities are outside its purview, overseen by ministries, affected by fiscal policy, and enforced by regulatory bodies to the extent that they exist. Maintenance is under ministries' or state agencies non-Plan budgets. Second, most of the Planning Commission's work revolves around a five-year cycle for the Plan. Within this context, there is limited scope for gathering the data or building the technical team for longer-run projections and visioning.

5. As documented in the Organisational History of the Ministry of Shipping listed on its website: http://shipping.nic.in/index1.php?lang=1&level=1&sublinkid=42&lid=52, accessed 13 February 2013.
6. According to http://planningcommission.nic.in/sectors/index.php?sectors=infra, accessed 1 October 2012.

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Third, transport-related ministries (Annex 5.3) have significant scope to define their own policies for the modes of transport that they oversee, whether at the request of the Planning Commission or as independent initiatives. The Planning Commission delegated the first concerted study of urban transport, for example, to the Railways Ministry in the 1960s. The resulting report focused on rail-based solutions. The Ministry of Urban Development, which became the line ministry for urban transport in 1986 after the cabinet changed the Allocation of Business Rules, oversaw the most recent National Urban Transport Policy. It also drafted the Model Urban Transport Act for states. Jurisdictional disputes between the Ministry of Rail and Ministry of Urban Development, such as debates over specifications for the Delhi Metro, were resolved by a Group of Ministers and a Cabinet decision.

Similarly, the Ministry of Civil Aviation plays an important role in determining the location and capacity development of India's airports through the Airports Authority of India (AAI). The Ministry can and does dispute Planning Commission Infrastructure Division initiatives, for example in the case of proposed privatisation of Chennai and Kolkata airports. The Ministry of Shipping, under the rules of business, has responsibility for 'legislation and coordination of development of major and minor ports', as well as inland waterways and shipping policies. It also 'formulates the privatisation policy in the infrastructure areas of ports, shipping, and inland waterways'[7], and developed the Maritime Agenda 2010-20 as a statement of longer-run priorities. The Ministry of Road Transport and Highways (MoRTH) claims authority for 'planning, development and maintenance of National Highways in the country,' part of which has been delegated to the National Highways Authority of India (NHAI) established by a separate Act of Parliament in 1988 (operationalised in 1995).

Transportation planning on a regional (multi-state) scale currently takes place through ad hoc coordination between national ministries focused on particular modes of transport, and state level transport-related departments focused on the areas where their jurisdiction and the transport corridors overlap.

STATE AND LOCAL GOVERNMENTS

State governments play a larger role in constructing, maintaining, and regulating the road transport system and some ports than in other transport sectors. They are responsible for establishing the site, constructing, and maintaining roads other than the National Highways. The central government, however, has an important de facto role in state road planning through the Ministry of Road Transport and Highways' responsibility to 'extend technical and financial support to state governments for the development of state roads and roads of inter-state connectivity and economic importance.'[8]

India is unique in having separate ministries for each transport mode. It lacks the governance infrastructure for intergovernmental coordination around points where pieces of the transport system link together.

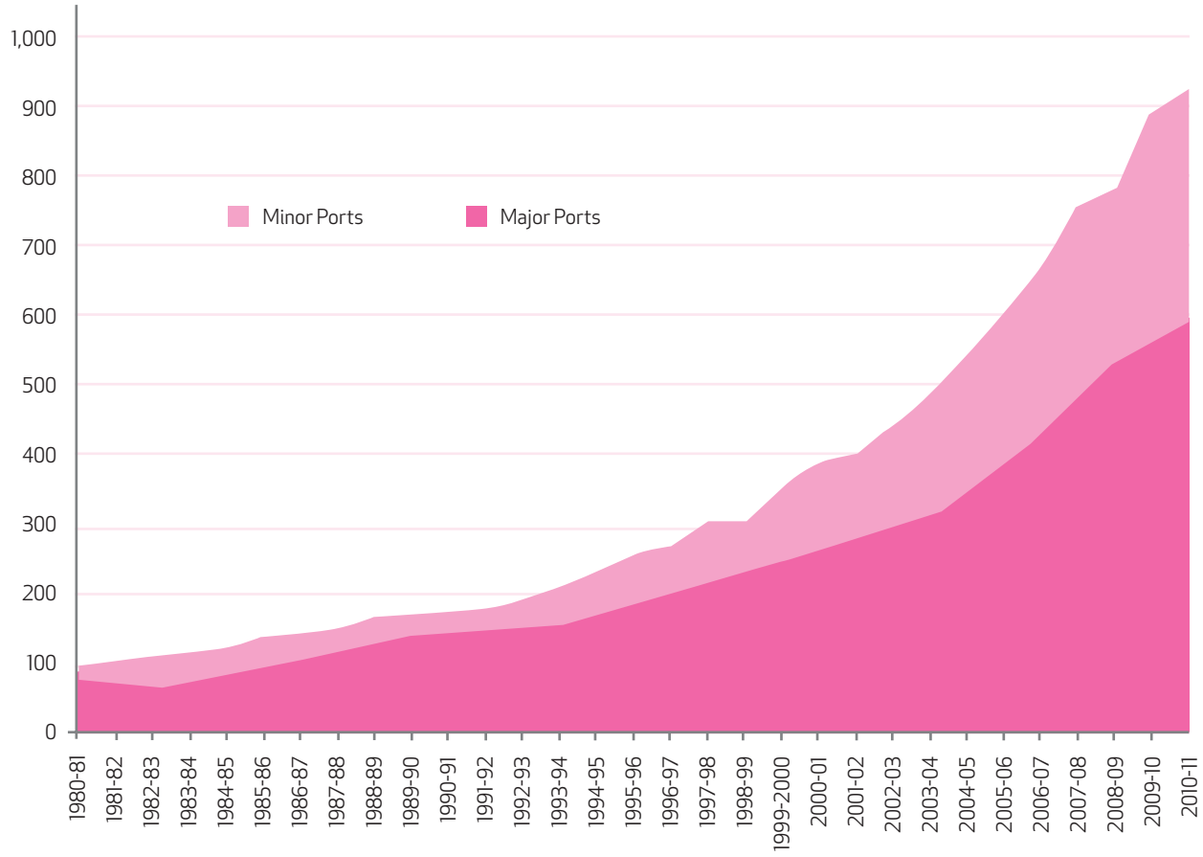
State-level division of responsibility across different tiers of roads (rural, major district roads, highways), policy and implementation, sources of finance (public, private, intergovernmental transfer), and links between the agencies overseeing roads policies and those involved in land, buildings, or other infrastructure also vary. Punjab, for example, separates road planning from construction and maintenance, but does not have separate agencies for rural and district roads/highways. The state has a separate Roads and Bridges Development Board (RBDB) in addition to the Public Works Department. The two are closely linked--the RBDB is chaired by the Minister of Public Works and has the Secretary Public Works as Member Secretary--but the RBDB was established as a separate entity in 1998. It acts as 'a nodal agency to plan, and monitor all aspects relating to construction and improvement of roads and bridges in the state. This Board is responsible for planning and deployment of funds on state roads, fiscal management, project management, interdepartmental coordination and the other key areas.'[9] It is the nodal agency for rural roads under the Prime Minister's Rural Roads programme (PMGSY). The Public Works Department (PWD), on the other hand, is the 'premier agency of the state government for construction, upgradation and maintenance of roads, buildings and bridges in the state.'[10] In Andhra Pradesh, oversight over roads is divided between the Department of Transport, Roads and Buildings (secondary roads) and the Department of Panchayati Raj and Rural Development (rural roads). Within the Department of Transport, Roads, and Buildings, the Roads Development Corporation oversees higher-traffic and privately financed roads. Many of the northeastern states have a single public works department.

The individuals staffing these various entities generally come from the same pool of officers on transfer, however, and thus are likely to have similar attitudes, training, and levels of knowledge on international and national experience in transport. This may improve inter-agency coordination, but it detracts from the ability to pursue specialised goals. As discussed in subsequent sections, it will be important

7. Rules of business as recorded at http://shipping.gov.in/index1.php?lang=1&level=1&sublinkid=43&lid=53, accessed 17 February 2013.
8. Website of the Ministry of Road Transport and Highways, http://month.nic.in, accessed 28 February 2013.
9. http://www.prbdb.gov.in/aboutus.htm, accessed 1 March 2013.
10. http://pwdpunjab.gov.in/, accessed 1 March 2013.

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Figure 5.2
Port Traffic
[Million Tonnes]



Source: Ministry of Shipping, Government of India, http://shipping.gov.in/, accessed 2 January 2012.
ICRA Rating Services - http://www.icra.in/Files/ticker/Indian%20Port%20Sector_Final_26Sep11.pdf, accessed 2 January 2012.

to develop a larger permanent professional staff in relevant state agencies.

The within-state division of authority for the second-tier roads appears to be in part a side effect of the response to new challenges of collaboration with the private sector in infrastructure development: state highway authorities were created to develop, implement, and maintain some sets of highways using private funding, while publicly funded roads remained with the public works or rural development departments. The 2004 enabling Act for Uttar Pradesh's Highway Authority, for example, divides jurisdiction by source of finance rather than road function: '19- (1) Subject to the rules made under this Act, it shall be the function of the Authority to develop, maintain and manage the state highways and any other highways vested in, or entrusted to it, by the state government in the manner that the authority becomes largely independent of government funding for the maintenance of the highways within three years from the date it is set up.'[11]

State Regional Transport Offices (RTOs) also issue licenses for private and commercial vehicles, including the common 'All India Permit' valid in states other than the place of issue. State Pollution Control Boards enforce the regionally varied emissions standards set by the national policy for vehicles.

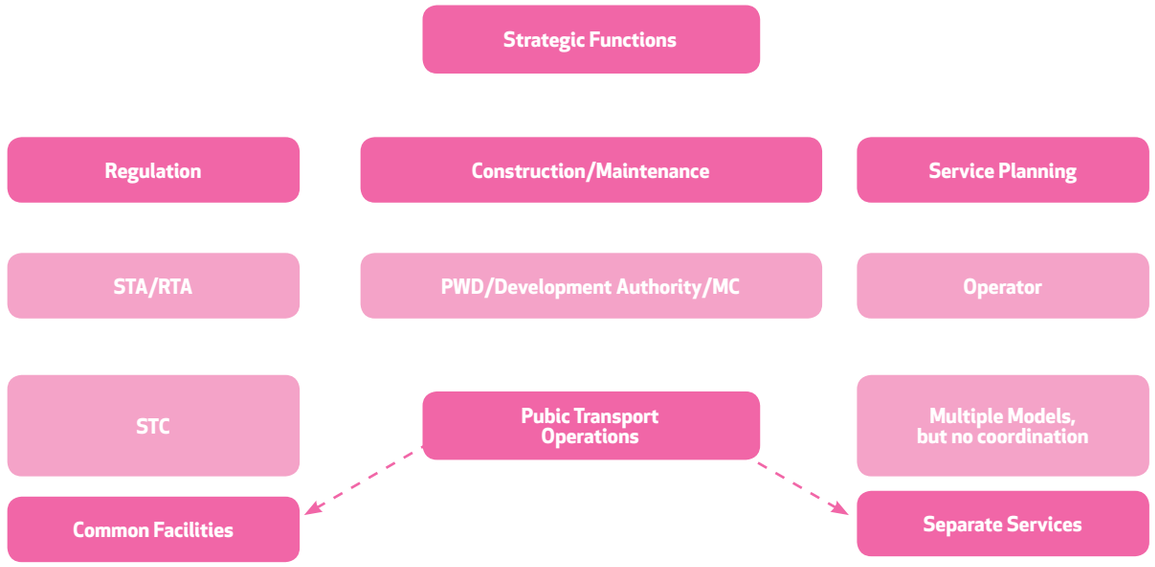
The maritime states have also played a significant role in the development of India's overall port capacity through their investments in and policies toward minor ports. As Figure 5.2 shows, minor ports have accounted for an increasing fraction of India's port traffic over recent years, in part because these ports have been able to engage the private sector in various ways, including allowing the development of captive ports. States have also used their authority over tariffs at minor ports to attract both investment and business, with discounts for larger customers and tariff rates that attract private investment. Dubai Ports World, for example, began looking at larger investments in minor ports after the Tariff Authority for Major Ports reduced the national ports' tariffs to the point that operators started to lose money.

States' direct role in capital-intensive transport investments such as airports or large urban transport systems tends to be limited to being a minority partner with the national government and private

11. http://www.upsha.in/act.htm, accessed 1 March 2013.

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Figure 5.3
Institutional Structure for Transport in Indian Cities



Source: NTDPC Research.
Note: STA: State Transport Authority
RTA: Regional Transport Authority
PWD: Public Works Department
Dev. Auth.: Development Authorities
MC: Municipal Corporations
STC: State Transport Corporation.

investors in joint ventures. State governments can propose airports, but they cannot independently develop these without central government permission. Their main influence is reactive, in their control over land acquisition for the projects and thus the location and pace of these projects. 'Airways aircraft and air navigation; provision of aerodromes; regulation and organisation of air traffic, and of aerodromes; provision for aeronautical education and training and regulation of such education and training provided by states and other agencies' is constitutionally a Union subject in India.

States have little formal influence on railway investment or operations. Connections between state-led transport systems (such as urban public transport) and airports are determined case by case. Indian Railways is divided into zones for investment planning, but these coincide with neither administrative regions (state or metropolitan) nor economic catchment areas relevant for transport system planning.

Rural local governments' role in transport is currently limited to contributions to the district rural roads plans and responsibility for maintenance of some rural roads. Both planning and maintenance are done under the oversight of a District Project Implementation Unit that reports to the state government. Working Groups on Rural Roads for the 11th and 12th Plans have proposed more extensive involvement of panchayat governments, although the Working Group for the 12th Plan notes, 'The objective of transferring full responsibilities for management of the rural roads network to PRIs [panchayati raj institutions] in most states is a long-term objective.'

URBAN TRANSPORT

'The present institutional framework to manage urban transport is quite fragmented and the responsibility is diffused. At the city level, several agencies are involved in the management of various components of urban transport. At the state level, urban transport is managed either by the Urban Development Department or by the Transport Ministry. At the Central Government level, urban transport is being managed by three Ministries, i.e. Urban Development, Railways and the Road transport and Highways. Laying down standards and norms for items such as roads is being done by the Indian Roads Congress.'(67)[12].

Urban transport planning is a 'constitutional and institutional orphan' according to the Report of the Working Group on Urban Transport (2012). It takes place as a collective but not necessarily collaborative effort between national, state, and, to a lesser extent, city government agencies. The specific constellation of agencies involved in urban transport planning varies between states due to their role in defining the financial and human resources of local government institutions, and within states by city size. Figure 5.3 summarises the typical division of responsibilities: the state government plays a dominant role in regulation, state and local government share responsibility for road investment planning and implementation,

12. NTDPC, Working Group On Urban Transport (2012).

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and the local government undertakes maintenance. Public transport services are operated by a mix of state corporations (primarily focused on inter-city transport), municipal transport corporations (intra-city), and private providers of cabs, rickshaws, and mini-buses.

Transport governance for larger cities (million-plus) is more complex, in part due to the scale of operations but also because it often includes rail-based intra-city transport that national and state agencies are typically involved in.

Recent initiatives to encourage more integrated transport planning in India's larger cities expose the significant gaps in capacity to leverage urban transport for metropolitan development.

The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) required all eligible cities[13] to create comprehensive mobility plans (CMPs) in order to access funding under the programme. These generated some attention to integrating transport planning and the funding does appear to have created an impetus and opportunity for strategy documents such as the Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC)'s Comprehensive Traffic and Transport Plan.

The Energy and Resources Institute's (TERI) review of Comprehensive Mobility Plans (CMPs)[14] finds that the CMPs generally were not integrated with other city plans such as the Master Plan, and that the links between broad goals (if articulated) and specific projects were not made. Most of the CMPs mentioned the need for some kind of apex body, but did not mention details about how these would be formed. The Association of Municipalities and Development Authorities offered a similar critique in a 2010 review of the 35 CMPs then completed or underway. Chotani noted various gaps in the CMPs: lack of attention to mixed land use, slum and informal settlements and mobility needs, inattention to broad changes in city structure and links to the urban periphery, and lack of elaboration on legal and administrative issues in implementation. The report also noted that costing and funding were 'not on a rational approach,' cost benefit analyses were rare, and that road-widening projects were typically at the cost of space for pedestrians.[15]

A report by Hidalgo et al. interviews with '28 urban transport and planning experts in India, including Central, State and Municipal government officials, civil service officials, consultants, academics and representatives of NGOs'[16] found that some cities had gained new insight into transport planning and started to shift their thinking in line with moving people not vehicles. However, the authors' review of CMPs found that they were more often a list of projects rather than a plan based on a coherent strategy or enabling monitoring of the strategy. Municipalities did engage consultants and officials in preparing plans according to the guidelines released by the Union government, making an enormous quantity of data available and highlighting interaction of transport and land use planning. However, the preparation of CMPs was rushed, funding for advancing them very limited, the data collected were generally not managed for subsequent updating and use in ongoing decision-making. The paper also argued that many CMPs involved inadequate consultation in the rush to list projects for funding.

In a separate initiative, the Ministry of Urban Development's National Urban Transport Policy (2006) recommended that each city of more than a million residents form an Urban Metropolitan Transport Authority (UMTA). Only a few cities acted on the recommendation, and even then the UMTAs operate more like committees than planning secretariats. They are the equivalent of the National Development Committee without the kind of technical secretariat that the Planning Commission provides and its ability to generate options for consideration.

As of the 2011 Census, there are 53 cities of that size, but there are only 8-10 UMTAs existing in any form. There are six UMTAs/UMTA-like entities as of 2011, according to Agarwal and Chauhan[17]:

- The Greater Guwahati Transport Coordination Committee, set up in 1999 under the Chief Secretary.
- Delhi Transport Planning Group set up in 2001 under the Chief Minister. The Unified Traffic and Transportation Infrastructure Planning & Engineering Centre (UTTIPEC), set up in 2008 as part of the Delhi Development Authority (DDA), appears to have taken over UMTA-like responsibilities. Agarwal and Chauhan (2011) report that another statutory UMTA was under consideration as of 2011.
- Hyderabad UMTA set up in 2008 as part of the HMDA act. It includes the Chief Secretary as chairman, two transport experts, and heads of all transport agencies.
- Bangalore Metro Land Transport Authority, set up in 2007, discussed below
- Unified Mumbai Metropolitan Transport Authority, set up in 2008.
- Chennai UMTA, set up in December 2010[18].

Media reports indicate that discussions about formation of UMTAs are underway in Pune and Kochi, though the timeframe for implementation is not clear.

13. 68 larger cities, state capitals, and others of historical/tourist/other importance.
14. TERI (2011).
15. Chotani (2010).
16. Hidalgo et al. (2011).
17. Agarwal and Chauhan (2011).
18. The Act is available at http://www.thehindu.com/multimedia/archive/00287/Chennai_Unified_Met_287799a.pdf, accessed 7 March 2012.

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Box 5.1

International Support for Integrated Urban Transport: Sustainable Urban Transport Project

The Government of India (GoI), in association with the Global Environment Facility (GEF), World Bank and United Nations Development Program (UNDP), initiated the Sustainable Urban Transport Project (SUTP) project in June 2007. The programme was started with the aim of developing integrated and comprehensive institutional and capacity development initiatives at the national, state and local government levels. The two main objectives of SUTP are:

- Strengthening capacity of GOI, Institute of Urban Transport (IUT), and participating states and cities in planning, financing, implementing, operating and managing sustainable urban transport systems;
- Assisting states and cities in preparing and implementing demonstration 'Green Transport' projects.

The project is being implemented by Ministry of Urban Development (MoUD), Government of India, through a Project Management Unit (PMU) at the national level. Project activities are under the overall guidance of a Steering Committee, under the chairmanship of Secretary Urban Development.[19]

SUTP implementation started in 2010, and is spread over four years and the project has three main components:

National Capacity Development Initiatives The primary objective of this component is to explore options and carry out preparatory work towards establishing and institutionalising the National Urban Transport Policy (NUTP). UNDP is directly supporting this component and the MoUD is tasked with implementation.[20]

Demonstration Projects The aim here is to implement demonstration projects in selected cities. These projects will then be sustainable transport solution-based models for other cities to replicate. The projects focus on four themes:

- Public transport development
- Non-motorised transport development
- Intelligent Transport System (ITS)
- Integrated land use, transport planning and Transit-Oriented Development (TOD).

The World Bank started with an initial list of about 30 cities, and narrowed this down to four demonstration cities: Pune and Pimpri-Chinchwad (Maharashtra), Naya Raipur (Chhattisgarh), Indore (Madhya Pradesh), and Mysore (Karnataka).[21] The World Bank supports this component. The MoUD and participating states and cities are tasked with jointly implementing these projects.[22]

Project Management This component aims to provide technical assistance to the MoUD to strengthen its project management capabilities and enable it to successfully manage the implementation of SUTP.

Role of State Governments The participating state governments, through their designated Implementing Agencies (PIAs), are responsible for implementation of their city demonstration projects. Each PIA has a Project Implementation Unit (PIU), which is led by a full-time project manager. The manager is responsible for day-to-day project implementation activities such as procurement, financial management, social and environmental management, as well as monitoring and evaluation.

Pimpri-Chinchwad, Raipur, Indore, and Mysore are also participating in the Sustainable Urban Transport Project (SUTP) jointly funded by Government of India and the Global Environment Facility (GEF), which includes formation of a UMTA as part of the set of activities for 'pilot cities.' (Box 5.1).

Available information suggests that even the older UMTAs are in the early stages of institutional devel-

19. https://www.pcmcindia.gov.in/sutp/, accessed 21 August 2012.
20. http://www.nayaraipur.com/SUTP/Pages/SUTP.aspx, accessed 29 August 2012.
21. http://www.dnaindia.com/bangalore/report_transport-mysore-makes-a-smart-move_1588173, accessed 2 September 2012.
22. http://www.nayaraipur.com/SUTP/Pages/SUTP.aspx, accessed 2 January 2013.

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Urban transport planning remains fairly insulated from urban residents' inputs. Local economic and political stakeholders have neither a clear voice with which to share information, nor to advocate solutions

opment. According to Agarwal and Chauhan (2011), the Guwahati initiative held one meeting and the original Delhi Transport Planning Group never met. Both were established by executive order, but did not gain traction once their political champions were moved. Mumbai's MTA was also created by executive order, but meets more regularly. The Hyderabad UMTA is reportedly the strongest: it has the power to approve projects and the Chief Secretary plays an active role in convening the various stakeholders. (More specific details of transport planning in Bengaluru, Mumbai, and Chennai are discussed in Annexes to Chapter 5, Volume III on Urban Transport).

State and urban governments appear to be creating, for the most part, committees or committee-like structures in their efforts to integrate transport planning across the many stakeholder agencies and departments. These committees may improve information flow and interagency negotiation, but do not address the deep need for the technical capacity required to evaluate technology options, assess and compare likely impacts of collections of projects, and otherwise generate integrated policy and investment packages to meet urban and regional development goals. Committees are also by definition evolving organisations with limited investment in maintaining knowledge bases or documenting organisational learning. They are no substitute for an organisation with a standing professional staff as well as a core, spatially referenced database on urban development.

Metropolitan planning, the backdrop for integrating transport investments for regional development, is similarly underdeveloped. Four of the 18 states with urban areas that should, according to the Constitution, have Metropolitan Planning Commissions[23] (MPCs) to integrate land use planning, regional development, and infrastructure among other tasks, do not have enabling legislation. Most of the enabled MPCs have not actually been set up[24]. No state has provided its MPCs with adequate sovereign authority to actually consolidate the draft development plan of the metropolitan areas and some of the statutes still contradict the 74th Amendment Act[25].

The state of urban transport planning varies across cities in India, but there are some common features. India's urban governance currently has fragmented authority, limited institutional support and capacity for creating a transport system that can be leveraged for urban planning, environment, and social goals (including, in particular, limited scope for coordination between land use planning and transport system development), and lack of channels for broad input from local citizens and businesses.

Transport planning and efforts to meet environmental goals are often disconnected. Some cities have implemented emission reduction plans by court order (e.g. Delhi's switch to CNG), and all have a formal legal framework for setting air quality norms and enforcing vehicle emissions standards. However, the level of actual enforcement varies, and there is no institutional mechanism for building environmental targets into broader plans for transport investment. Even if all fuel and vehicle-related norms were fully enforced, the fact of traffic and idling would continue to lead to higher than necessary emissions.

Transport development agencies do not currently face direct pressures to ensure that their investments reduce traffic sufficiently to meet air quality norms. Some cooperation occurs: for instance, the Karnataka State Transport Department has agreed to work with the Karnataka State Pollution Control Board (KSPCB) to use IT to track vehicle emissions and identify offenders so that fuel and engine norms can be enforced. However, there are no similar pacts to invest in comprehensive traffic management in the state. The Karnataka Traffic Police and the Karnataka Road Development Corporation (KRDC) have joined forces in the Bangalore Traffic Improvement Project (B-TRAC 2010), but the systems that the KRDC will implement are more concerned with managing the existing vehicles on the roads than substituting public transport for private vehicles or planning land use to reduce the need to move to obtain what one wants.

Finally, urban transport planning generally remains fairly insulated from urban residents' inputs. The ongoing efforts to integrate urban transport planning are driven in large part by state initiatives, where decision making is politically removed from the concerns of particular cities. Local political and economic stakeholders, who may have strong incentives to direct investment into transport infrastructure that supports their cities' integration with the region as well as efficient mobility within the city, have neither a clear voice with which to share information on mobility needs or advocate particular solutions. State governments may very well choose integration-enhancing infrastructure in the interests of the regional or state economy, but there is little scope for businesses or citizens' knowledge of the economy and its potential to be formally considered. There is also no forum to balance varying constituencies' preferences over investment in mobility and

23. 'Metropolitan area means an area having a population of a million or more, comprised in one or more districts and consisting of two or more municipalities or panchayats or other contiguous area, specified by the Governor by public notification to be Metropolitan Area for the purposes of this Part'.
24. Sivaramakrishnan and Maiti (2009). Updated by web search by MJ Vishnu, Research at IIHS.
25. Planning Commission (2011).

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goods transport. Debates over the prioritisation of investment in an expressway or an expansion of rail or bus-based urban transport, for example, happen in editorial pages if at all.

Unresolved inter-governmental allocation of powers over land use planning and urban administration affects the prospects for coordinated thinking about land use and infrastructure development. This is the case across India. The ongoing discussion about allocation of planning authority between the Bangalore Development Agency and the Bruhat Bengaluru Mahanagara Palike (BBMP) is a high-profile example of the unresolved institutional framework for urban planning in general, but it is not unique[26]. Planning Commission (2011) spells out the national impediments to 'urban strategic planning': urban planning without attention to regional development and the urban periphery, 'rigid master planning' that is not integrated with spatial planning including transportation and land use planning, utopian plans without basis in financial and operational realities, 'inadequate institutional clarity,' and lack of capacity and enabling tools such as GIS and GIS-enabled management information systems.

To some extent this fragmentation is a natural consequence of ad hoc efforts to invest in urban transport in the absence of a clear institutional 'home' as well as the rapid pace of some cities' growth and need to accommodate larger flows of goods and people. As we discuss below, it is also not unusual in comparative perspective.

This collectivity of institutions is expected to absorb and allocate up to Rs 1 trillion per year for the next 20 years in the service of urban India's circulatory system[28]. Questions about which levels of government (if any) will raise, direct, disburse, and use these resources are still open in political and bureaucratic terms. The 1992 74th Constitutional Amendment strengthened municipal governments in principle, but states have been slow to devolve the personnel, resources, and powers for urban planning, finance, infrastructure development, and other city administration to cities.

India's challenge will be to selectively improve policy coordination in order to address impacts that are necessarily interrelated through technology or individual decision-making. Land development choices and mobility needs, for example, are linked through peoples' living and working patterns–policy management can take place in silos, but one cannot help but affect the other. Most transport technologies produce emissions that damage health, agricultural yields, and affect the climate. Environmental policy and transport investment can ignore each other, but they cannot avoid affecting each other. As we discuss later, urban transport governance should recognise, address, and shape these relationships. It should not, however, substitute monolithic bureaucratised bottlenecks for the present fragmentation.

The 74th Constitutional Amendment strengthened municipal governments in principle, but states have been slow to devolve the personnel, resources and powers to cities

SUMMARY

The subsections discuss the role and responsibilities of various levels of government. National government agencies include the Prime Minister and Cabinet, the Planning Commission, as well as 5 Ministries, one for each mode of transport, and their sub-agencies. The Planning Commission's Transport Division (PCTD) currently functions as the main coordinating body on transport investment as part of its efforts to combine State Plan requests, the broad Plan vision as well as the recommendations of sector working groups and Mid-Year Reviews. Transport infrastructure investment, particularly decisions on programmatic approaches or financially large projects is also a subset of the work overseen by the Planning Commission Secretariat on Infrastructure and the Cabinet Committee on Infrastructure. Mode-specific industries oversee investment programmes and policy for the modes under their jurisdiction.

The Planning Commission is formally charged with undertaking long-range intermodal planning, but there is not currently any entity undertaking these exercises with data and required expertise. The policy frameworks for optimising use of the facilities are overseen by Ministries, affected by fiscal policy, and enforced by regulatory bodies to the extent that they exist. Maintenance is under Ministries' or state agencies non-Plan budgets. Second, most of the Planning Commission's work revolves around a five-year cycle for the Plan. Within this context, there is limited scope for gathering the data or building the technical team for longer-run projections and visioning. Transportation planning on a regional (multi-state) scale currently takes place through ad hoc coordination between national Ministries focused on particular modes of transport, and state level transport related departments focused on the areas where their jurisdiction and the transport corridors overlap.

26. The Bangalore Development Agency (BDA) is responsible for planning under the current statutory provisions of the State Act on Planning and related laws. However, this goes against the premise of the 74th Constitutional Amendment Act that suggests that these functions be vested with the urban local body, BBMP in this case. While both BBMP and BDA come under the umbrella of the Urban Development Department (UDD), Government of Karnataka, the BDA is currently dominant. As a para-statal, it is not answerable to BBMP. BBMP, on the other hand, follows the Zoning Regulations and Land-use Plan prepared by BDA in according building plan and other such approvals. Public representation by civil society as well as PILs in the High Court have called for shifting more powers and responsibilities to the BBMP.
27. Planning Commission (2011).
28. According to estimates from the MoUD, HPEC (2011).

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In the roads sector, financing and project selection are not always linked. Road policy and investment is often a key tension point in intergovernmental relations.

State governments play a larger role in constructing, maintaining, and regulating the road transport system and some ports than in other transport sectors. Their direct role in capital-intensive transport investments such as airports or large urban transport systems tends to be limited to being a minority partner with the national government and private investors in joint ventures. They have little formal influence on railway investment or operations. Connections between state-led transport systems (such as urban public transport) and airports are determined case by case. Indian Railways is divided into zones for investment planning, but these coincide with neither administrative regions (state or metropolitan) nor economic catchment areas relevant for transport system planning. Rural local governments' role in transport is currently limited to contributions to the district rural roads plans and responsibility for maintenance of some rural roads.

Urban transport planning is a 'constitutional and institutional orphan' according to the Report of the Working Group on Urban Transport[29]. It takes place as a collective but not necessarily collaborative effort between national, state, and, to a lesser extent, city government agencies. The specific constellation of agencies involved in urban transport planning varies between states due to their role in defining the financial and human resources of local government institutions, and within states by city size.

COMPARATIVE PERSPECTIVE

The division of different transport modes between ministries at the national level stands in stark contrast to international practice. Nearly all of the 100 largest economies, all of the OECD countries, and all of India's emerging market 'peers', the BRICS countries, have a Ministry of Transport or similar integrated equivalent rather than the collection of mode-specific ministries found in India. Some of these consolidated national agencies are also combined with the Ministry (or equivalent) of communication, a categorisation reminiscent of India's early post-independence structure. Iran, one of the remaining countries with separate ministries for different forms of transport merged its Ministry of Housing and Urban Development with its Ministry of Roads and Transportation to form a Ministry of Housing and Transport in 2011. While many of the public finance aspects of transportation, such as fuel taxation, design of appraisal for investments, and approvals for liabilities incurred in public-private partnerships remain under the Ministry of Finance or its equivalent, the trend is clearly toward consolidating planning for various modes of transport into one agency (Annex 5.2).

Railways seem to be one of the last modes of transport to be integrated into system-level planning, particularly in countries with significant histories of rail-based transport. In Brazil and Japan, this 'integration' took place through corporatisation, privatisation, and then policy formation by the integrated ministry. China, until recently, still had a Ministry of Transport and a Ministry of Railways. The Ministry of Urban-Rural Development also oversees some rural road infrastructure.

Many of these integrated national bodies adhere to visions focused on outcomes with inputs or investments (in principle) prioritised across modes to meet mobility or freight goals. The United States' Department of Transport (DOT), established in 1966, oversees road, rail, maritime, aviation, and other parts of the transport system. Its stated mission is to 'serve the United States by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future.' (http://www.dot.gov/, accessed 2 May 2012). The United Kingdom's Department of Transport states: 'Our vision is for a transport system that is an engine for economic growth, but one that is also greener and safer and improves quality of life in our communities.' (http://www.dft.gov.uk/, accessed 15 May 2012). The South Africa Department of Transport notes, 'Transport is the heartbeat of South Africa's economic growth and social development!' (http://www.transport.gov.za/, accessed 26 September 2012).

Annex 5.2 shows the division of responsibilities between levels of government in several federations comparable to India. India certainly has a relatively more centralised system. Most federations retain some national government oversight of constructing and maintaining facilities for civil aviation, railways and ports, though few retain the level of national control over civil aviation that India has. South Africa's national Department of Transportation, for example, oversees national and international airports, but the provincial governments have jurisdiction over local airports. Brazilian states and even municipalities oversee some of its airports. Many of Brazil's airports are operated by a national government-owned company, Infraero, but it operates as a concessionaire to the sub-national governments and these governments are free to choose other service providers. Most of the United States' commercial airports are owned by state and local governments, although the national government often subsidises airport development and continues to regulate the

29. NTDPC (2012).

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Box 5. 2

State and Federal Relations: Ebb and Flow of National Authority over Roads in the US

The United States' road network was based on state plans and administrations for much of its history. The national government did provide financial support: first in the form of land grants in the 1800s that states could then auction to finance transport or other improvement projects; later grant support for roads that the state could apply as it wished[30].

The Eisenhower Interstate System was the first major national government entry into planning the road network. Even then, the Bureau of Public Roads (BPR), the predecessor organisation of the current Federal Highway Administration, consulted state highway agencies to determine possible routes in the initial planning process. The final network placement was approved by the BPR. Substantial funding for it was proportioned and dispatched to the state agencies under the Federal-Aid Highway Act of 1956 with the federal government paying for 90 per cent of the project.

Later, in the 1990's, with aims to expand the Interstate System and subsume it under the newly proposed National Highway System (NHS), the FHWA again provided state agencies as well as metropolitan planning organisations a substantial amount of planning power. This included the identification of key routes, elevating existing routes to Interstate status and the ability to choose new technologies such as Intelligent Transportation Systems (ITS). This was done as the FHWA recognised that the lower-level agencies would have a better knowledge of their key resources and that there should be a concordance between national, state and local transportation plans. However, state and local agencies do need to provide required evidence and justification for their proposals ensuring that accountability and participation would be extended to all levels.

The link between FHWA and the states also extends to sharing of transportation data, which has a large impact on planning for the future. The lack of transportation data in India could be remedied with such a system being put into place in state and local governments in the country.

The United States has continued the move back to a more decentralised approach by reducing restrictions on federal funding provided to states. The 'Moving Ahead for Progress in the 21st Century' (MAP-21) bill consolidated most of the federal transfers to states for specific aspects highways into a single, more flexible stream of funding. The US National Department of Transport describes state DOTs as 'the largest units of government that develop transportation plans and projects'[31].

Source: http://www.fhwa.dot.gov/programadmin/interstate.cfm, accessed 12 October 2013
http://www.fhwa.dot.gov/publications/publicroads/96spring/p96sp2.cfm, accessed 12 October 2013
http://www.fhwa.dot.gov/planning/national_highway_system/dfitm.cfm, accessed 12 October 2013
http://www.fhwa.dot.gov/legsregs/directives/fapg/cfr0470a.htm#470113, accessed 12 October 2013

airports as well as oversee air traffic control and safety.

Similarly, planning for road networks is generally divided between levels of government by tier: higher-speed national interconnections under national highway programmes; state highways, sometimes including higher-traffic ring roads or links between urban and rural areas under state governments; and local government oversight of the lower-use local roads. Financing arrangements and decision-making about the location of road investments often cut across this general intergovernmental relationship: national governments sometimes give states specific funds for surface transport; state governments sometimes guide the location of national investments; national and state governments finance some local roads to ensure access to remote populations; and the balance of authority over roads varies over time (Box 5.2). Financing and project selection are also not always linked. Road policy and investment is often a key tension point in intergovernmental relations given the investment requirements well as the networks' economic and social importance[32].

30. Dilger (2012). 'Federalism Issues in Surface Transportation Policy: Past and Present,' Congressional Research Service Brief (United States).
31. The Federal Road-Aid Act of 1916 was limited to support for 'post roads,' which were mentioned in the Constitution as eligible for national support. States later accepted federal funding for other categories of roads in the 1921 and 1944 Federal Highway Acts, but project selection remained in the hands of state officials.
32. U.S. Department of Transportation (2009). A Guide to Transport Decision-making. Available online at http://www.fhwa.dot.gov/planning/publications/transportation_decision_making/decisionmaking.pdf, accessed 22 January 2013.

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While there is agreement on the 'ideal' in urban transport, 'best practice' seems to be elusive. India is not alone in having fragmented and sometimes contradictory systems in this area.

India's governance of regional transport corridors is also somewhat more centralised than international practice for intergovernmental division of responsibility. In some cases, multi-state transport corridors are federal responsibilities, in which the Ministry of Transport or equivalent sets up a sub-agency or a less permanent working group or fund to facilitate inter-state, intermodal coordination. The Saint Lawrence Seaway Development Corporation under the US Department of Transportation, for example, was set up to oversee an important inland shipping route through the Great Lakes. Brazil's national Ministry of Transport has identified eight transportation corridors to be developed to connect inland agricultural areas to ports for export through multiple modes of transport.

In other cases, states or the equivalent first tier of subnational government cooperate to invest in or manage transport infrastructure across state lines, often in collaboration with the national government. The Port Authority of New York and New Jersey (PATH), which oversees bridges, tunnels, terminals, airports in the two-state region, is an example of the latter. It was established in 1921 after a dispute between the national Interstate Commerce Commission ordered New York and New Jersey to find a solution to their disputes over rail and port freight boundaries. The two states formed the authority by interstate compact under a Constitutional clause that permitted such agreements with Congressional consent. The interstate agreements for some aspects of transport in the National Capital Region (NCR) of Delhi are in some ways similar.

The British Metropolitan Areas are another example of voluntary regional coordination for transport systems. These authorities were created (or allowed to continue in existence after the Local Government Reform of 1985) by agreement between the district authorities and were responsible to Boards of Management representing the districts, which had become the highest level of local government in the metropolitan areas after the reform of local government. The metropolitan area of Greater Manchester, one example of this form of organisation, consists of 10 District Councils; Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford and Wigan. Each District Council has the primary responsibility for providing services in its area but contributes finance from local taxes and appoints local councillors to the Greater Manchester Integrated Transport Authority to represent its district. The Authority decides on public transport policy for the county. The Greater Manchester Integrated Transport (GMITA) has less strategic power than TfL (Discussed in Box 17 in Chapter on Urban Transport) and is restricted to public transport management[33].

While there is substantial agreement on the 'ideal' in urban transport, 'best practice' seems to be elusive. Boarnet's (2011) summary of good practice describes aspirations succinctly: 'The intra-metropolitan systems should be governed at a metropolitan scale. Metropolitan transport institutions should have the authority to balance modes, link to land use, price the system, and adjust plans and infrastructure to fit local tastes and contexts and stages of urban development…Anything that empowers metropolitan-scale governance in user pricing (which within urban areas will include congestion pricing and marginal cost pricing of other externalities), land value-capture tax financing, and integrating land use plans and transport infrastructure should be encouraged. This implies that the governance structures at the metropolitan level should have sufficient tax, pricing, and planning authority to meet those objectives.'. Other general proposals for transport investment planning make similar points. Asian Development Bank (ADB) (2009) recommends integrating decision-making by creating a 'Sector Investment Organisation' for transport and other areas. This should be under the umbrella of 'Strategic Development Corporation' aka entity with regional planning authority.

However, India is not alone in having a fragmented and sometimes contradictory institutional setting for urban transport. The 'conventional wisdom is easy to state. But, as far as I know, it is not implemented anywhere in the world,' writes one researcher[34]. Nigeria, for example, has more than 100 agencies across three levels of government involved in providing urban transport infrastructure or services. Most develop and implement their policies and programmes in isolation[35].

Coordinating bus and rail systems appears to be a common challenge for countries as diverse as Mexico, Hong Kong, Vietnam, and the Philippines. In each case, local governments either run buses or award concessions, while national governments plan rail[36].

Colombia's efforts to simply override incumbent bus providers by offering redundant but better service offer another illustration of the challenges of operating without a comprehensive strategic authority. The national government sought to simply build a new, high-quality Bus Rapid Transit (BRT) system in parallel to a politically entrenched bus system, hop-

33. Gwilliam (2011).
34. Frug (2007).
35. Gwilliam (2011).
36. Gwilliam (2011), Perkins (2012).

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ing that the new system would replace/co-opt the old one. De facto policy support for the BRT, however, has been mixed, with the Secretary of Transport allowing the old buses to operate in parallel to the BRT (with additional flexibility in route). Older bus companies have been encouraged to bid for feeder routes, but the regulated routes in the traditional bus system have not been restructured to serve as feeders for the BRT. Gwilliam (2011) attributes the outcome to politics–that the older bus companies 'captured' their regulator--but regardless of the cause, the outcome of clashing systems within the public sector shows the importance of imposing 'peace' via a forward-looking 'referee' for urban transport.

Cities that have succeeded in developing integrated public transport systems still face the challenge of coordinating strategy across investment, maintenance, and regulation of different transport infrastructures. New York City, for example, has a city Department of Transport with 4,500 employees, a Metropolitan Transportation Authority (MTA) operating public transport, and the Port Authority of New York and New Jersey. The first runs subways, buses, and suburban rail to the east of the city, while the second runs the airports, suburban rail to the south, and connections between airports and the rest of the public transport system. A third entity, New Jersey Transit, also run trains and buses into New York and a fourth, the NYC Taxi and Limousine Commission licenses cabs. Transport infrastructure (tunnels, roads, bridges) is overseen by five agencies across two states. Transport for London (TfL) is a prominent example of an agency that has successfully created a seamless passenger experience across subways and buses in the London metropolitan area, but London's boroughs retain authority over a large part of the city's road construction and maintenance. TfL can and does propose integrated policies for reducing congestion and increasing safety on London's roads, host public consultations including on roads development, and develop model contracting and project management frameworks for the boroughs to use, but the boroughs are not legally required to collaborate.

China has moved toward integrating land use and transport infrastructure with a focus on mobility rather than specific modes, but local governments have not caught up with this direction. Most municipal governments oversee a geographic area larger than current built-up area, which has helped with strategic spatial development planning including transport investments, but the integration of decisions about modes of transport is weaker. Local governments still focus on accommodating cars rather than promoting alternatives. Urban bus and metro systems are managed by separate agencies with no formal mechanism for integration, and rail tends to be financially and politically dominant.

Cities that have succeeded in developing integrated public transport systems still face the challenge of coordinating strategy across different transport infrastructures.

Transfers between the two systems are often problematic and inconvenient. Some major cities, such as Kunming, still have no focal strategic planning institutions.

Conflicts between various interests in urban development are inevitable and being resolved on an ongoing basis even in some of the most 'advanced' systems. The Netherlands, for example, pioneered a zoning system that coordinated transport and land-use policy. In practice, local governments sometimes succumb to pressure from large employers and taxpayers to re-classify zones for transport-intensive uses. City and regional plans for land use and transport development in Zurich, Switzerland, were in conflict for about a decade in the 1980s and 1990s. (Perkins, 2012) The typical titles of case studies on urban transport make this clear: Wilkinson (2002) on South Africa asks, 'Integrated planning at the local level? The problematic intersection of integrated development planning and integrated transport planning in contemporary South Africa.' Low, Gleeson and Rush (2003) on Australia, call their study 'Making Believe: Institutional and Discursive Barriers to Sustainable Transport in Two Australian Cities.'

KEY CHALLENGES

This section discusses some of the key challenges that India's institutional environment creates for integrated transport governance. An integrated planning framework and more in-depth research and data collection could help quantify and avert two additional intra-modal challenges stemming from the intergovernmental division of responsibilities.

INTERMODAL COORDINATION OF INVESTMENT

The effects of ad hoc multi-agency coordination are apparent at various scales in India. Facility performance is affected. For example, traffic through Chennai port is growing quickly, but infrastructure projects to connect the port to road and rail networks have been stalled. This is a common occurrence whenever large new facilities such as ports and airports are constructed. Many issues have converged to affect shipping through the port[37]. First, environmental: some of the cargo, such as coal, is dusty, and Madras High Court banned handling of these cargoes. The national Supreme Court then appointed a committee with representatives from state and national environmental regulators, academics, and the relevant state and national top bureaucrats to resolve the issue. The committee has given a list of stringent pollution control measures that the port

37. As reported in Anand (2012).

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The current division of responsibilities between levels of government affects the prospects of each transport mode to achieve its potential efficiency. This seems particularly important for India's road network and ports.

will have to complete before it is allowed to handle coal. Second, the State Public Works Department is behind schedule in linking the port to roads by widening near the gate and an elevated expressway to a Chennai suburb. The Ennore-Manali Road, a joint venture of the state government, two national ports, and the National Highways Authority of India, is also behind schedule. Third, bidders for the container terminal are waiting for security clearance from the Central government. The result: 'Every time a top government official visits the Chennai Port, new hope is kindled among stakeholders for the revival of connectivity projects…And often, such hope fades away soon after the visit'[38].

On the larger urban scale, projects often need to be resolved by diplomacy. Informal coordination between the many agencies involved in Bangalore's transport worked well before the inauguration of the new International Airport at Devanahalli, when the state government constituted a High Level Task Force to Airport Connectivity, under the guidance of an Additional Chief Secretary to ensure there was better connectivity to the new international airport from city centre. Inter-agency agreements have also functioned well. The Bangalore Metrorail Corporation (BMC) and the Bangalore Metropolitan Transport Corporation (BMTC) signed an MoU for Common Day Metro-Bus transit passes in February 2011. 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.

Ad hoc coordination creates an opening for the more politically powerful and/or better-financed transport organisations to disproportionately affect the transport system. The Delhi Metro Rail Corporation (DMRC), for example, reportedly forced the Delhi Transport Corporation to stop operations along some of its routes. It has also opposed proposals for new BRT lines to come up in the same corridors. Such overlapping routes, however, can help ease congestion in the longer run as well as cater to varying client bases.

Diplomacy is also a weak basis for resolving coordination problems that extend across state and national governments. This problem is particularly pronounced for rail-based public transport, which is currently divided among state and national oversight and, within the Union government, between the Ministry of Urban Development and Ministry of Railways. Land use and re-use of existing rights of ways and tracks are one challenge. The BMC and Indian Railways have sparred over land use for points where the two rail networks converge. The Metro's North-South Corridor is stalled because the South West Railways is asking for additional compensation for Railways land to be used by Metro[39]. There have been extended delays over transfer of land to Metro by Karnataka State Road Transport Corporation (KSRTC) and vice-versa for construction of Central Station at Majestic by Metro and Intermodal Bus Terminal at Peenya by KSRTC respectively. The matter appeared in at least two meetings of the Bangalore Metropolitan Land Transport Authority and has been finally resolved. The state government has now resorted to special purpose vehicles (SPVs) to ensure that various projects proposed under the comprehensive traffic management plan move forward[40].

Intermodal fragmentation can also affect regional-scale projects. The Working Group on Roads for the NTDPC reports (NTDPC, 2012) that the Delhi-Mumbai Industrial Corridor Project (DMIC) has been 'persistently making requests to the Ministry of Road Transport & Highways to give special emphasis for development of road corridors necessary for…efficient hinterland dispersal traffic generated on account of the Dedicated Freight Corridor (DFC) and anticipated future demands on account of proposed development of [Investment Regions] and [Investment Areas]' approved by the Government. There has been limited coordination between ministries on developing plans for DFCs and the National Highways Development Programme, although both are important components of the national backbone for freight transport.

INVESTMENT PRIORITISATION WITHIN MODES

The current division of responsibilities between levels of government also affects the prospects for each mode of transport to achieve its potential overall efficiency. This appears to be particularly important for India's road network as well as its ports.

The returns on investment in a kilometer of road depend substantially on what that stretch of road is connected to. The impact of a National Highways project, for example, is affected by the quality of State Highways and Major District Roads that link to it; while the return on upgrading a Major District Road depend on the Highways and rural roads it connects. The funding streams for each tier of roads, however, are distinct and there is limited

38. Anand (2012).
39. http://articles.timesofindia.indiatimes.com/2012-04-18/Bengaluru/31361004_1_railway-land-swr-metro-workers, accessed 2 May 2012.
40. The Bengaluru Airport Rail Link Limited, another Special Purpose Vehicle (SPV) under the Infrastructure Development Department was set to study the feasibility for high speed rail to airport, monorail/ light rail as proposed in Comprehensive Traffic and Transportation Plan (CTTP) and then take on its construction similar to the relationship between BMC and the Metro. In a more recent move, the state government has established Hubli-Dharwad BRTS Company Limited (registered in the first week of May 2012) for taking up the BRTS between Hubli-Dharwad in northern Karnataka.

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potential to transfer funding across primary, secondary, and rural networks based on the contribution of an improved kilometer to the network. State implementing agencies could, in principle, integrate decisions about investment in second tier roads and rural roads funded by the PMGSY, but re-allocating funds between national and state highways would be nearly impossible even if the capacity to evaluate alternate uses of funds in a network perspective existed.

There does not appear to be a comprehensive study of the potential to increase the road network traffic capacity and flow rate through selected targeted investments in roads linking to national highways. However, it is clear that state roads are not always developed in the same timeframe as the national investments, nor do they meet quality standards. The Working Group on Roads for the NTPDC notes that most of the state highways and major district roads, which link state capitals and rural areas with National Highways are not capable of handling the extra traffic that would come from connection to a National Highway system: 65 per cent of the state highways have less than two-lane standards and many have narrow bridges and culverts as well as encroachments where roads pass through towns and villages. Nearly all (90 per cent) of the major district roads also have less than two-lane standards. (NTDPC, 2012b). Road conditions are in part a consequence of the Plan/non-Plan separation of maintenance and capital investment budgets, but inconsistent widths along the same road reflect inefficient allocation even within budgets for capital investment.

Some National Highways have also been a weak link in the network. Bihar's Chief Minister, for example, requested permission to take over development and maintenance of some stretches of National Highway so that these could be brought to the same quality as State Highways. The state unilaterally invested in maintenance from its own budget[41].

The division of regulatory authority over India's major and minor ports affects the potential for competitive development of the overall ports system as well. The differences in regulatory oversight between the two sets of ports mean that the policy environment–labour laws, differential effort to attract private investment, tariffs and returns on investment allowed for private operators, affect private investment decisions in addition to the areas' natural potential as ports or their prospects for serving an unmet freight need. KPMG-CII (2008) notes this bifurcation of regulatory oversight as an important 'distortion in an emerging competitive market'[42].

Checkpoints for collecting sub-national taxes and tolls, lack of access control for highways, and varied state and local traffic enforcement affect the capacity of India's road network.

POLICY INFLUENCES ON CAPACITY OF THE PHYSICAL NETWORK

A transport network's performance depends on the policies governing access to and use of the network in addition to the physical infrastructure. This section provides some examples to illustrate the externalities that fiscal regimes and regulatory policy have on India's transport system. It is in no way a comprehensive inventory of all opportunities to improve the carrying capacity of India's physical transport infrastructure, but is meant to establish the existence of substitutability between investment and policy change and make the case for India to invest in building the institutional capacity to identify, quantify, and reduce these impacts faster.

Checkpoints for collecting sub-national taxes and tolls, lack of access control for highways, and varied state and local traffic enforcement affect the capacity of India's road network, for example. One widely-cited study by IIM Calcutta and Transport Corporation of India estimated that delays at checkpoints led to time and fuel wastage of Rs 870 billion[43]. Deloitte (2012) reported similar findings in a study on the logistics in India[44]. While octroi checkpoints have been nearly entirely phased out along with the tax, tolls and checkpoints for overloading remain. The new category of federally-funded expressways include built-in access control, but states are otherwise in control of preventing incursions on National Highways and the enforcement is complicated by absence of physical barriers. Similarly, traffic control decisions and investments–designation of one-way streets, investments in curbs or dividers, signal timing–affect flow rate and as such can be seen as substitutes for investment in road length or width.

The regulatory and fiscal regimes for civil aviation, fuel, and industry services also affect the impact that investments in airports have on the overall transport system capacity. Landing rights, for example, affect airlines' decisions about routes to serve. The NTDPC Working Group on Civil Aviation considers the slots akin to a 'natural resource,' an essential input for provider decisions on par with spectrum for telecom services (NTDPC, 2012c). There is currently regulatory overlap in slot assignment, some inconsistencies in slot allocation processes across airports, and no provision to trade slots. The gener-

40. Srivastava (2012).
41. KPMG-CII (2008).
42. The document was not publicly available. IIM-Kolkata press release available online at http://iimcal.ac.in/iim-calcutta-study-indicates-huge-loss-countrys-economy-due-shoddy-road-checkpoint-system, accessed 10 January 2013.
43. Deloitte & Indian Chamber of Commerce (2012).

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Fixation of economic levels of rail tariffs, for both freight and passengers, is a constant struggle in the current politicised system that distorts modal distribution of freight traffic.

ally high, but state-varying price of aviation turbine fuel, may also affect route decisions. The Report of the NTDPC Working Group on Civil Aviation notes that ATF accounts for 40-50 per cent of airlines' operating costs. India's fiscal regime also discourages development of domestic maintenance options, affecting flight planning by forcing Indian carriers to take their aircraft to Dubai, Singapore, Malaysia, and other MRO centres. According to the Working Group (NTDPC, 2012c), Indian MRO players have to suffer an additional tax burden of nearly 40 per cent over foreign MROs due to import duties on equipment and spare parts, VAT, and service tax. Domestic MROs also find it difficult to bring experts into India for urgent repairs due to security and visa restrictions. Service aircraft are 40-50 per cent more expensive in India than in neighbouring countries. Spare parts are also not always kept in stock because customs, VAT, and octroi are high for third-party MROs.

Finally, the politics of railway pricing are an obvious factor in the modal distribution of freight traffic. Freight tariffs, kept high in order to cross-subsidise passenger traffic, may be lower at times than the costs of road transport, but they are not sufficiently lower to offset the inconvenience of shifting from rail to road for the last mile of transport. Fixation of economic levels of rail tariffs, for both freight and passengers, is a constant struggle in the current politicised system of fixing rail tariffs.

INDIA'S TRANSPORT GOVERNANCE: 2023

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

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

This chapter focuses primarily on the first three challenges, leaving the other two to the chapters on Regulatory Issues and Research and Human Resource Development. Each of these is representative of broader institutional challenges beyond transport.

SET UP A UNIFIED MINISTRY OF TRANSPORT

CENTRAL GOVERNMENT

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

Transport planning is too big a job for a dedicated 'Group of Ministers.' These are designed for coordination of existing plans and do not have the standing technical staff or information base to undertake integration of plans at the design phase. It is also too big a job to be left to the Planning Commission, as is the current de jure arrangement. As discussed earlier, the transport system involves much more than capital investment and strategies must be developed over a longer time horizon than the 5-10 year period that most of the Planning Commission's work focuses on. It is possible but unlikely for a particularly skilled individual from the Planning Commission or Prime Minister's Office (the two entities with a mandate for inter-ministerial coordination) to broker a set of productive exchanges and concessions. And in any case, this would be short-lived.

That said, the Transport Ministry must be carefully designed to create and maintain an incentive structure that encourages technical excellence, open-minded consideration of all available options, and consistent attention to transport system goals rather than particular means. Concentrating transport authority in one entity creates the potential for more coordinated–larger scale–failure as well as success. This objective implies two essential structural features:

- Explicit distribution of accountability between Ministers and the Ministers of State, with the Minister being responsible for systemic outcomes and 'first among equals.'
- Investment in an integrated monitoring and public reporting system that tracks system performance above and beyond achievements within particular modes. The common data repository would also support improved communication between departments.

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The Transport Minister should be held responsible overall for the transport system's contribution to development goals articulated by the Government. The Ministry's consolidated data collection and reporting should be designed to monitor these goals and should measure system-wide performance on access, energy efficiency, cost, and other parameters. It should also include a Secretary of 'Transport Affairs' or similar, and a professional staff, similar to the Department of Economic Affairs, to support this focus on system-wide performance and develop broad policy and investment frameworks for investments in particular modes.

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

Day-to-day operations should be overseen by Divisions within these Departments, headed by Joint Secretaries. The number and structure of these divisions should be determined on the basis of transport needs, corporate structure, and technical requirements when the Transport Ministry is formed.

Nearly every other country in the world, and every one of India's perceived peers, has moved in this direction. Railway systems have also been included as part of this unified Transport Ministry or equivalent. China's integration of rail into the larger Transport Ministry is underway. Most of these integrated ministries retain the basic division of labour across departments focusing on different modes of transport, with additional 'integrative' sections looking at energy efficiency, innovation, and other cross-cutting functions. This may be for political feasibility, and international experience with integration should be reviewed in more detail after the concept of a single Transport Ministry is accepted in principle.

Consolidation of all or some parts of various ministries into a single Transport Ministry will be difficult in an era of coalition politics, but it must be done. As discussed earlier, the trend in transport governance in India in recent decades has been in the other direction, and any effort to consolidate has been overturned. Fragmentation of responsibility runs throughout the government. Each election brings some form of ministerial re-

Consolidation of all or some parts of various ministries into a single Transport Ministry will be difficult in an era of coalition politics, but it needs to be done. Unfortunately, the trend in recent decades has been in the other direction.

structuring to create the requisite number of cabinet portfolios.

However, politics and the preference for the path of least resistance cannot continue to hold public sector transformation hostage. Other committees have also suggested similar consolidation: the High Powered Expert Committee on Urban Infrastructure, for example, called for merging the Ministry of Housing and Urban Poverty Alleviation and the Ministry of Urban Development. It is time to examine these various suggestions in aggregate and negotiate a comprehensive restructuring. The settlement should also include provisions that restrict the Government's ability to re-allocate business, as a way to prevent the problem from recurring.

STATE GOVERNMENTS

A similar process of integration of transport planning and policy into a single department must happen at the state level. Given states' relatively limited jurisdiction (mainly roads, urban transport, and ports), the main focus must be on integrating investment planning and policy across urban and rural areas, with particular emphasis on serving high-density peri-urban areas. The near-term priority is to develop the states' capacity and ability to articulate transport requirements, improve urban transport and its links to regional economic networks, and provide feedback for national transport investments.

Consolidating transport planning across modes takes time, even when there is some history of coordinated decision-making. Russia, for example, has re-consolidated all of its transport ministries, but is still said to have fragmented decision-making. Central planning involved intermodal coordination among a set of mode-specific industries before the 1990s. The government replaced this arrangement with a single integrated Transport Ministry for all modes except rail when it liberalised in 1990, but then re-divided this Ministry into separate ministries for each mode in 1996. This led to 'overlaps of responsibilities, policy incoherence and most significantly gaps in policy, notably with respect to sustainable development and intermodal containers'[44]. The government attempted to coordinate these Ministries by forming committees (more than 50 of them over four years, but ultimately decided to reunite the ministries in a new Ministry of Transport in 2000.

44. Perkins (2012). 'Seamless Transport Policy: Institutional and Regulatory Aspects of Inter-Modal Coordination,' World Bank—International Transport Forum Working Paper, May 2012.

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Railways came under the Ministry in 2004 when railway operations were corporatised and re-established as a state-owned company. Simply re-labeling institutions, however, has not been enough. According to Perkins:

'The earlier fragmentation of the sector is, however, still felt as many decisions on fiscal policy, funding and regulation are taken in other ministries or in industry associations. The cultural change involved in transitioning from a fragmented model of modal ministries to an integrated ministry with separate corporatised transport service operators is bound to take time and meet resistance, so authority for policy making across the modes has to be identified clearly in government – either in a comprehensive transport ministry or a ministry or inter-ministerial authority for economic reform of some areas of policy are not to be captured by vested interests.'

Later in this chapter, we discuss some early investments in integration.

IMPLEMENT THE 74TH AMENDMENT, INCLUDING, IN PARTICULAR, THE METROPOLITAN PLANNING COMMITTEES

Metropolitan[45] governance is particularly important, given India's new trends leading to expansion around metropolitan cities, in which new employment and investment are increasingly locating on the outskirts of large cities[46]. Economically contiguous (or economically relevant) areas in Indian cities are nearly always much larger than the formal Urban Land Body (ULB) boundaries, and it appears that the large 'near-urban' population is expanding. Some have estimated that as many as 200 million more people live in 'near-urban' conditions on the periphery of metropolitan areas or in large towns that other countries might classify as urban areas.

The new Metropolitan Urban Transport Authorities should be financially independent and have some authority over allocation of funding for urban transport projects, to ensure that they can exercise their statutory role in integrated planning across geographies and modes.

Urban transport governance has several critical elements: expertise for generating feasible policy alternatives and evaluating them on technical merit, discussion fora for evaluating these options in light of multifaceted urban development goals (e.g. sustainability, equity, economic growth), credible authority for sanctioning plans as well as modifying them in light of new information, and the ability to implement the chosen plans efficiently. People need to be capable of generating sound policy options, politics need to hold them accountable for contributions to urban development, and finance has to flow once decisions are taken.

India will need to invest in the people and information systems for urban transport planning as well as delegate the financial authority to act on these strategies. We recommend establishing urban transport as a state responsibility in general, with devolution of authority to metropolitan governments of larger cities. Unified Metropolitan Transport Authorities (UMTAs) must be made independent and given the technical capacity and access to financial resources for effective, responsive metropolitan transport planning.

State governments or their sub-agencies, the Development Authorities, are currently the only platform for such institutional investments, and some of the nascent UMTAs act as subsidiaries of these entities. While the Development Authorities are charged with metropolitan area development, they are politically accountable to the state government. Calls to route more funding for urban transport projects through existing UMTAs operating within Development Authorities could reinforce state dominance over urban transport. International experience demonstrates that consolidating urban transport is a long run (many-decade) institutional construction project in any case; thus, it should start on a firm foundation.

The NTDPC therefore recommends the formation of new statutorily and financially empowered agencies, the Metropolitan Urban Transport Authorities (MUTAs). These are discussed in more detail in Chapter 5, Volume III on Urban Transport. The core point is that these bodies should be financially independent and have some authority over allocation of funding for urban transport projects. The latter is essential for ensuring that the MUTAs can exercise their statutory role in integrated planning across projects, geographies, and modes that may also be influenced by other actors in urban governance.

STRENGTHEN AND COMPLETE THE SET OF INDEPENDENT REGULATORS

A separate chapter addresses the principles and proposed design of transport regulation to oversee various aspects of access to and usage of transport infrastructure, including maintaining competiveness, de-politicising pricing and subsidies, protecting consumers, and governing public-private partner-

45. 'Metropolitan' regions are defined in the Constitution as 'areas having a population of a million or more, comprised one or more districts and consisting of two or more municipalities or panchayats or other contiguous area, specified by the Governor by public notification to be Metropolitan Area for the purposes of [Article 243]'
46. World Bank (2012).

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ships in delivery. We note two points here. First, regulation is a complement to the transport system and substitute for particular transport infrastructure investments. It must be used this way to conserve scarce resources. Emissions regulation, for example, increases the cost of operating a private car, and increases the attractiveness of public transportation. The extra customers swayed toward using the metro or bus system can help improve the financial sustainability of that system. Shifting passengers to public transport can also ease congestion in the same way that widening a road or building a flyover would–in fact, it is likely to be a more sustainable fix since capacity is easier to adjust. Similarly, railway pricing for freight–currently a political decision but at some point a regulatory decision–also affects the use of road versus rail infrastructure and the congestion on each mode for a given level of capacity.

Second, the regulatory framework should comprise a mix of general-purpose and sector-specific regulators as required to leverage expertise effectively. Some topics, such as monitoring and preventing anti-competitive behaviour, for example, draw on a general body of institutional design and economic knowledge and should be governed by law or multi-sector regulators in collaboration with sector experts. Other aspects of infrastructure regulation, such as the means to creating a level playing field given the technologies in use, are arguably more sector-specific and require deeper specialised expertise to be deployed within broad guidelines. India should not simply create sectoral regulators expected to cover all aspects of regulation within a sector-specific silo.

This report recommends sector-specific regulators to identify and allocate valuable inputs between public and private investors as well as between private providers, since understanding the amount, dynamics, and possible divisibility of economic value created by infrastructure development or service provision requires sector-specific expertise.

However, many of the regulatory issues related to transport come down to restricting anti-competitive behaviour, and detection of anti-competitive behaviour is arguably a more general skill. Strengthening the Competition Commission of India (CCI) and clarifying its jurisdiction could support more efficient use of existing infrastructure. Aggregating oversight and enforcement of competitive behaviour also retains flexibility to look into interactions between technologies that may functionally overlap (e.g. different modes of transport). Consolidating competition oversight in the CCI would limit fragmentation of scarce expertise and avoid inconsistent policies across sectors that may be administratively distinct but technologically inter-related. It would also reduce the potential for regulatory jurisdiction-shopping.

Consolidating competition oversight in the Competition Commission would limit fragmentation of scarce expertise and avoid inconsistent policies across sectors.

BUILD AND MAINTAIN A HIGH-QUALITY INTER-DISCIPLINARY PROFESSIONAL BODY OF TRANSPORT PLANNING EXPERTS

Comprehensive transport planning requires a range of expertise to be drawn from different academic disciplines and put into practice. Such expertise is needed to enable the development of feasible, cost-efficient policy options for national, state, and urban local bodies' consideration. Civil engineering and materials science, construction management, project management, financial structuring (whether PPPs are involved or not), economic and other social science analysis of impacts, systems science and agent-based modeling (in turn familiarity with programming and mathematical theory), geography, and other areas of expertise, all have roles to play. This is a medium to long-term goal because it will require both demand-side administrative reform to create attractive positions for transport professionals, as well as investments in the supply side, human resource development.

As discussed in the chapter on Research and Human Resource Development (Chapter 11, Volume II), India must also build up its research capacity. Most Asian and European countries (EC, France, Netherlands, Sweden, Japan, and South Korea) visited in a 2008 study tour undertaken by the United States' Federal Highways Authority believed that 'if you aren't doing transportation R&D, then you won't be globally competitive.'[47] Research and policy analysis also create important feedback loops for transport policymakers as well as those in other agencies (such as revenue) whose decision affects the system. It is not possible to integrate all factors that affect transport outcomes into one institution; research and policy analysis create an alternate means for information to flow between decision-makers. Transport data and analysis also play an important role in modulating the market response to transport policy and investment: investors and customers who are aware of their options are logically more likely to behave like the optimising individuals often assumed in models.

47. Office of International Programs, U.S. Federal Highway Authority. Report available at http://international.fhwa.dot.gov/pubs/pl09015/02.cfm, accessed 13 October 2012.

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INDIA'S TRANSPORT GOVERNANCE–FIRST STEPS: 2013

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

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

In the long run, there is no substitute for establishing financially independent, well-staffed urban governments that would undertake transport among other roles.

OFFICE OF TRANSPORT STRATEGY: INTEGRATING NATIONAL TRANSPORT DEVELOPMENT

Given the political challenges of consolidating India's existing division of responsibilities in the short run, India must focus on the most essential part of the groundwork for integrated transport governance: establishing a 'Strategy Secretariat' with the resources to build a technical team; aggregate, manage, and analyse transport data; and assert itself as a compelling advocate of policies that leverage transport for development goals.

The proposed Office of Transport Strategy should be set up as an independent agency along the lines of the Independent Evaluation Office of the Planning Commission[48]. The IEO has been constituted to review progress more than set forward looking strategy, but, most importantly, it has the freedom to conduct independent analysis, hold open consultations, and publish its research in any way that it sees fit.

The OTS mandate would be to build on the work of the NTDPC by providing ongoing technical support for sectoral investment programmes as they are accepted, evaluating alternatives for the institutional reforms, setting up new entities as proposals are accepted, and updating the Committee's analysis in coming years. Strategic transport planning is not a one-time exercise, particularly in times of economic and political uncertainty.

The OTS should also have the mandate to overhaul India's system of transport statistics in preparation for the creation of a Ministry of Transport. The simple act of measuring and tracking outcomes is a necessary foundation for moving investment and policy away from processes and projects to systemic impact[49] outlines the evolution of transport policy's focus:

'Over recent decades there has been a growing focus in transport policy making towards service delivery to end users, in both freight and passenger transport. The policy focus has shifted from intermediate goals such as annual plans and budgets for public transport corporations and annual spending on infrastructure, to final goals in terms of the effectiveness of transport services in providing access to jobs, housing and leisure activities, aiding the competitiveness of businesses and creating the conditions for economic growth.'

This transition cannot happen in a context where progress is measured by project completion or process guidelines. Perkins goes on to emphasise the importance of developing new data on transport to inform policies and investments in the system:

'This [emphasis] is reflected in a range of initiatives including requirements for public transport services to publish key performance indicators, governments providing public support for the development of advanced logistics management tools, increasing political interest in congestion and a new transport policy focus on reliability of service and, in a few administrations, the development of analytical tools to focus on the end-to-end journey.'

An OTS with a mandate to produce and disseminate policy options focused on leveraging transport investment and policy as tools for development and the powers to obtain the required inputs and ensure that its analysis is considered in key decision-making fora would fill an important gap in India's transport governance. As technical agency, it would effectively

48. The first Director General of the IEO, Ajay Chibber, was appointed in August 2013.
49. Perkins (2012).

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Box 5.3
Factoring Life Cycle Energy and Emissions Costs in Transport Decisions

Environmental impact assessment exercises and other environmental analyses carried out to support decision-making in transport sector do not consider the full life cycle energy and CO_2 costs/impacts of transport modes and focus on the tailpipe impacts only. It is, however, necessary that a holistic approach is adopted while analysing the impacts of the sector. Different transport modes involve varying degrees of construction and maintenance activities; while some modes may be highly material and energy intensive, the others may be comparably low intensive. Material and energy consumption at various stages of a transport project i.e. construction, operations and maintenance, needs to be examined in order to fully understand its impacts on the environment. Life cycle analyses (LCA) are typically used to assess such holistic/full-life impacts of various products, systems, projects, etc. ISO 14042 defines LCA as a systematic way of evaluating the environmental impacts of products or activities by following a 'cradle to grave' approach. It involves identification and quantification of material and energy consumption and emissions which affect the environment at all stages of the entire product life cycle.

Application of LCA to the transport sector becomes important as transport impacts are not limited to tailpipe only. Full life cycle impacts of transport need to be accounted and recognised while taking policy decisions related to 'greening' of the sector. Understanding of the life cycle energy consumption and CO_2 emissions associated with various life stages of different transport modes can help make informed choices for climate-friendly and energy-efficient modes for the country and for suggesting intra-mode improvements to reduce these impacts.

The LCA in the transport sector should aim to understand the energy and emissions equivalent impacts of at least the following activities in life cycle of any transport project[50].

1. Production of construction materials used in transport construction activities
   - Embodied energy and CO_2 emissions in construction materials
2. Transportation of construction materials to site
   - Direct energy consumption and CO_2 emissions due to fuel consumption by vehicles transporting construction materials
   - Embodied energy and CO_2 emissions in fuels used
3. On-site construction activities
   - Direct energy consumption and CO_2 emissions due to on-site fuel consumption (by construction machinery)
   - Embodied energy and CO_2 emissions in fuels used (by construction machinery)
   - Carbon sequestration potential lost due to removal of vegetation on site
4. Operations of rolling stock/vehicles
   - Direct energy consumption and CO_2 emissions by rolling stock/ vehicles
   - Embodied energy and CO_2 emissions in fuels used
   - Energy consumed and CO_2 emitted due to manufacturing and maintenance of rolling stock
5. Annual and periodic maintenance works for fixed infrastructure
   - Material consumption (embodied energy and CO_2)
   - Energy use on site

Source: TERI (2012).

complete the triad of capabilities required for transport strategy: generation of sound policy options (OTS), review of consistency with social goals (Government), and implementation (existing Ministries-cum-Departments of the Ministry of Transport). It would leave existing agencies to pursue their current mandates, but within a clearer strategic framework. The Planning Commission, for example, would continue to coordinate investment planning across ministries and states. Each ministry would continue to be the nodal agency for policies and investments in its jurisdiction.

The OTS should be granted a number of powers in order to pursue its mandate. These include:

- Mandate to recommend formation of a High-Powered Committee, Group of Ministers, Expert Group/Task Force or similar to further coordination of projects and transport

50. TERI (2012).

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Box 5. 4

Facilitating Informed Choices of Urban Transport Modes

An understanding of the life cycle energy and emission costs resulting from the above listed activities in the life cycle of a transport project can help make informed and objective choices of transport modes and technologies in our policies and plans, especially in urban transport plans where different urban transport options are evaluated for meeting the mobility needs of the cities. As stated earlier, traditional environmental impact analysis exercises carried out to support decision-making in transport sector do not consider the full life cycle energy and CO_2 impacts of transport modes.

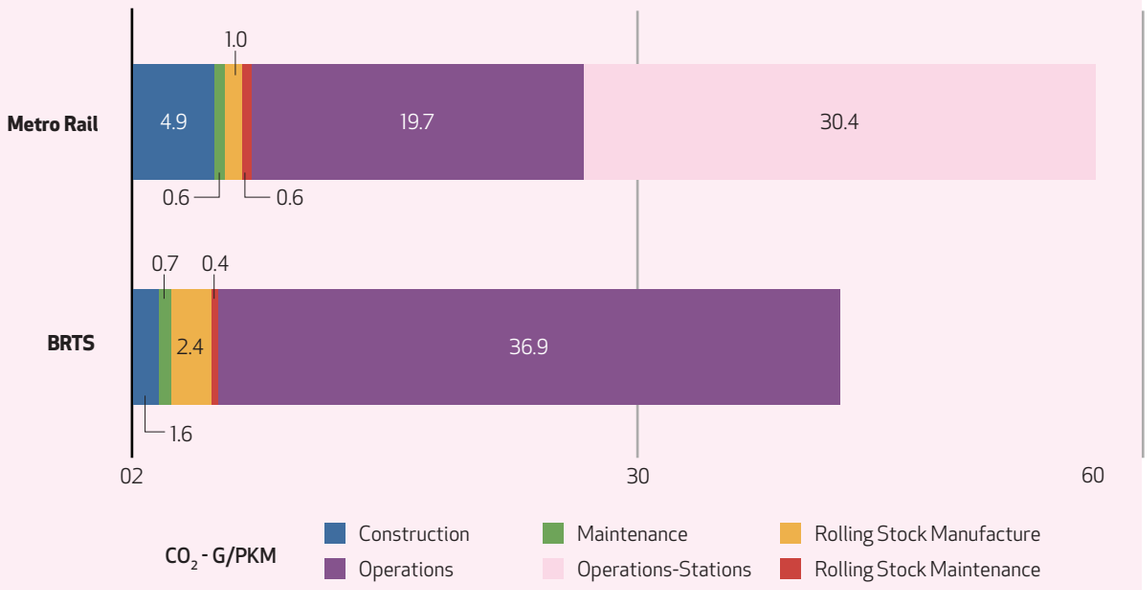
It is important that decisions related to choice of transport modes, especially in urban transport plans, consider the life cycle impacts in terms of energy and CO_2 emissions in addition to other financial, technical, and environmental criteria used today. This becomes important in today's context when energy security and climate change have been recognised as areas of concern and measures to address these challenges are being deliberated upon. Consideration of modes that are least energy and carbon intensive throughout their life period can help address these challenges to some extent.

Considering life cycle energy and emission costs in urban transport modal choices can change the way we conventionally go about making choices for different transport modes in our cities. While cities may choose high capacity public transport systems like metro rail as the least carbon emissions generating technology for public transport because they generate zero emissions at tail pipe, an evaluation based on life cycle analysis indicates that a metro system generates more CO_2 emissions/PKM on a life cycle basis compared to for example a BRT system, which can also offer high levels of capacity to carry urban commuters (Figure 5.4). The same metro system, however, is more energy efficient (on a per PKM basis) for its full life period, when compared to a BRT system (Figure 5.5). Introducing life cycle impact considerations can hence bring more detailed understanding of the overall impacts of a system/proposed infrastructure project that are not limited to just tailpipe or a particular city and help make informed choices based on the economic, social and environmental objectives/goals set by national, state or city governments.

Source: TERI (2012).

Figure 5. 4

Life cycle CO2 emissions (Per PKM): Ahmedabad BRTS and Delhi Metro Rail (Phase I and II) Projects

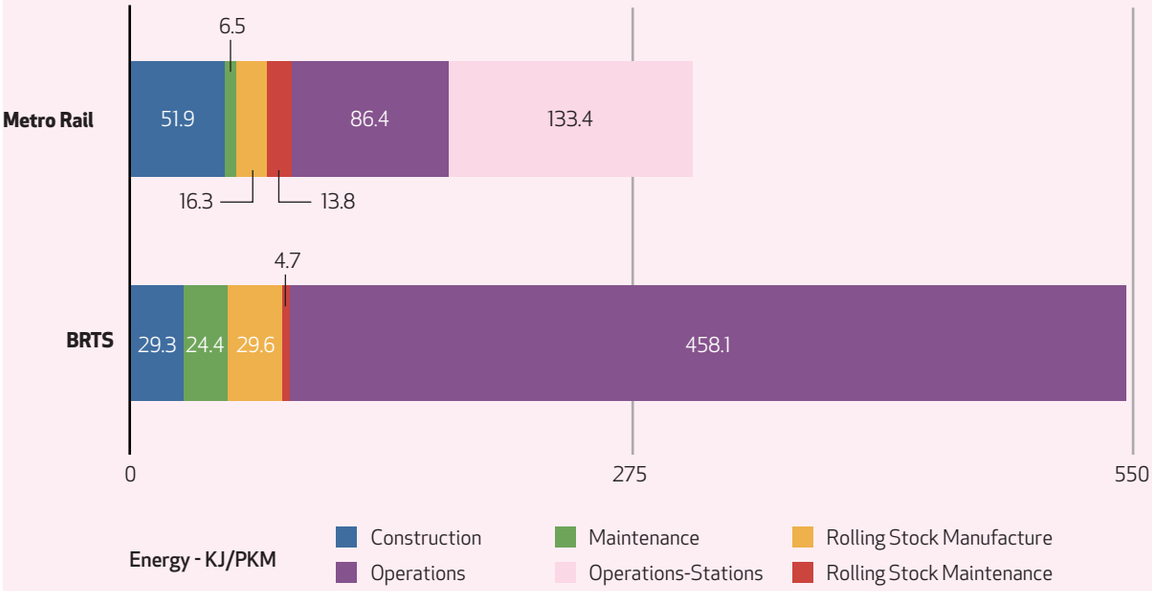


Source: TERI (2012).

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Figure 5. 5

Life Cycle Energy Consumption (Per PKM): Ahmedabad BRTS and Delhi Metro Rail (Phase I and II) Projects



It is important to note that the LCA results cannot be generalised. While in smaller cities, high capacity systems like metro rail may not look desirable from a life cycle energy and emissions impact basis (per PKM) on account of the low ridership, the same systems may be highly desirable in very large cities having very high levels of ridership. The choice of a particular mode in each city hence needs to go through such detailed analysis exercise to arrive at the most context-specific and economically and environmentally feasible choice.

As stated earlier, there are significant energy and CO_2 impacts due to construction and maintenance of transport infrastructure. Construction and maintenance of transport infrastructure involves consumption of materials and fuels, some of which are highly energy and carbon intensive and lead to significant contribution to life cycle energy and CO_2 impacts of a particular transport mode. LCA, if carried out, can indicate the materials and fuels that should be replaced by alternative materials and fuels that are less energy and carbon intensive, if available. The LCA can also indicate the impact of using locally available materials in reducing life cycle energy and emissions impacts, as the transportation related energy and emissions costs are reduced due to the use of locally available materials. Some possible areas where energy reduction can be achieved during the life of a transportation system are:

- Reducing energy and CO_2 intensity of conventional materials used,
- Using alternative materials that are comparatively less energy and CO_2 intensive,
- Using locally available materials,
- Using energy efficient processes and machinery during construction and maintenance,
- Optimising resource utilisation during construction and maintenance, especially for transportation of materials (using locally available materials, reducing idling, using rail for bulk transport of materials, etc.),
- Promoting inter-modal shift (towards more energy efficient modes),
- Improving efficiency of rolling stock, and
- Reducing energy and material intensity during manufacturing and maintenance of rolling stock.

LCA also indicates that if life of projects is enhanced, then the energy and CO_2 impacts due to reconstruction can be reduced/deferred, especially in the case of road-based projects that tend to have shorter life. Life of the projects can be enhanced by continued maintenance. Maintenance of constructed assets should hence be given due importance; it will help reduce both monetary and environmental costs on a life cycle basis.

Source: TERI (2012).

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Investment in technical expertise and a professional culture could help insulate the Office of Transport Strategy from the political pressures that will inevitably follow its role in deciding on large public investments.

initiatives that are not solely within the jurisdiction of another ministry or state agency. This is similar to the mandate of other expert bodies such as the Finance Commission. (We note, however, that the Finance Commission is a constitutional body). Government agencies would be required to accept the recommendation or provide a formal written reason for rejection.

- Statutory authority to obtain any and all available data related to transport from Union and state government authorities within a specified time.
- Representation on all government committees or other bodies related to infrastructure planning at the national level, including the Cabinet Committee on Infrastructure, the National Investment Board/Cabinet Committee on Investment, High Powered and High Level Committees concerning Transport. Integrated transport planning may be more focused on policies about infrastructure use than public investment in some of the wealthier countries where core infrastructure has already been fully developed[51], but India still requires significant investment and choices made about capital investment will have long-run consequences.
- Director General to have the rank of Minister of State, and can be drawn from a global labour pool. This is an increasingly common practice for technical positions, including politically sensitive ones. The United Kingdom, for example, appointed Canadian Mark Carney as the Governor of the Bank of England.
- Personnel policy to enable hiring of experts from a global labour pool for at least the initial 10 years while research programmes and expertise in India are being strengthened. This is also important for ensuring exposure to a variety of perspectives, training backgrounds, and experience in the formative early years of the OTS-cum-Ministry of Transport. It should also allow for independent selection of performance norms to enable creation of an institutional culture linking employees to global transport research and practice as well as close attention to Indian context and priorities.
- Independent budget authority to ensure autonomy in hiring, selection and commissioning of research, and utilisation of resources for establishing and maintaining a data centre.
- An R&D budget sufficient to commission independent analysis on strategic questions that cut across modes of transports, jurisdictions of different levels of government, and/or involve trade-offs between investments in physical infrastructure and policy changes. For instance, Box 5.3 on Life Cycle Analysis for an example of a relevant approach. Box 5.4 applies the approach to illustrate some intermodal decisions integrating environment impacts that the OTS could undertake or commission and supervise.
- Dedicated budget for establishing and maintaining an integrated data centre for the proposed Ministry of Transport. This should focus on converting data into decision support tools for prioritising national, state, and metropolitan investments and for examining shadow-financing scenarios independent on the Plan-non-Plan division. It is not sufficient to simply compile data, at a minimum it should be posted online in machine-readable format so that interested groups from private sector, civil society, and academia can use it for evaluation, modeling, and development of decision support tools.

The OTS should be visibly technocratic in order to minimise accusations of politicisation. Its cost-benefit analysis and 'system impact assessments' for individual projects should be rooted in transparent analysis and credible data. Its policy advisory functions should be backed by significant in-house expertise as well as research generated by 'centres of excellence' around the country. Investment in technical expertise and professional culture could also help insulate the institution from the political pressures that will inevitably follow its role in decision making over large public investments with potentially significant private benefits. Various historians argue that the apolitical image of United States Bureau of Roads, for example, was in part due to its reputation for technical expertise even as it oversaw one of the major flows of national funds to state infrastructure[52].

STAFFING OF THE OFFICE OF TRANSPORT STRATEGY

It difficult to give credible targets for numbers of staff, since this will depend on the organisational structure and procedural requirements, the division of responsibilities between Union and state governments, and the extent of reliance on short-term or contract employees for specialised expertise. However, some orders of magnitudes are relevant. The United States Department of Transportation has about 60,000 professional staff. This is in addition to the State Departments of Transportation, whose mandates include overall safety as well as setting State transport goals across modes, including road investments, interconnections

51. Perkins (2012).
52. Seely (1987).

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with rail, ports and airports. California has 22,277 permanent staff (www.dot.gov, accessed 11 December 2012), and Texas 12,000 (http://www.txdot.gov/, accessed 11 December 2012). New York State has 10,000 plus another 4,500 staff members in the New York City Department of Transportation. (http://www.dot.ny.gov/, accessed 11 December 2012).
The Directorate-General of Transport for the European Commission, an agency that mainly coordinates strategies across member nations through technical advice and is thus probably the most comparable in mandate, has 2,272 employees and is the largest Directorate-General (9.6 per cent of Commission Staff) of the European Commission.

Such numbers are obviously very crude comparisons, particularly since the support functions of financial management and process compliance vary widely as do the organisational structures. They also do not take consultant/contract expertise into account. Indian agencies involved in transport planning can and do rely on consultants and outside experts for policy formulation.

STATE TRANSPORT REFORMS: OTS AND DEVOLUTION

Indian states are important economic and political actors by global let alone national standards. Many would be large countries, in territory and population if not yet economies. The subsidiarity principle of federal design and international practice suggest that they should play a strong role in planning state-level multi-modal transport networks. Indian states also have substantial electoral and competitive incentives to leverage transport investments effectively as a tool for development. Lall, Wang, and Deichmann (2010) find that transport infrastructure, especially ports and highways that link locations to large internal markets, is one of the most significant factors in attracting new private investment[53].

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

The features of the state OTS would be analogous to those of the national OTS, including:

- Mandate to recommend formation of state-level committee or similar to further coordination of projects and transport initiatives that are not solely within the jurisdiction of another state agency. It could also recommend that the national OTS initiate intergovernmental working groups in cases where state and national investments overlap. The OTS and state agencies would be required to accept or provide formal rejection of the request with reasons.
- Statutory authority to obtain any and all available data related to transport from state government authorities within a specified time.
- Representation on all government committees or other bodies related to infrastructure planning at the state level, including in consultations with the national government.
- Director to have the rank of Minister, State Government and can be drawn from a global labour pool.
- Personnel policy to enable hiring of experts from a global labour pool for at least the initial 10 years. Experts from the OTS-cum-Ministry of Transport could also be rotated through State OTS, to encourage development of expert networks across levels of government.
- Independent budget authority to ensure autonomy in hiring, selection and commissioning of research, and utilisation of resources for establishing and maintaining a state data centre, following guidelines established by the national OTS. Government of India to provide specific-purpose funding for an integrated data centre.
- An R&D budget sufficient to commission independent analysis on strategic questions that cut across modes of transports, jurisdictions of different levels of government, and/or involve trade-offs between investments in physical infrastructure and policy changes.

Creating state analogues of the national OTS would provide an important counterweight to the national OTS and Ministry of Transport by ensuring that states can be effective advocates of regional development needs.

States could choose whether to affiliate the OTS with the Chief Minister's office, the state Planning Commission, or make it an autonomous statutory agency. The important parts are the convening of expertise and data, alignment with the national OTS, and the ability to work as 'first among equals' with other transport-related agencies at the state level.

The OTSs would be especially important if further action were taken to reallocate responsibilities within various modes of transport to bring India's transport governance more in line with principles of subsidiarity.

53. Lall, Wang and Deichmann (2010).

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Box 5.5

Rail vs Bus: Mutually Exclusive or Complementary?

The choice between rail metros and bus rapid transit systems depends on several factors: construction time and cost, estimated ridership, existence of radial corridors, and ability of the public to afford rail transit. Although often presented as a strict dichotomy, rail and bus systems can be combined to good effect.

Rail metros are very expensive, with standard Asian costs around $75mn/km (elevated) and $180mn/km (underground), although these costs are substantially lower in China (roughly half at 2008 prices). This means that metro systems rarely cover their full operating costs (Fouracre et al. 1990). At-grade alignment is approximately half the cost of elevated alignment systems, which are in turn approximately half the cost of underground alignment systems. Revenues must be approximately twice operating costs for systems to be financially viable, but only large cities with concentrated corridor flows and high revenues per passenger (this is associated with higher incomes) come close e.g. Santiago (revenue/op cost=1.84), Singapore (1.67) (World Bank, 2002).

Metro projects are **typically public sector** endeavours, with a poor record of keeping to budget (capital costs typically increase 50-100 per cent from forecasts) and schedule (implementation times up to 50 per cent longer than expected). Ridership is often less than forecasts suggest, and projections may be inflated by municipalities to attract higher investment (Pickrell 1992). **Private sector partnerships** in six concessions in Bangkok, Kuala Lumpur and Manila have led to successful implementation of metros which might otherwise not have been developed (although capital costs are higher and some problems still arise).

Bus Rapid Transit (BRT) is increasingly salient, after success in Brisbane and Latin America. It is much cheaper in terms of capital than metros, since existing road infrastructure at grade already in public ownership can be modified to accommodate bus lanes. It can thus be rolled out rapidly and can be operated without subsidy at affordable fares. BRT systems can be either open or closed (restricted access to special bus lanes) and usually run on trunk and feeder systems. Although they operate at a slower speed than metros, BRTs facilitate closer stop spacing. Private involvement is much more common: many Latin American systems have a single government control agency and multiple operators.

Chinese Example BRT systems are encouraged, and metro development is encouraged only in 'large cities with better economic conditions but more serious problems of traffic congestion'. In intermediate cases, light rail transit is developed. Buoyant demand, lower costs, and a central government willing and able to invest in infrastructure mean that viability of metros is easier to justify. The central government has defined protocols (Decree 81, 2003) for MRT technologies (three are specified), approval procedures, construction standards and safety requirements, as well as management systems for construction and operations. This standardisation improves costs and efficiency. Criteria were established for metro development in cities (see table below): high population (>3m), high GDP (>RMB100bn p.a.), high passenger demand (>30,000 passengers/hour/direction). Cities are also required to invest 40 per cent equity in metro projects to guard against excessive borrowing.

CRITERION	METRO	LRT
City population (Million)	>3	>1.5
City GDP (RMB p.a.)	>100bn	>60bn
City GDP (USD p.a.)	>16bn	>9.6bn
City GDP per capita (USD p.a.)	>5,333	>6,400
City budget income (RMB p.a.)	>10bn	>6bn
City budget income (USD p.a.)	>1.6bn	>0.96bn
Passenger demand (passengers/hour/direction)	>30,000	>10,000
City equity investment (this guards against excessive borrowing)		>40 per cent

N.B. USD-CNY exchange rate as of October 2012
Source: Developing Public Transport, Ken Gwilliam, August 2011.

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States are, for example, the logical level of government for overseeing urban rail-based transport. They are large enough to consider regional and financial externalities, but small enough to also have a strong incentive to pay attention to local development requirements. Aggregating urban transport expertise at the state level is also a logical staffing choice. A big enough group can be formed to have the professional interactions, deliberate on the challenges, and also be deployed to help cities of all sizes. Declaring urban transport a state subject would also clarify ongoing ambiguity in authority and responsibility for urban public transport. The Ministry of Urban Development has been the line ministry for urban transport since 1986, but Railways retained authority over safety and technical advice. The potential for conflict was realised during the development of the Delhi metro, in which the Managing Director of the Metro and Railways disagreed over the gauge to be used. Railways prevailed in that case, but the question of jurisdiction was re-examined by a Group of Ministers. The GoM and the Cabinet decided that urban transport should be a state subject, but with national guidance in the form of a Model Law to be drafted by the Ministry of Urban Development. The so-called 'Guided Urban Transport Act' was drafted, circulated, but not passed. The Metro-Railways Act was revised in 2009 to reinstate urban transport as a Union subject, as before with safety oversight by the Ministry of Railways.

As mentioned earlier, India's level of national government control over airport development is unusual among large federations. State governments can propose new airports or expansion of existing airports but cannot currently initiate these developments without national approval. Devolving greater autonomy in airport development would enable closer integration of planning for rural road transport with air connectivity, and is consistent with the chapter on Civil Aviation's (Chapter 3, Volume III) emphasis on the importance of remote connectivity. To quote from the Report of the Working Group on Civil Aviation:

'Airports cannot be built in isolation. There is a need for seamless coordination with other state agencies to develop ground support and logistics to provide surface connectivity. Appropriate access through road connectivity is an essential part of airport infrastructure. Delays in building road connectivity to New Bangalore airport, for example, resulted in negative implications for the facility. There is therefore a need for effective coordination between road development agencies both at the Centre and in the states, besides coordination with the railway authorities to enable seamless intermodal connectivity for passengers and cargo to and from the airports' [54].

India's level of national government control over airport development is unusual. Devolving greater autonomy to states would enable closer integration of planning for rural road transport with air connectivity, and also ensure better remote connectivity.

Devolution of authority would create both incentives and the institutional basis for such 'seamless' connectivity.

URBAN TRANSPORT: BUILD EXPERTISE, PUBLIC AND PRIVATE

National government policy has followed two main approaches for encouraging more integrated, programmatic urban transport planning: conditionalities for intergovernmental transfers and constitutional mandates to create new integrative agencies. Neither has been effective, nor will they be until metropolitan transport authorities have access to sufficient technical expertise to respond to regional transport needs. Independent Unified Metropolitan Transport Authorities should serve as institutional focal points for extensive investments in expertise in cities above one million, while state governments support smaller urban areas. Such investment should be centred at the metropolitan level, in keeping with principles of subsidiarity and international 'best practice.'

More autonomous metropolitan planning committees, as currently required by the Constitution but only partially enacted, are also required for more general management of India's larger cities. We reiterate others' calls to move forward on the constitutional mandate for devolution. Here, we propose three interim actions.

BUILD CITY-LEVEL CAPACITY BY ESTABLISHING A 'CENTRE OF EXCELLENCE IN URBAN TRANSPORT' IN EACH MILLION+ CITY

Local think tanks, research institutions, and universities can play an important role in generating and evaluating policy options as well as providing policymakers with information from comparative experience. Technical support for the existing UMTAs already comes from outside the government, including expertise from multilateral development banks (World Bank in Mumbai), civil society inputs (such as Chennai City Connect and Institute for Transport and Development Policy in Chennai), and academic insitutions (e.g. TRIPP at the Indian Institute of Technology, Delhi).

There are no bars to funding city-specific initiatives with researchers aligned with metropolitan interests, at least as residents. These centres will take some time to become 'excellent,' but would be valuable assets

54. NTDPC (2012c).

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Box 5.6
Operator Collaboration: The German Verkehrsverbund

All of the major German speaking urban areas in Europe (i.e. Germany, Austria and Switzerland) have a quasi-independent Verkehrsverbund (VVB). The largest of these, the Verkehrsverbund Rhein-Ruhr, covers the area of the Rhine-Ruhr, an area of some 5,000 km² with more than seven million inhabitants, and encompasses several cities. Others are more dispersed. For example, in the Rhein-Neckar region, the Verkehrsverbund Rhein-Neckar (VRN), which was founded in 1989, initially served the Rhein Neckar Area, but has since grown beyond its borders to cover an oblong area of 10,000 km² with a population of three million, including Mannheim and Ludwigshafen, Heidelberg, Kaiserslautern, the entire Palatinate Forest and the northernmost parts of Baden-Württemberg. VRN is owned by the three states, cities and rural districts whose area it serves. Some, like the VV Overelbe around Dresden, are more simply concentrated on a central city and perform the function of integrating the city with its suburbs and dependent rural areas.

The development of the VVB since 1970 has been in three phases. In the first phase, the VVB was simply a tariff association (public transport companies accepting each others' tickets leading to associated tariffs). In the second phase, the VVB moved on to be a broader transport association, being involved in coordination and increase of transport planning and marketing, as well as coordinated timetables for public transport. Finally, in its more advanced stage, the VVB became involved in shared timetables and common tariff setting on a contractual basis. The larger VVB now typically plans services, sets fares and timetables, markets services, coordinates fare integration between modes, and procures bus services from private sector operators. A consequence of the harmonisation of fares and aggregation of income in a single collection is that some operators gain and some lose. Hence the VVB in its most advanced form has needed to become a kind of clearing house, allocating income between the different operating agencies.

The legal structure of the VVB has developed with its functions. In the first phase, as is still the case in Warnow, the VVB was simply a voluntary association of operating companies. Later it became an association involving operators and local government representation. Finally, and now most commonly, it has become a non-operating company, jointly owned by the local authorities, regions and states, all of which have some involvement in the financing and management of urban transport.

To give an example, the Verkehsverbund Oberelbe serves an area of more than 4,800 sq km., stretching along both sides of the Elbe River from the Czech border in the south to the state border with Brandenburg in the north. The entire area has a population of 1.2 million. The Upper Elbe region has traditionally had one of the densest public transportation networks in Europe. For local rapid transit, there are 3 S-Bahn (urban railway) lines, 21 regional lines and two narrow-gauge railways. The city and the regional public transportation systems are also above average. There are currently 208 regional bus lines, 13 tram lines, 66 city bus lines, 19 ferries and two mountain railways that regularly service the VVO area. Passengers can use a total of 3,800 train stations and other stops to get into and out of their chosen means of transport.

The Verkehrsverbund Oberelbe uses more than 1,000 vehicles (buses, trams and trains). All together the buses and trains travel more than 62 million scheduled kilometres per year (as a comparison: the distance from the sun to the earth is 149 million kilometres.) The buses, trams and trains drive on a network that has a total length of almost 7,000 km. Every year, DB Regio, the local traffic subsidiary of the Deutsche Bahn (German rail), travels more than 8 million kilometres on behalf of the VVO. That is around one-third of the total rail traffic in Saxony..

In an integrated public transport system, task sharing between he public transport authorities and the operators is crucial. The VV Oberelbe, is organised on three levels. On the strategic level, political responsibility lies with Zweckverband Verkehrsverbund Oberelbe (Z-VOE), which makes political decisions and establishes guidelines for the development and performance of public transport. Z-VOE is guided by the associated district administrators and city mayors. On the tactical level, Verkehrsverbund Oberelbe GmbH (VVO GmbH) is the direct partner of public transport operators and other economic partners and is responsible for the development of tariff, network, service and marketing issues. It manages public service contracts and the integrated public transport system. On the opera-

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tional level, the individual public transport companies are responsible for the performance of the railway, tram, bus and ferry services. In some cases, as in the Rhein Neckar VVB network, the operators are also organised in a company form, Unternehmensgesellschaft Verkehrsverbund Rhein-Neckar GmbH (URN)..

The distinguishing features of the Verkehrsverbund approach are (i) the organic way in which they have grown and expanded their aspirations; (ii) the continued emphasis on voluntary collaboration between independent operators. (iii) the limitation of the activities of the VVB to public transport, and (iv) the very wide and disparate areas over which they operate.

Source: Excerpted from Annex 2 of Gwilliam, Kenneth, 2011. 'Institutions for Urban Transport,' Paper 5 prepared for the NTDPC and World Bank. August 10, 2011.

for the metropolitan government as it consolidates. Public funds could also have additional leverage if urban-interested private citizens and state governments co-invest. This strategy of autonomous capacity-building also does not create a lasting bureaucratic imprint and potential to cement state dominance of urban transport. This geographic focus may be considered as part of the HRD strategy.

INVEST IN UNIFIED METROPOLITAN DATABASES

Urban transport generally impacts areas larger than a city's administrative jurisdiction, hence regional officials should often be involved in setting priorities. Finally, implementation ability can also come from public or private organisations and need not always be locally rooted. The key is that the collection of public and private institutions be able to share information at all stages of a transport plan–from project and technology identification to implementation and maintenance–and have a clear process for discussion and decision making as well as incentives to deliver their part of the overall plan.

TRIAGE FOR PUBLIC TRANSPORT

Transport governance can be successfully created even in relatively newly formed metropolitan entities, but public transport will need to improve even faster, before metropolitan governance is consolidated, to prevent a difficult-to-reverse shift to private vehicles as incomes rise. Rapid improvements in public transport are especially important for diverting the ongoing transition from non-motorised to private motorised transport, especially two-wheelers.

Hanoi's experience in managing the growth in two-wheelers illustrates the consequences of disconnects between various forms of public transportation[55]. The city attempted to attract new motorcycle/car users to rely on public transportation instead of private transport but failed because the public transport alternative that it developed was not integrated across bus and rail, and the bus system failed to keep up with demand for both quality and quantity of service. Gwilliam[56] attributes this problem in part to role of the incumbent public transport company (bus) in operation of bus routes, the lack of a coordinating agency to oversee segregation of bus routes from other traffic and coordinate investment in BRT when these were being made. He also cites delay in creating a comprehensive transport authority and limited capacity of the body that was eventually designated responsible for strategic planning.

This kind of outcome could be stopped with early attention to a subset of urban transport governance–coordinating existing public transport–as the broader frameworks evolve. Local efforts to integrate could be supported by demand-driven national challenge grants to pay for systems integration for ticketing and scheduling, investment in pedestrian and shelter facilities at points of interchange, small feeder buses, or other equipment as needed to improve mobility. Unified ticketing to create a seamless customer interface could also help articulate demand for public transport more clearly by helping providers track route use and passenger habits more consistently. Operator collaboration can also evolve into important contributions to the overall governance framework, as the German example in Box 5.6 illustrates.

Such a move would also be important for sustainability. Schipper, Banerjee and Ng[57], cited in project that energy consumption in Indian urban transport will grow from 1.6 EJ in 2000 to 6.1 EJ in 2030 if the current movement to private transport continues. But more than 25 per cent of the energy use expected in a business-as-usual scenario could be saved if cities shift their trajectory toward more public and non-motorised transport.

Second, it will be important to establish the basis for more deliberate and informed comparisons of costs and benefits of rail and bus-based systems.

SUMMARY

The first two parts of this sub-section discuss immediate steps toward creating national and state institutions with the authority and ability to coordinate forward-looking investments in the backbone of the transport infrastructure as well as guide regulation

55. Gwilliam (2011).
56. Ibid.
57. Cited in Hidalgo et al. (2011).

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and other policies to ensure effective utilisation of the physical infrastructure across the country. It also recommends establishing a national 'Office of Transport Strategy' (OTS) to host data and technical expertise for developing, monitoring, and refining longer-range strategies for transport as the Ministry of Transport comes together. In the long run, the OTS could perhaps be absorbed as the technical secretariat for the Minister of Transport.

The state-level transport agencies would perform a similar technical role in designing transport programmes, leaving implementation to the existing Departments of Public Works. It would work closely with the State Urban and Rural Development Ministries as well as the Chief Minister on transport planning to address state development, and be the primary liaison to the national government for intergovernmental coordination of transport investment and policy. It should have sufficient financial resources to undertake comprehensive studies and data collections within its jurisdiction, maintain a high quality professional staff and access specialists from around the world as needed.

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

CONCLUSION

India faces three main institutional challenges in developing the governance infrastructure to support a transport system that will meet its needs over the coming decades. First, India will have to shed the old version of directive planning to move to a new skill of facilitation, recognising that capital investment in transport infrastructure and regulation or policy are instruments to affect the transport system rather than decrees that determine its final shape. Ultimately, mobility for passengers and services for freight are the products of individual responses to existing infrastructure and policy structures. Similarly, the transport system is one of many contributors to an emerging economic and social geography that is also the product of millions of households' and businesses' decisions about investment, living, travel, investment, and consumption.

Second, it will have to integrate decision-making across agencies that have historically focused on particular modes of transport and between elements of the system. Policies concerning physical infrastructure, its use, and investments in rolling stock have historically been undertaken in different parts of the federal system and agencies within each level of government. India's fragmentation of transport investment planning between modes of transport stands out in comparative context: it is the only country among the hundred largest economies that continues to maintain separate ministries for each mode of transport. India's allocation of responsibility across levels of government and separation of decision-making about investments in physical infrastructure versus efforts to system capacity through better management of existing facilities is more in line with international practice, but leaves much room for improvement. This fragmentation is deeply rooted in India's bureaucracy and will be difficult to overcome, but the process must begin.

'Integration' does not mean centralised decision-making, but rather setting up of systems for information flow, knowledge generation, and continuous, interactive dialogue between relevant organisations throughout the project cycle. This challenge is an old one. To quote from Hayek (1945)[58]: the 'problem of what is the best way of utilising knowledge initially dispersed among all the people is at least one of the main problems of economic policy—or of designing an efficient economic system.' We must move toward decentralised coordination, enabled by information flow among agencies with clear responsibilities and the financial and human resources to carry out their mandates. Transport planning is far too complex a problem to be conclusively solved by algorithm, even if data and reliable projections were available. It would be dangerous to rely on such an approach.

Third, it will have to reconsider the division of authority between levels of government. Transport governance in India is far more centralised than international practice, in part because of constitutional divisions of authority that have become monopolies on oversight rather than designation of leadership among collaborators, in part because of the power that fiscal centralisation awards to the Union government, and in part because of the allocation of and adaptation to scarce technical capacity. The changes we recommend here start to re-align transport governance with the principles of subsidiarity in federal design.

THE ROAD AHEAD

It is extremely important to understand that an 'integrated' approach to transport planning does not mean centralised decision making, but rather setting up of systems for information flow, knowledge generation, and continuous, interactive dialogue between relevant organisations throughout the project cycle. This chapter emphatically argues for a move toward decentralised coordination based on the principle of subsidiarity, enabled by information

58. Hayek (1945).

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flow among agencies with clear responsibilities and the financial and human resources to carry out their mandates.

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

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

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

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Annex 5.1

Transport Decision Makers by Mode in India

MODE	FIXED FACILITIES			OPERATIONS		
	CENTRE	STATE	LOCAL	CENTRE	STATE	LOCAL
Roads	Ministry of Road Transport and Highways	PWD/ RD/Roads Departments	Panchayats and ULBs (maintenance)	Ministry of Road Transport and Highways	Road Transport Corporations	Local Bus Transport Corporations (although leadership often appointed by state government)
	National Highways Authority of India	Road Development Corporations		Ministry of Environment and Forests	Legislative Assemblies	
	Ministry of Urban Development	Land Development Authorities		CBCP	Transport Corporation Authorities (e.g. Metro)	
	Planning Commission	Transport Corporation Authorities (e.g. Metro)		Parliament: (Motor Vehicles Act 1988, Central Motor Vehicle Rules 1989)	RTOs	
	Border Roads Organisation					
	Ministry of Rural Development					
Civil Aviation	Ministry of Civil Aviation	State JVs for some airports		Airports Authority of India,	State Departments of Civil Aviation	
	Airports Authority of India			Directorate General of Civil Aviation		
	Airports Economic Regulatory Authority (AERA)			Bureau of Civil Aviation Security (BCAS),		
				Airports Economic Regulatory Authority (AERA)		
Ports	Ministry of Shipping, National Shipping Board	State Governments of maritime States	Involved in decisions about expansion of connecting infrastructure.	Directorate General of Shipping, Tariff Authority for Major Ports, Indian Coast Guard	State Governments (Minor Ports)	Involved in decisions about use of connecting infrastructure.
		Committee of Maritime States				
		Private companies (captive ports)				
Rail	Ministry of Railways, Zonal Railways	Metro Rail Corporations	Inputs on Metro/ Urban Rail	Ministry of Railways, Commission of Railway Safety, Indian Railway Catering and Tourism Corporation Ltd.		
				Zonal Railways (Southern Railway, South Central Railway and others)		
Inland Waterways	Inland Waterways Authority of India			Inland Waterways Authority of India, Indian Coast Guard	State legislation for registration and permits, e.g. Kerala Inland Vessels Rule	

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Annex 5.2

Division of Responsibilities in Other Federations

SOUTH AFRICA Overarching Entity: Ministry and Department of Transport						
MODE	**FIXED FACILITIES**			**OPERATIONS**		
	CENTRE	**STATE**	**LOCAL**	**CENTRE**	**STATE**	**LOCAL**
Roads	South African National Roads Agency	Department of Transport (for most provinces). However, they only handle road transport.		Cross Border Road Transport Agency, Road Traffic Management Corporation, Road Accidents Fund, Road Traffic Infringement Agency	Department of Transport	Municipal Transport Authority, City Department of Transport
Civil Aviation	South African Civil Aviation Authority			Airports Company South Africa, Air Traffic & Navigation Services		
Ports	National Ports Authority			South African Maritime Safety Authority, Ports Regulator		
Inland Waterways						
Rail	Passenger Rail Agency of South Africa			Railway Safety Regulator		

ARGENTINA Overarching Entity: Ministry of Transport						
MODE	**FIXED FACILITIES**			**OPERATIONS**		
	CENTRE	**STATE**	**LOCAL**	**CENTRE**	**STATE**	**LOCAL**
Roads		Provincial Road Department			Provincial Road Department	City Governments
Civil Aviation	National Civil Aviation Administration	Office of Provincial Air Navigation Management		Regulatory Body of National Airports System		
Ports	National Secretariat of Ports and Navigable Ways			General Ports Administration		General Ports Administration
Inland Waterways	National Secretariat of Ports and Navigable Ways					
Rail	Privatised, major public carriers include Ferrobaires (Rail Buenos Aires)					

NIGERIA Overarching Entity: Federal Ministry of Transport						
MODE	**FIXED FACILITIES**			**OPERATIONS**		
	CENTRE	**STATE**	**LOCAL**	**CENTRE**	**STATE**	**LOCAL**
Roads		State Ministry of Transport	State Metropolitan Area Transport Authority	Federal Roads Maintenance Agency	State Traffic Management Authority	State Metropolitan Area Transport Authority
Civil Aviation	Nigerian Civil Aviation Authority			Nigerian Civil Aviation Authority		
Ports	Nigerian Ports Authority			Nigerian Maritime Administration and Safety Agency		
Inland Waterways	Nigerian Inland Waterways Authority	State Waterways Authority		Nigerian Inland Waterways Authority	State Waterways Authority	
Rail	Nigerian Railway Corporation			Nigerian Railway Corporation		

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CHINA Overarching Entity: Ministry of Transport and Ministry of Railways						
MODE	**FIXED FACILITIES**			**OPERATIONS**		
	CENTRE	**STATE**	**LOCAL**	**CENTRE**	**STATE**	**LOCAL**
Roads	Highway Bureau					City Municipal Committee of Transportation
Civil Aviation	Civil Aviation Administration of China					
Ports			City-level Port Authority	China Ports and Harbors Association, China Maritime Safety Administration		City-level Port Authority
Inland Waterways	Water Transport Bureau, Yangtze Navigational Authority, Pearl River Navigational Authority					
Rail	Ministry of Railways	Regional (Not provincial) Railway Boards			Regional Railway Boards	

MEXICO Overarching Entity: Secretariat of Communications and Transport						
MODE	**FIXED FACILITIES**			**OPERATIONS**		
	CENTRE	**STATE**	**LOCAL**	**CENTRE**	**STATE**	**LOCAL**
Roads	Directorate General of Road Development		Department of Public Works	Directorate General of Road Maintenance		(City) Ministry of Municipal Utilities, Department of Public Works
Civil Aviation	Directorate General of Civil Aviation			Airports and Auxiliary Services		Airports and Auxiliary Services
Ports	Directorate General of Ports					Port Authority
Inland Waterways						
Rail	Directorate General of Railways and Multimodal Transport			Privatised		

USA Overarching Entity: Department of Transport						
MODE	**FIXED FACILITIES**			**OPERATIONS**		
	CENTRE	**STATE**	**LOCAL**	**CENTRE**	**STATE**	**LOCAL**
Roads	Federal Highways Administration (Federal Lands Highway Program)	State Department of Transportation, State Bridges Authority, State Thruway Authority	Metropolitan Transit Authorities	National Highway Traffic Safety Administration, Federal Motor Carrier Safety Administration	State Transportation Commission, Traffic Safety Commission	Metropolitan Transport Authorities, Quasi-Private agencies (eg. South Jersey Transportation Authority),
Civil Aviation	Federal Aviation Administration	State Aviation Administration			State Aviation Administration (or multi-state group as in the case of the Port Authority of NY and NJ)	City Transportation Division, Quasi-Private agencies
Ports	Maritime Administration Office of Infrastructure Development & Congestion Mitigation		Port Authority (working alongside with a consortium of private firms)			Port Authority
Inland Waterways	U S Army Corps of Engineers	State Waterways Advisory Board			State Departments (for eg. Washington State Ferries), State Canal Corporations	
Rail	Federal Railroad Administration			National Railroad Passenger Corporation (Amtrak), Alaska Railroad Corporation		

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CANADA Overarching Entity: Transport Canada						
MODE	**FIXED FACILITIES**			**OPERATIONS**		
	CENTRE	**STATE**	**LOCAL**	**CENTRE**	**STATE**	**LOCAL**
Roads	Transport Canada	Provincial Ministry of Transportation		Road Safety Directorate		City-level Transport Commissions (eg. Toronto)
Civil Aviation						
Ports		Local Port Authorities	Canadian Coast Guard		Local Port Authorities	
Inland Waterways					Provincial Ministries of Transport	
Rail	Via Rail, Privatised, major players include Canadian National Railway and Canadian Pacific Railway					

BRAZIL Overarching Entity: Ministry of Transportation						
MODE	**FIXED FACILITIES**			**OPERATIONS**		
	CENTRE	**STATE**	**LOCAL**	**CENTRE**	**STATE**	**LOCAL**
Roads	National Agency for Land Transportation, National Department of Transport Infrastructure	State Road Transport Department		National Road Transport Department, National Transit (Road Transportation) Council	Road Transport Department	
Civil Aviation	National Civil Aviation Agency of Brazil					
Ports	National Department of Transport Infrastructure, Port Authority, National Agency for Waterway Transportation			National Department of Transport Infrastructure		
Inland Waterways	National Agency for Waterway Transportation			National Department of Transport Infrastructure	Private Entities	
Rail	National Agency for Land Transport, VALEC Engineering, Construction and Rail			Privatised		

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Annex 5.3

Transport Planning Responsibilities: Union Government

PLANNING COMMISSION TRANSPORT DIVISION (discussed at length in main text)

Ministry of Civil Aviation: (http://www.civilaviation.gov.in/)

'This Ministry exercises administrative control over attached and autonomous organisations like the Directorate General of Civil Aviation, Bureau of Civil Aviation Security and Indira Gandhi Rashtriya Udan Academy and affiliated Public Sector Undertakings like National Aviation Company of India Limited, Airports Authority of India and Pawan Hans Helicopters Limited. The Commission of Railway Safety, which is responsible for safety in rail travel and operations in terms of the provisions of the Railways Act, 1989 also comes under the administrative control of this Ministry.'

Ministry of Shipping (http://shipping.gov.in/)

'The Ministry of Shipping encompasses within its fold shipping and ports sectors which include shipbuilding and ship-repair, major ports, national waterways, and inland water transport. Ministry of Shipping has been entrusted with the responsibility to formulate policies and programmes on these subjects and their implementation.'

Ministry of Road Transport and Highways (http://morth.nic.in/)

'An apex organisation under the Central Government, is entrusted with the task of formulating and administering, in consultation with other Central Ministries/Departments, State Governments/UT Administrations, organisations and individuals, policies for Road Transport, National Highways and Transport Research with a view to increasing the mobility and efficiency of the road transport system in the country. e Ministry has two wings: Roads wing and Transport wing.'

National Highways Authority of India (www.nhai.org)

'The National Highways Authority of India is responsible for the development, maintenance and management of National Highways entrusted to it and for matters connected or incidental thereto.'

Ministry of Railways (http://www.indianrailways.gov.in/)

Oversees and manages all aspects of rail infrastructure, rolling stock, service, operated by Indian Railways and overseen by the Railways Board.

Ministry of Rural Development/Department of Rural Development (http://drd.nic.in/)

'Keeping in view the fact that Rural Roads are vital to economic growth and measures for poverty alleviation in the village, Government have launched a 100 per cent Centrally Sponsored Scheme called the Pradhan Mantri Gram Sadak Yojana (PMGSY). The Programme seeks to provide connectivity to all unconnected habitations in the rural areas with a population of more than 500 persons through good All-weather roads by the end of the Tenth Plan Period. In respect of the Hill States (North-East, Sikkim, Himachal Pradesh, Jammu & Kashmir, Uttaranchal) and the Desert Areas, the objective would be to connect habitations with a population of 250 persons and above.'

Ministry of Urban Development (http://urbanindia.nic.in/)

'The Ministry of Urban Development is responsible for formulating policies, supporting and monitoring programmes and coordinating the activities of various Central Ministries, State Governments and other nodal authorities in so far as they relate to urban development issues in the country.' The work allocation includes Urban Transport among other areas of infrastructure and services.

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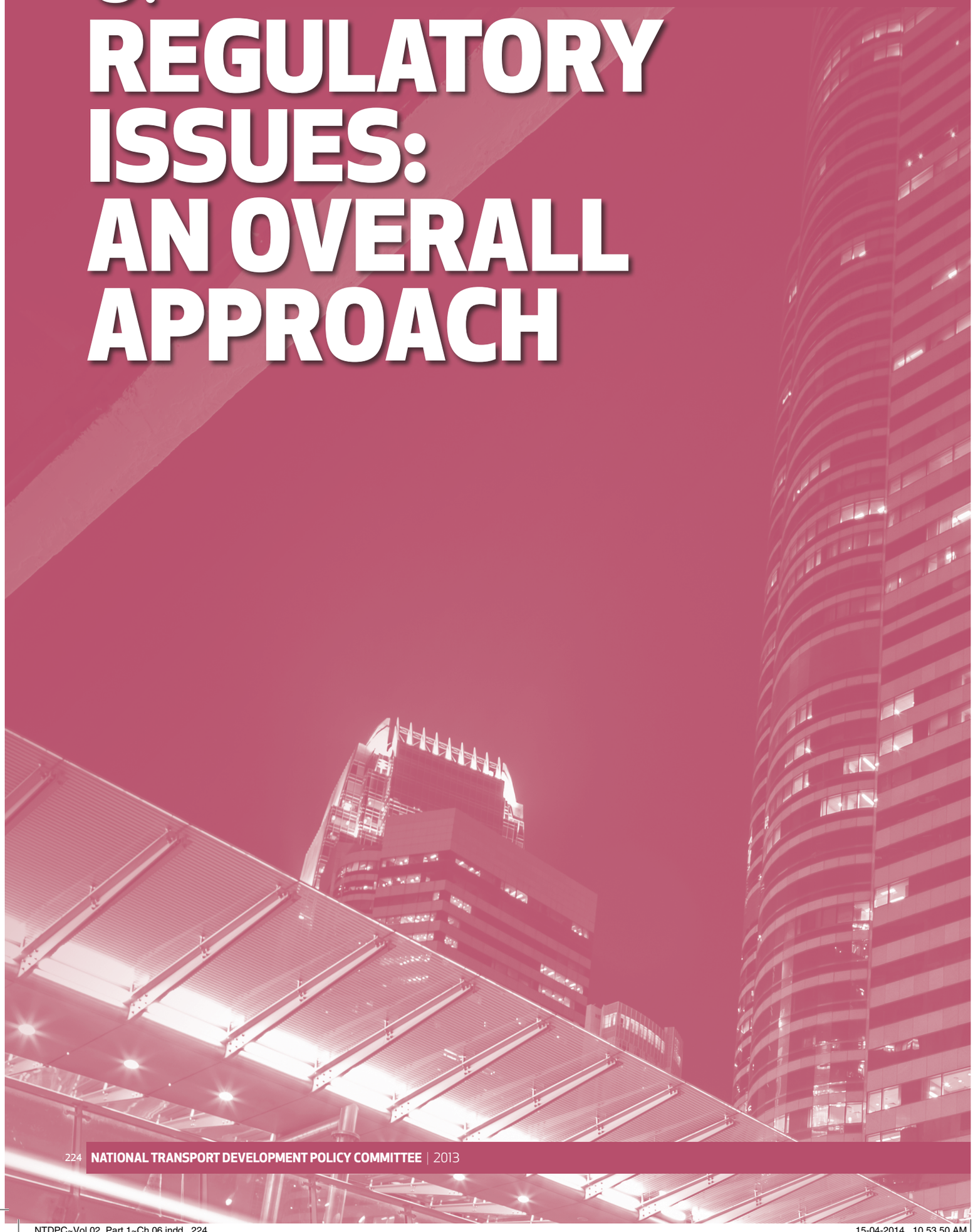
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6. REGULATORY ISSUES: AN OVERALL APPROACH



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6. REGULATORY ISSUES: AN OVERALL APPROACH

Recognising the importance of transport and inadequacies in the network, India's 11th Five Year Plan had envisaged investment of $500 billion to modernise, expand and integrate the country's transport infrastructure and other infrastructure services such as power, telecom and urban infrastructure[1].

The 12th Five Year Plan has doubled the expected investment in infrastructure to $1 trillion[2]. Even this increased amount is hardly going to suffice given the demands that are likely to be placed on transport and other infrastructure services by a rapidly growing economy. Thus, it is both necessary and perhaps inevitable that the role of government change from that of a producer to an enabler as well. This chapter discusses an important part of that transition: the development of a regulatory framework for guiding public and private contributions to India's transport development.

Regulation is an extensive theme. The difficulty of arriving at a precise definition of regulation among other aspects of policy and administration has been widely recognised, due in part to the several justifications that have been advanced for regulatory intervention from different theoretical perspectives[3]. We define it here as the set of organisations and policy statements that establish and clarify the 'rules of the game' for both public and private actors involved in infrastructure and service delivery. 'Regulators' are the organisations charged with clarifying and applying rules to specific cases, ideally in an apolitical manner. As a discipline, regulation is best approached from multiple perspectives using instruments of economics, political economy, law and public policy[4]. As an instrumentality of the state, regulation is happily no longer seen in a state versus market dichotomy, but rather as one that reflects the changing role of the state towards market-led development[5].

Regulation is an essential part of the foundation for collaboration between public and private sectors in delivering and managing transport infrastructure and services. This collaboration is inevitable, but its outcomes will be determined by the quality of the framework for the interaction. In a country of India's size and diversity, the demands on the public purse are enormous[6]. Growing fiscal deficits and lack of fiscal consolidation restrict the ability of the state to fund capital-intensive infrastructure projects. This constraint has stimulated the development of innovative models of engaging with the private sec-

1. Planning Commission (2008).
2. Planning Commission (2013).
3. See den Hertog (2010); Breyer (1984) for a discussion of regulatory justifications.
4. Morgan and Yeung (2007).
5. Kohli (2004).
6. See, for example, Budget documents of various years.

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The pendulum is shifting back towards a greater private sector role in financing, owning and operating transport, with public influence wielded through policy and regulations. 'Ownership' may not be the most effective way to influence transport development.

tor in India and elsewhere. Since public investment will coexist with private in all transport sectors, including as public-private partnerships (PPP), the State has to be effective not only in service delivery, but also in regulation, contracting and policymaking to obviate, *inter alia*, conflicts of interest. Private sector participation however requires creating independent and effective regulatory mechanisms to ensure, on the one hand, fair returns to private investment, and on the other, protection of consumer interest, including safety and affordability. India has, thus far, been slow in creating these institutions in all areas of transport. We hope to accelerate the process by providing a clear roadmap for regulatory development as part of a larger portfolio of transport governance reforms.

The chapter addresses both general principles of regulation as well as specific recommendations for the Indian context. After the recent decades of private sector participation in traditional infrastructure industries, there is broad recognition of the need to embed it in the wider social and constitutional context—for locating it within the dynamics of state-market relations i.e., within the local context[7]. Comparative studies of regulation in other sectors have also emphasised the interplay between policymaking institutions, representative governance, the judiciary and so-called 'regulators' in creating the full 'regulatory environment'[8].

BEYOND OWNERSHIP: REGULATION AS A POLICY TOOL TO SHAPE INFRASTRUCTURE OUTCOMES

Regulation and other policy frameworks for shaping private decisions have replaced public ownership and direct planning as the primary means of public influence on transport infrastructure. Public and private sector roles in transport infrastructure have evolved over time. Private companies played a significant role in building transport networks in the 18th and 19th centuries as part of efforts to access new sources of profit such as natural resources and land for settlement. Much of the United States (US) railway system, for example, was built by private corporations with state charters. The US Army Corps of Engineers contributed civil engineering expertise and Army officers often managed parts of railway operation. American states also chartered private companies to build some of the initial highways in the late 19th century. England's rail network was initially developed by private companies focused on freight rather than passengers, while its competitor, England's canal network, was state-owned, although steamboats were run by private companies. Rail networks of China and India were initiated by foreign companies in the late 19th century.

The public sector took on a more prominent role in provision of transport infrastructure in the 20th century[9]. Public sector ownership was viewed as a way to ensure broad access, as many transport services had natural monopoly characteristics. Supply responsibilities were assigned to the state primarily because of high upfront costs and long payback periods that the public sector was seen as better able to accept. The indivisibilities in infrastructure investment and presence of externalities also limit the prospects for user charges to cover return on investments. Moreover, it was widely believed that government ownership of transport infrastructure facilities and services was the best way to achieve multiple government objectives: not just facilitating commerce, but also increasing mobility, labour migration in the shift from agriculture to industrial employment, and national integration (and international integration in the case of Europe).

The pendulum is shifting back towards a greater private sector role in financing, owning and operating transport (Box 6.1), with public influence wielded through policy and regulation. 'Ownership' is merely one means of control over infrastructure delivery, and not necessarily the most effective way to influence transport development. There is ample evidence from across the world suggesting that protected state-owned monopolies have failed to respond to demands for expanded service or improved quality[10]. Public funding dulls the incentive to respond to customers, while government mandates to provide services may be simply infeasible if they are not accompanied by sufficient financial, technology and human resources to deliver these outcomes. Inclusive, efficient transport cannot simply be decreed without an institutional framework that guides investment and management toward public goals.

The United Kingdom (UK) and the US led the shift to a hybrid approach of private ownership and/or financing, with public policies and regulation as instruments to shape infrastructure providers' incentives to provide wide access to services, consider environmental impacts, and meet other non-commercial goals. These two countries rushed

7. Döhler (2011). It is however necessary to note the origins of the concept in the United States, where 'it appeared as a form of state intervention, enforced by specialised agencies, situated at "arm"s length" from direct political control'.
8. See, for example, Levy and Spiller (1996).
9. In the 19th century, however, a good portion of infrastructure investments, particularly investments required to open up access to natural resources or new areas for development, were provided by the private sector. See Rakesh Mohan India Infrastructure Report.
10. Brown et al.

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Box 6.1
Shifting Roles in Infrastructure Provision

Regulatory reforms in infrastructure provision—transport and otherwise—have often been pushed by economic circumstances and observations of failures in the reigning model of public finance, ownership and operation. The efforts to strengthen incentives for performance by leveraging competitive pressure have played out in various ways across regulatory environments, offering both cautionary tales and some lessons from experience.

In the late 1970s, the United States initiated wide-ranging regulatory reforms because of serious challenges—including stagflation, energy crises, double-digit inflation, increased environmental concerns, the bankruptcy of backbone industries (such as railways), and a perceived erosion in national productivity and international competitiveness. Deregulation was based on the premise that unleashing competition among service providers would lower inflation and restore productivity growth. At the same time, concerns about the energy crises and environmental protection facilitated the introduction of economically efficient pricing, which was expected to discourage wasteful consumption.

During the same period, large-scale privatisation began in the United Kingdom in 1984, when 51 per cent of British Telecom was sold to the private sector. The company's divestiture was driven by the government's desire to remove telecommunications investment from its balance sheet in order to meet its targets for public borrowing. The subsequent privatisation of other utility industries was accompanied by radical regulatory reforms. Several new regulatory bodies were created, and new tasks were assigned to existing agencies such as the Monopolies and Mergers Commission. Meanwhile, members of the European Union increasingly came to see state-owned monopolies as hindrances to international trade in goods and services. Thus in the 1990s, a series of directives were issued to create a single market where goods, services, people, and capital could move freely. These directives spelled out rules for telecommunications, railways, electricity, and natural gas markets across European Union member states, mapping out a common regulatory framework and liberalising these industries.

As the United States deregulated, the United Kingdom restructured and privatised, and the European Union issued directives calling for extensive liberalisation and building a single market, a powerful privatisation movement began sweeping developing and transition economies. For many developing countries, the primary push for privatisation came from the debt and fiscal crises of the early 1980s. Another major impetus came from the extraordinarily weak performance of infrastructure. Moreover, unrealistic price controls resulted in enterprises being subject to financial distress and impairing their ability to mobilise investments and provide reliable services. In a globalised economy, poorly performing state-owned infrastructure providers were increasingly seen as constraining economic growth and undermining international competitiveness. Developing countries simply could not continue to absorb the fiscal burden of these enterprises.

Over the past decade, there has been more attention to the challenges of industrial restructuring and the details of policy implementation, as well as careful assessment of the costs and benefits of these reforms. While it is clear that structural changes and realigning the roles of the government and the private sector are important for delivering infrastructure, we are still learning about the best combinations of public and private sectors in financing, owning, operating and maintaining infrastructure.

Source: Kessides (2004).

toward privatisation and deregulation, beginning with telecommunications and air travel in the mid-1980s, and moving on to more difficult and challenging sectors such as railways, ports and roads[11]. Latin America and other lower-income regions joined in the shift in the 1990s, motivated by disappointment with ineffective state-operated utilities, the promise of private funding, and the greater flexibility offered by technological change and regulatory changes. Private investment in infrastructure in Latin America increased from about $17 billion in 1995 to a peak of more than $70 billion in 1998[12].

The early 2000s witnessed a rethink of the dogmatic rejection of the State-led model of infrastructure provision. In November 2005, 78 per cent of Argentines surveyed desired that infrastructure be brought back under government control[13]. This reflects a gen-

11. Thoopal (2000).
12. Andrés et al. (2008).
13. Ibid.

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Box 6. 2
Main Messages of World Development Report 1994

- Infrastructure can deliver major benefits in economic growth, poverty alleviation, and environmental sustainability, but only when it provides services that respond to effective demand and does so efficiently.
- The causes of past poor performance, and the source of improved performance, lie in the incentives facing providers. These incentives are shaped by stakeholders including investors and customers, as well as the regulatory context.
- Manage infrastructure like a business, not a bureaucracy: manage personnel to encourage organisational focus on meeting customer needs.
- Introduce competition—directly if feasible, indirectly if not; it can create incentives for innovation and efficiency.
- Give users and other stakeholders a strong voice and real responsibility.
- Public-private partnerships in financing have promise, this potential requires careful planning and allocation of roles to be realised.
- Governments will have a continuing, if changed, role in infrastructure.

eral trend in Latin America where approximately 75 per cent of the population on average expressed discontent with private sector participation in infrastructure in 2005. The public opposition stems from its perceived adverse impact on key variables such as tariffs, employment and coverage. On the other hand, private sector participation had a significant positive effect on labour productivity, efficiency and quality in telecommunications, electricity and water[14]. At the same time, in 2005, the private sector seemed to have lost its appetite for infrastructure in Latin America, illustrating a precarious combination of relatively low public and private infrastructure investment.

Beginning with the economic liberalisation of the 1990s, the State in India started to vacate some of the commanding heights of the economy, in which State responsibility for provision of infrastructure and services was synonymous with ownership. India's transport infrastructure is evolving towards more private participation, although the pace varies substantially across sectors[15]. The institutional framework for this move remains incomplete, with ongoing debates about consolidation of authority within and across levels of government, formal and informal rules of operation, the degree of consultation among stakeholders, the extent of regulatory capture, appointments to existing institutions, accountability and transparency in decision making, and opportunities for dispute settlement, among other topics.

The new approach makes space for PPPs combined with regulation to address 'market failures' to protect the public from such evils as monopoly behaviour, 'destructive' competition, the abuse of private economic power, or the effects of externalities[16]. The command and control mode is thus being replaced by a new mode of regulatory governance where PPPs and private sector participation require governmental priorities to be achieved through independent regulation and the law of contract. The proliferation of regulatory commissions and parastatals in India is a manifestation of the changed role of the State. It is reassuring that the awareness of the need to establish, and the benefits of establishing, an effective regulatory regime appears to be increasing.

First, it is important to emphasise that understanding of how to combine public and private sector strengths in infrastructure provision is still evolving. Some broad principles for motivating infrastructure provision are well known and have been known for decades. Box 6.2 summarises lessons from a survey of literature in the mid-1990s that are still relevant today. In particular, contained competition is important and increasingly possible. It is now widely recognised that some (if not all) transport operations can be undertaken by the private sector in some form, activities that may motivate public performance as well as supplement gaps in public provision. Recent changes in technology also offer increased scope for the introduction of competition horizontally and unbundling of services supplied vertically. Even where direct competition between suppliers is not achievable, greater use of market forces is still possible. For example, in terms of transport facilities, competitive award of long period concessions, licences or facility leases can be used to improve efficiency, the terms and conditions of such leases being set by an independent regulatory body with the objective of stimulating efficiency.

14. Andrés et al. (2008).
15. Seddon and Singh (2013); Mohan (1996).
16. Ibid.

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In case the facility is operated by the public sector, pricing and other decisions should be subject to the oversight of an independent regulator with the aim of reproducing the outcomes of a competitive marketplace. Second, management matters. Public and private practices for risk management, project management and technology innovation can both contribute to delivering infrastructure effectively and efficiently. The move to rebalance public and private roles also includes efforts to shift public companies toward more 'private-sector' orientation. Public and private-sector norms for corporate governance, human resource and compensation policy are starting to converge, and the 'public sector' does not have to be inefficient. State-owned enterprises in China have produced a large number of world infrastructure records, such as the largest hydroelectric project, the Three Gorges dam, and 6,400 km of high-speed rail besides new airports and railway terminals[17].

Third, both public and private sectors have important roles to play. Transport infrastructure cannot be fully commercial, given social externalities. Low levels of infrastructure investment are a concern because of the widely-documented link between infrastructure and growth, productivity, and poverty reduction[18].

However, there are no detailed blueprints for leveraging policy, public finance rules, and the market environment from suppliers to customers, to guarantee effective delivery of transport infrastructure. Moving forward, an ideologically-neutral approach towards infrastructure development and maintenance is fundamental. Wherever possible and justified, private provision of transport services will be advantageous and at the same time, the public sector will continue to play a role in both actual investment and in delivery of services while its role in regulation will be fundamental.

If anything, in India the government's evolving role in regulation could be the difference between good and 'not so good' outcomes. Effective regulation—including the setting of adequate tariff levels—is the most critical enabling condition for infrastructure reform. Crafting proper regulation is the greatest challenge facing policymakers in developing and transition economies. The new agenda therefore calls for the introduction of a robust framework for transport regulation, including for PPPs so that the much needed investments can fructify. A vast amount of empirical evidence gathered over the years suggests that the quality of regulation matters for sector performance[19]. Among the most critical tasks for policy makers is therefore to design and implement stable and effective regulation for infrastructure, thereby reducing a lot of existing and unwarranted governmental intrusion.

A robust regulatory culture is particularly important in today's fiscal environment. The massive investment requirement in maintaining existing and creating new public transport infrastructure means that governments will have inadequate resources at the best of times to finance the transport needs of a growing economy. In times of fiscal stringency, the need for private participation becomes de rigueur. While we have made the transition from exclusive provision by the public sector to a situation where there will be many entities, public and private and combinations of both, the rules of engagement must be better defined for the benefit of investors, service providers and consumers. The large requirement of funds needed to improve the quality and quantity of infrastructure can be met, in part, by tapping global capital markets, but the terms of these transactions and their costs for the country depend on the quality and credibility of regulation. Sovereign-wealth funds are in fact favouring infrastructure projects to avoid the volatility of the stock market. The Boston Consulting Group (BCG) argues that over the next 20 years, the BRIC countries will account for more than half of the growth in road travel and more than 40 per cent of the growth in air travel[20]. In order to leverage these developments, India needs to immediately establish a robust institutional and regulatory mechanism to attract much needed capital to beef up its transport infrastructure, whether driven by the State, the private sector or by PPPs.

WHY REGULATE?

Governments regulate to overcome market failures, or the consequences of markets' inability to direct effort toward public goals that cannot readily be priced or bought and sold through exchanges (Figure 6.1). In general, regulation can be defined as the use of legal instruments for the implementation of social-economic policy objectives[21]. These instruments can force individuals or organisations to comply with prescribed rules under penalty of sanctions. For example, regulated firms are often obliged to observe certain prices, maintain a minimum quality or service, or face sanctions.

A distinction is usually made between economic and social regulation[22]. Economic regulation consists of two types, structural regulation and conduct regulation. Structural regulation is used for regulating market structure. Examples are restrictions on entry and exit, rules governing mergers and acquisitions, and subjecting supply to recognised qualifications, such as in the case of professional services. Conduct

17. Ibid.
18. Both foreign and domestic investors routinely cite infrastructure as among the most severe constraints for increasing investment. See Airoldi et. al. (2010).
19. See for example Andrés et al. (2008).
20. Ibid.
21. den Hertog (2010).
22. For example, Viscusi et al. (2005).

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Box 6.3
The New Economics of Industrial Organisation

The traditional approach to assessing market power in the industrial organisation literature is the Structure-Conduct-Performance paradigm (SCP). The SCP approach assumes a stable, causal relationship between the structure of an industry, firm conduct, and market performance as measured by economic profits. Typically, the set of observable structural variables are measures of seller concentration and barriers to entry and the line of causality is envisaged to run from structure through conduct to performance or the exercise of market power. The implication is that concentration facilitates the exercise of market power. In contrast to this industry approach, the new economics of industrial organisation emphasises that industry structure is not merely an exogenous determinant of conduct and performance, but is instead endogenously determined by the competitive process in a given industry. For example, if sunk costs (irreversible commitments) exist, then the potential entrant must always consider how the incumbent firm will respond to entry. Thus the new model makes the firm the centre piece of analysis. Firms differ in the products they sell, their organisation form and internal efficiency. It is the drive to be different that encourages dynamic competition of the Schumpeterian sort. This firm approach reverses the link between structure and conduct and performance; it is firm specific efficiency advantages that determine how large a firm grows and therefore industry concentration. Thus more efficient companies with superior products or services grow to be larger than other firms. According to this logic, dominance and its abuse cannot readily be inferred from market share since it ignores importance of competitors, extent of entry and exit barriers, countervailing buying power and importantly the source of high market shares. The relation between structure and market power is therefore far from being unambiguous. America's soft-drink industry, to take one example, is noted for price competition although only two firms, Coca-Cola and PepsiCo, control three-quarters of sales. The implication of this is that economic regulation based solely on market share analysis is likely to be incomplete and misleading.

Source: Viscusi et al. (2005).

regulation is used to regulate behaviour through price controls and/or minimum quality standards. Economic regulation is mainly exercised on natural monopolies and market structures with limited competition where firms possess and exercise market power but has become more nuanced in recent times (Box 6.3).

Social regulation, on the other hand, includes setting standards relating to safety, health and environment. Instruments applied here include regulation dealing with the discharge of environmentally harmful substances, safety regulations in supply and in factories and workplaces, the obligation to include information on the packaging of goods or on labels, the prohibition of the supply of certain goods or services unless firms possess a permit[23].

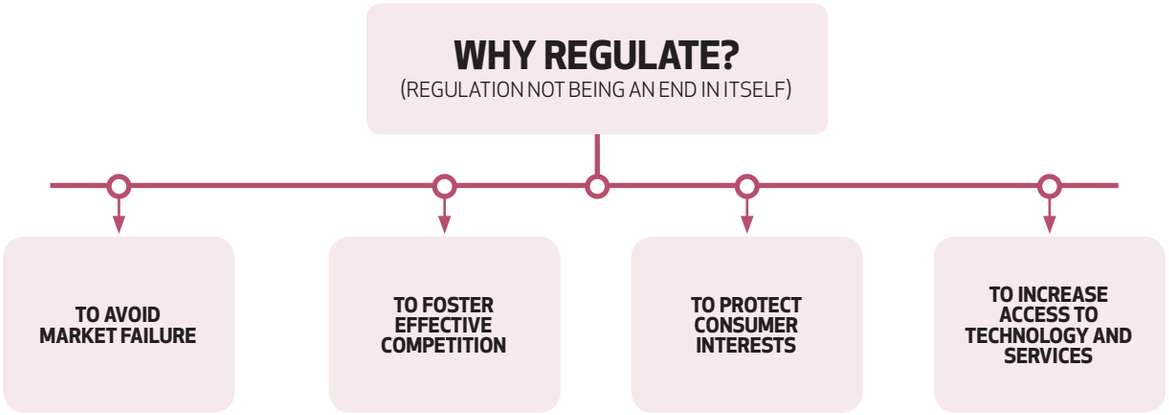
In most developed economies, the allocation of scarce resources is to a large extent coordinated by the market and economic theory has shown that under certain conditions this arrangement is optimal[24]. The conditions for market efficiency are however extremely demanding in practice. The theory requires that competition must be 'perfect', i.e., there must be many buyers and sellers, goods from competing suppliers must be indistinguishable, buyers and sellers must be fully informed and markets must be complete[25]. Thus, the existence of monopolies, public goods, externalities and asymmetric information that distort the allocation of resources, individually and severally, all result in pervasive market failures in practice. For the reason that these demanding conditions are frequently not achieved in practice, government regulation is required to improve the allocation of resources[26].

Addressing market failure to meet the public interest, however, is a non-trivial task. There are occasions when markets correct their own failures or may require very little, regulation in order to improve the allocation of resources. Monopoly, for instance, may seem to preclude an efficient market. But if barriers to entry are low, lack of actual competitors does not prove that the monopoly is damaging: the threat of competition may be enough to make it behave as though it were a competitive firm. The role of the government in some cases could thus be limited to reducing remaining entry barriers. That is why it is important to judge whether a market is 'contest-

23. den Hertog (2010).
24. Arrow (1985).
25. *Economist* (1996).
26. Arrow (1970); Shubik (1970).

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Figure 6.1
The Goals of Regulation



Source: International Telecommunications Union (2008).

able'—that is, whether barriers to entry are high before deciding the extent and nature of regulatory intervention (Box 6.3).

On the other hand, if a 'natural monopoly' (whose costs fall indefinitely as it increases its output) exists, from the point of view of productive efficiency, public interest would recommend concentrating the production in a single company. A monopolist striving for maximisation of profits will set a price that deviates from the marginal cost. The pursuit of productive efficiency and excessive profits in such instances will conflict with the public goal of allocative efficiency, i.e., too little of the good will be provided. Natural monopolies are therefore either subject to extensive price regulation or are provided by the State, as happens in many European countries. Regulation in such cases seeks to achieve the outcomes of perfect competition by simulating conditions. Examples of natural monopolies are the fixed infrastructure components of railways, electricity transmission and distribution, gas and oil pipelines and the like. Telecommunications was also once considered a natural monopoly. Today, however because of new technology and deregulation, it is an intensely competitive business, including in India, and therefore subject to only limited tariff regulation[27].

From the point of view of public interest, government regulation is also necessary where markets do not exist at all. This occurs in the presence of information problems and when transaction costs are excessive, such as in the case of externalities and public goods[28]. When it is not possible to establish the quality of goods or services in advance due to information asymmetries, *adverse selection* could occur, resulting in high-quality goods being driven out of the market by low-quality goods[29]. Consider the market for used cars. A buyer, lacking reliable information, may extract signals of quality based on average price. If sellers reduce price, buyers might be led to believe that the cars being offered for sale are 'lemons' or of poor quality, resulting in the complete breakdown of the market. In addition, incomplete and asymmetric information could also give rise to moral hazard which creates incentives for parties to misuse their information advantage. The markets for professional services, such as medical, law and architecture are examples. Problems of adverse selection and moral hazard also arise in markets such as those in insurance in which there is no incentive for the contracting parties to truthfully reveal information about individual risks[30]. Certifications, licenses and trading regulations are often used to overcome problems relating to adverse selection and moral hazard.

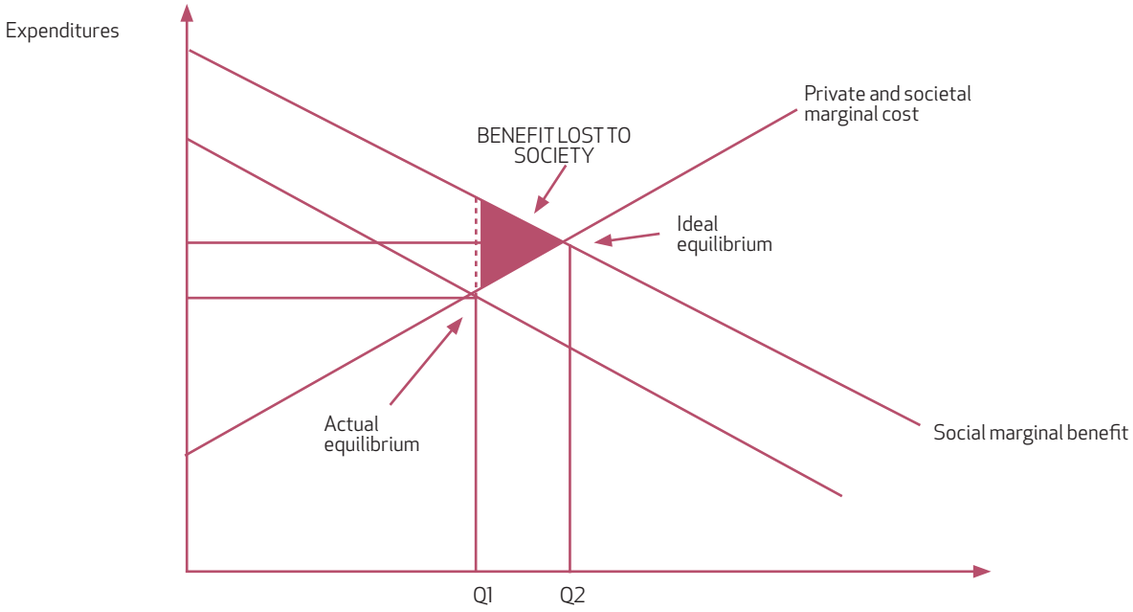
In addition to information failures, very high transactions costs can also result in missing markets. In a market economy, resources are efficiently used when the production of goods is increased until marginal costs equal the marginal benefits of production (Figure 6.2). 'Externalities' prevent the market from reaching this socially efficient equilibrium. For example, the cleanup cost of environment damage is often ignored by firms making their production decisions. The cost is therefore 'external' to the firm and borne by people with no say in deciding how much is produced. In the case of 'bad' externalities such as pollution, markets will produce too much of it; in the case of 'goods', too little[31]. Ronald Coase argued that, so long as property rights are clearly established,

27. TRAI (2012).
28. Akerlof (1970); Greenwald and Stiglitz (1986); Samuelson (1954).
29. The classic discussion is the used car market due to Akerlof (1970).
30. Stiglitz (1989).
31. Consuming some goods (education, anti-lock brakes) spreads benefits beyond the buyer; again, this will be ignored when the market decides how much to produce. See Stiglitz (1986).

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Figure 6.2

The Private Market will Underinvest in Infrastructure, Foregoing Societal Benefits



Source: NTDPC Research.

externalities will not cause an inefficient allocation of resources[32]. While Coase's insight was useful in that markets might find ways to 'internalise' the externalities, the presence of very high transaction costs will prevent that from happening frequently enough, obliging the government to intervene to correct the market failure. Limits for automobile emission or permits for discharge of hazardous substances are examples. Accordingly, it is through the regulation of fuel quality and emission limits of motorised vehicles that auto emissions have been reduced.

Missing markets may also occur in the case of public goods[33]. One major reason why infrastructure receives much policy attention is that it displays features of what economists refer to as public goods. Public goods have two unique characteristics. For the supplier of public goods, it is either impossible or too expensive to exclude people from consuming it; the technical term for this is 'non-excludability'. For example, if a buyer refuses to pay for an iPad, it will not be supplied. But if a buyer refuses to pay for national defence, the service cannot easily be withheld. The temptation, therefore, on part of the consumer is to let others pay, the so-called free-rider problem[34]. Like national defence, there are other services such as law and order and clean air that are practically 'non-excludable' and since private sellers cannot expect to recover the costs of production, supply will not be forthcoming[35]. In addition to non-excludability, consumption of these types of goods by one person is not at the expense of another; the technical term for this is 'non-rivalry in consumption'. Classical examples are lighthouses, public order, street lighting and national defence. Because of the free-rider problem and the inability to establish a willingness to pay for these goods, markets will not supply these goods in optimum quantities, if at all. Government regulation or direct supply thus becomes inevitable both for supply and for designing payment methods for these goods[36]. Many other goods, such as education, healthcare, parks and within the transport sector, roads, also have public good characteristics.

In economics textbooks, the all-time favourite example of a *pure public good* is a lighthouse; since its services are both non-excludable and non-rivalrous, only the state could be expected to provide it. Conversely, markets work best in providing pure private goods or services. Such a neat example (the lighthouse), cited by economists for several years has to now contend with changes that have occurred in technology and in recent thinking in the provision of such goods. For example, television broadcasting was considered both non-excludable and non-rivalrous. Due to improvements in technology, it is now easily excludable: satellite broadcasters collect a subscription, and in return provide a card that

32. According to the Coase theorem, an efficient allocation of resources can result from a process of negotiation in the case of clearly defined property rights and in the absence of transaction costs. See Coase (1960).
33. See Samuelson (1954).
34. See ibid.
35. *Economist* (1996).
36. See Stiglitz (1986).

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Table 6.1
Economic Framework Infrastructure/Public Goods

BASIC PROBLEMS	SOLUTIONS
INFRASTRUCTURE	
Long horizon/Economies of scale	Natural monopoly/duopoly
Supports wide range of activity	Positive externalities
PUBLIC GOODS	
Non-rivalrous	Social obligations
Non-excludable/ Externalities	Public support for investment/ Allows internalisation

Source: Cooper (2005).

unscrambles the signal to enable viewing. Tolls are used to restrict access to certain roads and also serve as a method to cover costs (and provide a profit)[37]. The government's role in this case is confined to authorising the collection. Increasingly, markets could be relied on to supply 'quasi' public goods or 'club goods' but that will need carefully designed and enforceable regulation.

Table 6.1 provides a schema developed by economists to analyse the fundamental issues that arise due to the existence of public goods and the nature of the corresponding intervention that seeks to address the problem. Markets in which economies of scale are extensive, for example in provision of port facilities or rail track, will result in one or two firms dominating the market with the attendant need for regulation or with public provision of these facilities. Rural roads result in externalities and will therefore need public support for the investment.

These market-strengthening innovations for private provision of public goods will however depend on how practicable and feasible pricing is for the specific good in question[38]. Further, even if pricing is feasible, its nature will vary across sectors and within a sector, and will need to be regulated not only for efficiency enhancements but more importantly for reasons related to access and equity. That there exists a trade off between economic efficiency and equity is not new. Regulation in the public interest that aims exclusively for economic efficiency may not be just or equitable and hence will have to be expanded to achieve social obligations[39]. In a broader interpretation, regulation for public interest not only attempts to address market failure but also aims to correct inequitable market outcomes[40]. According to this view, regulation can be construed as the socially efficient use of scarce resources. Examples are the design of minimum wage laws, cross-subsidies in postal systems and in passenger transport, and rules enhancing the accessibility of health care to lower-income or more remote populations. In the transport sector, for example, Indian Railways has been cross-subsidising passengers from the tariffs it receives from freight: hence the recommendation for a rail tariff authority, which has already been approved by the Government. This Authority should be constituted early.

The reason distributional considerations assume importance is that such investments in infrastructure often result in positive externalities that are unlikely to be captured by unregulated markets (Figure 6.2)[41]. Since private benefit is lower than social benefit, the market will produce less than socially efficient output. The resulting underinvestment is the deadweight loss or the 'Harberger' triangle, after the economist Arnold Harberger[42]. In other words, the private market undersupplies the public good, even though it is good for the public. To resolve this, governments often support public investment in infrastructure. Empirically there are clear linkages between infrastructure and public goods. Such investments generate widespread spillovers and enable 'crowding in'. The last few years, especially since the financial crisis, have seen a number of governments invest millions of dollars in infrastructure, particularly high-speed telecom broadband infrastructure. This investment is intended to capture positive externalities by stimulating economic activity since the private market will not invest in or will delay the deployment of such large-scale infrastructure projects. Public investment helps solve the problem of the inability to internalise externalities in private market transactions. In addition, as a practical matter, when infrastructure projects are first deployed and for a large part of their economic life, they tend to be uncongested and therefore non-rivalrous and unattractive for private investment[43].

37. Ibid.
38. Using the price mechanism for resource allocation is efficient under certain conditions. See First Welfare theorem.
39. Paul Joskow (1998).
40. Posner (1974).
41. Network effects associated with certain infrastructure investment means that the value of the infrastructure investment increases with the number of users. The literature on network effects distinguishes between 'direct network effects' of the sort associated with computer software and 'indirect network effects' which result in more supporting services around the initial investment. Formally, a good exhibits network effects if the demand for the good depends on how many other people purchase it. The classic example is a fax machine; picture phones and email exhibit the same characteristic.
42. Harberger (1954).
43. Cooper (2005).

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Table 6. 2
The Public Good Character of Transport

	EXCLUDABLE	NON-EXCLUDABLE
RIVAL	**PRIVATE GOODS**	**COMMON PROPERTY**
	a) Urban Bus	a) Urban Roads
	b) Rail, Airport and Port Services	
NON-RIVAL	**CLUB GOODS**	**PUBLIC GOODS**
	a) Inter-Urban Highways (toll roads)	a) Rural Roads
	b) Rail, Airport and Port Services	b) Street Sweeping
		c) Traffic Signaling

Lower ← Externalities → Higher

Source: World Bank (1994).

Such examples pervade the transport sector. Private sector port terminals need initial public investment in development of the basic port infrastructure; private airport investment cannot be made without the public provision of air traffic control; and initial investment in expressways is unlikely to be remunerative.

Economists are divided in their views regarding the prevalence of market failures. Some view the government's task as ensuring that all impediments to the proper functioning of markets are removed, i.e., regulation ought to be minimal. On the other hand, there are those who support a more active role for public policy since market failures can be pervasive. Indeed, Stiglitz has argued that contrary to the traditional view that market failures are the exception, such failures may be so pervasive as to be the norm[44]. However, it is not at all obvious that government will necessarily succeed where markets have failed. Consequently, not all cases of market failure will be amenable to correction through government action. The key to effective government intervention, therefore, lies not in demonstrating the existence of market failures (and thereby establishing a rationale for government intervention) but rather, one of identifying the nature of the intervention that would make it worthwhile.

One of our chief tasks in this chapter is to understand the kind of market failure in transport and the nature of regulatory intervention that would be effective specifically in the transport sector in India.

THE NEED FOR REGULATION IN TRANSPORT

The combination of the sector's large potential impacts on development, its distinctive technological and economic characteristics that are in sharp contrast to most other goods and services, make infrastructure subject to special policy and regulatory attention. These characteristics include[45]:

- Extensive economies of scale and scope that generally lead to market concentration and limit competition. As a result regulation cannot be completely abolished.
- Large sunk costs relative to fixed and variable (avoidable) costs. Sunk costs are those that in the short- and medium-term cannot be eliminated even by ceasing production. Such costs impose considerable risks and so discourage entry by new service providers.
- Services deemed essential to a broad range of users, making their provision and pricing politically sensitive.

Most parts of the transport infrastructure, and all transport services are private goods with potential for market failure, locating them firmly in the territory where regulation, rather than ownership is an important tool for achieving public policy goals (Table 6.2).

Services provided by the transport sector are excludable in a specific sense—their use depends on gaining access to a facility or network, for example railways, ports, airports and to urban transport services. The use of these services is and has been subject to an explicit charge in most economies. However, once a user is connected to the network utility or gains access to the transport facility that usually entails huge upfront investment, the degree of rivalry with other users depends on the costs (including congestion) imposed on existing users or on the service supplier when an additional service unit is consumed. Congestion is customary on urban roads especially during peak hours.

While transport infrastructure facilities (rights of way, track, terminals and associated traffic management) involve heavy upfront investment and display significant economies of scale, service provision (conveyance of passengers and freight) varies from being monopolistic (railways) to competitive (trucking

44. Stiglitz (1989).
45. Savedoff and Spiller (1999).

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and bus services). Consequently, trucking services are provided almost exclusively by the private sector in most countries. Besides, certain services are entirely similar to private goods, such as urban bus transport, while others such as port, air and rail services may be private or 'club goods' depending upon congestion. These services also often exhibit positive externalities: hence the existence of subsidies in public provisioning. Rural roads are the main exception and closest to being public goods: they are non-excludable (except in very specific cases where geography prevents an alternate transport path from being built), and non-rivalrous because they are rarely so congested that one person's use of the road substantially affects another's experience.

These characteristics have important implications for the manner in which transport infrastructure and services should be provided. To the extent that specific infrastructure activities entail economies of scale or depend on a network characterised by natural monopoly, they will not be efficiently provided in an unfettered market. In addition, transport is pivotal to economic development, and its inadequacy a major constraint to socio-economic progress[46].

Congestion is not the only externality that transport infrastructure and services create. Decisions about infrastructure investment, for example in roads versus public transport, rail and waterways, for example, affect energy efficiency and thus India's prospects for energy security and fiscal health. The current allocation of freight traffic between road and rail is one such negative externality. Indian Railways' (IR) relentless cross subsidisation of passenger travel with high-freight tariffs has resulted in IR losing market share to trucking, further affecting its ability to fund capacity-enhancing and quality-improving investments. All of India's high-density rail corridors face severe capacity constraints. As a result, India presently endures severe and chronic under-investment in railway infrastructure. The resulting diversion of freight and passenger traffic to roads, imposes a heavy burden in terms of a much larger freight cost to GDP ratio and higher environmental cost per route km of freight and passenger traffic compared to other countries. This report is therefore recommending significantly increased investment in the railways, on a proportionate basis.

Transport services and choice of vehicle and fuel affect air pollution, which in turn negatively affects public health. On the positive side, transport infrastructure, like other networks, produces 'network effects' meaning that the value of the economic activity the infrastructure supports expands simultaneously and potentially non-linearly[47]. The social impact of additional investment may be higher whenever a significant network size (or critical mass) is achieved. For example, research has shown that Indian states that achieved a penetration rate of 25 per cent or more in mobile telecommunications experienced significantly higher growth impacts compared to States that were below the threshold, i.e., the impact of telecommunications on growth is amplified by network effects[48]. This means there is an important milestone for policy makers for all types of infrastructure subject to network effects.

Introduction of private sector participation in transport does not eliminate the need for regulation. In fact, it accentuates the role of effective regulation and regulatory institutions. The Indian experience in power and telecom clearly highlights this.

Transport safety is also an externality from investments in particular forms of infrastructure as well as an 'invisible' aspect of service delivery. Regulation is thus required to reduce incentives to cut corners in parts of service provision that customers cannot readily assess when choosing which services to purchase.

In short, regulation of various parts of the transport network is needed for many reasons: to limit the potential monopoly power exercised by owners of networks with high capital costs; manage congestion, air pollution, and other negative externalities from use of transport networks; achieve positive externalities including network effects; and motivate investments in 'invisible' consumer goods such as safety. Regulation can be used to encourage extension of access to infrastructure and services to lower-income or remote services, though other instruments such as subsidies to providers or transfers targeted to the interested users are often more effective.

Many countries that have implemented economic reform in transport have sought to increase the role of the private sector in the provision of both transport infrastructure facilities and services. Introducing private sector participation in transport does not eliminate the need for regulation; in fact, it accentuates the role of effective regulation and regulatory institutions. For instance, the introduction of private sector participation in the power and telecommunications sectors in India heightened the need for effective regulation and regulatory institutions in India as these forms of policy influence replaced the mandate that ownership offers[49].

Restructuring of erstwhile monopolies and introduction of competition (where possible) are necessary but not sufficient conditions to improve the techni-

46. Ibid.
47. The magnitude of network effects could of course vary across different types of infrastructures.
48. Kathuria and Uppal (2009).
49. Desai (2006); Dubash and Rao (2007).

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cal performance of infrastructure sectors. When the process of restructuring is initiated, these sectors typically exhibit low levels of productivity, prices are often below break-even, and service providers face poor cash flows and encounter difficulties in mobilising the financial resources necessary to maintain and construct adequate additional capacity to meet growing demand[50]. Even after the process of restructuring is started, performance levels continue to be poor due to the quality of regulatory institutions and use of these sectors to pursue a variety of social and political goals. The availability and quality of infrastructure services are often highly politicised, and corruption is widespread. The poor performance of these infrastructure sectors can be a significant drag on economic growth and development[51].

Creating regulatory institutions is challenging and has been a concern for all countries, especially developing and emerging countries. In India, institutional capacity has been weak.

Although restructuring to promote competition and regulatory reform to address structural impediments has been initiated, the performance of transport sectors in India remains severely deficient even after two decades of deregulation. India's logistics network, for example, is beleaguered by inefficiencies due to the lack of infrastructure and equipment, high handling costs and damages[52]. McKinsey & Company estimates that losses from logistics inefficiencies cost India around $45 billion in 2007[53].

Even after further restructuring, there will be limits to competition in certain segments of the transport sector. Due to the high initial investment in fixed facilities and therefore the need to attain a certain minimum efficient size (MES), transport infrastructure will continue to exhibit important elements of natural monopoly[54]. Because investments in fixed facilities are lumpy, it is often difficult to match the availability of supply with demand at all times, resulting in episodes of overcapacity at the time of investment or under capacity later. Given indivisibilities or 'lumpiness' in investment requirements and the need to expand consumption over a long-time horizon, it is hard for private actors to realise an adequate return on such projects. Under these conditions, it is very unlikely that multiple suppliers will emerge, so the probable outcome is a natural monopoly, or at best a duopoly[55]. In addition, the associated sunk costs aggravate the problem of market power in provision which will inevitably lead to socially suboptimal outcomes if pricing and investment decisions are left unregulated.

BUILDING THE REGULATORY CONTEXT FOR TRANSPORT IN INDIA: CROSS-CUTTING THEMES

This section discusses a variety of issues that must be addressed in introducing competition and designing good regulatory institutions to motivate investment in and management of an integrated transport network for freight and passenger movement. There are four general roles for regulation in transport:

- Ensuring competition among service providers, which includes setting terms and conditions of access to bottleneck network facilities as well as tariff regulation in some cases.
- Setting a framework for PPPs, including resolving disputes that arise over the course of the partnership.
- Consumer protection, including safety and quality of service norms.
- Social regulation to reduce environmental impact and allocate costs of social services such as essential air service, road transport to remote areas, etc.

India's regulatory capacity in each of these areas requires strengthening to achieve minimum capabilities (Box 6.4). While India has been able to attract private domestic entrepreneurs who are willing to finance, operate and maintain mobile pieces of transport equipment trucks, buses, flatcars, ships and airplanes in a competitive environment, the development of an effective regulatory framework that promotes price and service competition has been inadequate. The public sector dominates fixed infrastructure such as roads, ports, rail lines and airports. Due to insufficient or timely investment, these facilities have often become physical bottlenecks to efficient transportation of goods and people. India has implemented regulatory reform in sectors such as telecom and electricity, and in transport sectors such as civil aviation and ports among others, although the governance and regulatory architecture has been subject to several design and implementation problems. All major reforms have been predicated on the expectation that effective regulation of infrastructure monopolies can be implemented fairly quickly.

Yet, building regulatory institutions has, at best been challenging and at worst, a severe disappointment.

50. This has been case for example in Indian Railways, Power and Urban Transport.
51. Op cit.
52. India has some of the highest logistics costs in the world. India incurs around 15 per cent of its GDP as logistics costs while this figure is only 9.5 per cent for the US and 10-12 per cent for other developed countries. World Bank (2012a). A high percentage of logistics cost in India is accounted by transportation (62 per cent) and inventory carrying costs (34 per cent) followed by administrative cost. See Planning Commission (2009).
53. McKinsey & Company (2010).
54. See for example Bain (1993).
55. Cooper (2005).

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Box 6. 4
What Makes for Effective Regulation

Regulatory bodies should

- have competent, non-political, professional staff—expert in relevant economic, accounting, engineering, and legal principles and familiar with good regulatory practices;
- operate in a statutory framework that fosters competition and market-like regulatory policies and practice;
- be subject to substantive and procedural requirements that ensure integrity, independence, transparency, and accountability.

Source: Kessides (2004).

Seddon and Singh argue that the delay reflects the challenges of creating new institutions and political-organisational practices[56]. Unless India is able to create a credible, conducive, capable and transparent institutional structure for governance of logistics, the macroeconomic goals of high, stable and inclusive growth will continue to suffer.

Social regulation on environmental issues and consumer protection are addressed in chapters on Safety (Chapter 12, Volume II) and Environment (Chapter 7, Volume ll). This section focuses first on reform sequencing, then on regulatory institutions for promoting competition, setting the framework for PPPs, and ensuring wide access to transport services. The regulatory priorities to support reforms in specific modes of transport are discussed in the next section.

SEQUENCING

Creating regulatory institutions is challenging and has been a concern for all countries, especially emerging and developing countries. In India, institutional capacity has been weak, as it has been so in many emerging markets. Strong institutions take a long time to develop; even in advanced industrial economies which have an established tradition of regulation, the pace has been sluggish[57]. Building regulatory institutions in countries with little or no regulatory tradition in any sector is therefore likely to be much more demanding and a slow process.

The challenges of creating such a context for public and private collaboration in infrastructure provision in India are daunting, but India's experience in telecommunications shows that it is possible. Although marred by recent scandal, the sector has seen the emergence of a governance structure that includes creation of an increasingly independent regulator along with easier rules for market entry, a mechanism for funding of universal access, management of scarce resources, access to interconnection and bottleneck facilities, and enforcement of regulatory rules via the creation of a dispute settlement tribunal. Arguably, the telecommunications sector best reflects the benefits of creating regulatory institutions, albeit even after 15 years in existence, the regulatory processes are still evolving.

To summarise the history: An 'independent' regulator, the Telecom Regulatory Authority of India (TRAI), was created in 1997 but extensive litigation followed its baptism. Many of its initial decisions were challenged since the public sector was reluctant to accept TRAI as the new regulator, a role it had performed since the 1950s. Successive court rulings that followed diluted many of TRAI's powers, especially those that were critical to independent regulation. Thus, the court decisions, *inter alia*, established that the Government was not required to seek a recommendation from the TRAI before issuing additional telecom licenses and that it did not have the power to make regulations on interconnection and revenue sharing, without these being negotiated between service providers[58]. Several disputes later, the Government separated the adjudicatory role of TRAI and created a new Telecom Dispute Settlement and Appellate Tribunal (TDSAT), which paved the way for the creation of many tribunals in other sectors. India's telecom experience confirms what has been known for many years—designing effective regulatory frameworks and enforcing them is highly complex and requires strong political commitment, skilled personnel, and a well-designed incentive structure. The experience also demonstrates that the independence of regulatory agencies may not be easy to create. It necessarily takes time and attributes such as independence and credibility are established on the basis of both legal foundations and actual behavior of the institutions when faced with difficult decisions that involve substantial interest group controversy[59]. Independence, according to one definition, is the ability to implement policy without undue interference from politicians or industry lobbyists,

56. Seddon and Singh (2013).
57. World Bank (1997).
58. 'Revenue sharing' here refers to the percentage of call revenues to be shared between telecom operators involved in successfully completing a call. In case the dominant operator declines to complete the call or share a fair amount with a new entrant, regulation is vital.
59. Melody (1997).

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a test that institutions charged with governance in telecom frequently failed to satisfy[60].

In most countries, the public policy role of the Transport Ministry (and, it usually is a single ministry) has been separated from the economic regulation and/or safety regulation roles (Chapter 5, Volume II)[61]. This is a vital step that is needed right away. In addition to creating independent regulatory institutions in each transport sector, the issue of creating a mechanism for dispute settlement is also important. The state of India's regulatory institutions in transport can at best be described as rudimentary.

For the transport sector, the principle of separation of powers is met only in the breach and is one of the major areas of reform that has been identified in this report. Most transport sectors suffer 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. These have been described in the sector-specific analyses. The coexistence of large, durable assets with significant sunk costs and the highly politicised nature of consumption make certain types of transport infrastructure and similar networked utilities vulnerable to administrative expropriation—both directly and through uneconomic price controls[62]. As a result, private investors reduce their investments, demand high-risk premiums, or both[63]. These basic features are common to most transport utilities in varying degrees and create special challenges for effective regulation.

Ministries are reluctant to relinquish control of the sector since it serves short-term political goals. Political constraints and ministerial preferences over time seem to have dominated the reform agenda in different infrastructure sectors[64]. It is time to recognise that institutionalising a robust regulatory philosophy based on a framework with adequate capacity is a necessary, although not sufficient, condition for accelerated and sustainable growth[65]. Experience has also shown that the regulatory strengthening must also happen before restructuring of ownership or lifting of controls on private participation (Box 6.5).

'Separation of powers' has been achieved in India (at least on paper) in the telecommunications sector. The institutional framework that has emerged in telecom and is emerging in electricity conforms to the doctrine of separation of powers. The regulators are separate from service providers while appeals against their orders are heard by Appellate Tribunals that resemble judicial bodies in form and character[66]. This principle has also been applied to the competition and securities regulatory regimes after a prolonged effort.

The first priority for India's transport regulation policy is therefore to create independent regulatory institutions where none exist and to strengthen regulatory independence where they do. The strengthening of the existing regulatory framework along the lines described above and creating new regulators where none exist is essential. Currently, roads, railways and urban transport sectors do not have independent regulators, while the mandate of TAMP is restricted to tariff regulation of major ports. What kind of regulators these sectors need is open for discussion. DGCA performs both policy and regulatory functions for Civil Aviation. This needs to be addressed. A dispute settlement body must also be constituted to ensure transparent administrative procedures and opportunities for judicial review.

Independence of the regulatory agencies in India must be strengthened by insulating them from political pressure to the extent possible. Preserving independence as well as ensuring its legitimacy is a difficult and demanding task, especially for a newly created regulator. To maintain its independence, the regulatory agency should be given functional autonomy in its day-to-day activities while the administrative ministry issues only broad policy guidelines and directives. It is noteworthy that it took several years for TRAI to create a legitimate position within the institutional framework. Establishing an independent regulator is however only a necessary condition for securing legitimacy. One way to ensure the latter is to have a transparent consultative process of decision making and opportunities for judicial review. In practice, this means holding open house discussions and posting consultation documents on the regulators website. This enables the regulator to collect evidence and also take account of the views of those who have an interest in the outcome. Consultation is an essential part of regulatory accountability—and it has now become intrinsic to the regulatory process. Regulatory decisions should be subject to judicial review thereby introducing a reasonable safeguard to regulatory authority.

Financial autonomy is often linked to regulatory independence. In India, this has not yet happened for regulatory institutions[67]. Regulatory institutions are supported by budgetary allocations that can compromise its independence. For example, TRAI is funded by the government and although it has been proposed a number of times, the government has not

60. Ibid.
61. NTDPC (2011).
62. Kessides (2004). A key attraction of privatisation is that it places the realignment of prices with underlying costs at the centre of the reform agenda. A similar outcome could be achieved even without privatisation by creating an effective regulatory mechanism that limits or eliminates political interference.
63. Henisz and Zelner (2001).
64. Planning Commission (2006).
65. Ibid.
66. Ibid.
67. The regulatory institutions could be financed by a percentage share of sector revenue as is international best practice.

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Box 6.5

Why Timing of Regulatory Reform is Important: An Example from Indian Telecom

The change in attitude toward telecommunications was first set out in the National Telecom Policy (NTP) document in 1994. NTP 1994 stated that in order to realise the goals of India's new economic policy (1991), it was necessary to have a world-class telecommunications infrastructure. To achieve these objectives, the policy acknowledged the pivotal role of private investment and therefore NTP 1994 envisaged setting up of an 'independent' regulatory body, the Telecom Regulatory Authority of India (TRAI). Although the policy specified the creation of a regulator, the latter was not set-up until 1997. Meanwhile, implementation of the 1994 policy was carried out by the Department of Telecommunications (DoT). This was faulty institutional design since it gave DoT an enormous advantage over private operators who began commercial operations in Delhi, Mumbai, Kolkata and Madras in August and September 1995. It was later to prove to be a thorny legal matter in regard to the newly-created regulators' powers to give directions to a policy maker that also combined the role of a service provider.

The regime devised by DoT to implement policy was naturally skewed in its favour, especially as it related to its service provision functions. DoT was also not keen on setting up a regulatory body. DoT and its counterpart in Mumbai and Delhi, Mahanagar Telephone Nigam Limited (MTNL) denied or delayed private entrants' access to their networks. In order for communications systems to be effective, it must interconnect with other systems. 'Interconnection' includes both the commercial and technical arrangements under which service providers connect their equipment networks and services to enable their customers to have access to customers, services and networks of other service providers. Private licensees were forced to deal with the incumbents because they were forbidden to directly interconnect among themselves. In addition, all national and international long-distance calls had to be transmitted exclusively through DoT networks in its capacity as the monopoly long distance carrier and interconnection charges were to be borne totally by the new entrants. The effects of unsatisfactory interconnection can undo much of the benefits of good regulation in other areas. Thus, the benefits of private entry can be neutralised by a dominant incumbent, especially in the absence of a regulatory body.

Unchecked, DoT relied on unilateral internal orders in deciding the manner in which private licensees could interconnect to its networks and the process of fresh entry into the nascent telecommunications sector. The inevitable litigation that followed led the Honorable Supreme Court to declare that there had been delay on part of the government to establish an independent regulatory agency.

'The existence of the Telecom Regulatory Authority with the appropriate powers is essential for the introduction of plurality in the telecom sector. The National Telecom Policy is a historic departure from the practice followed in the past century. Since the private sector will have to contribute more to the development of the telecom network than DoT/MTNL in the next few years, the role of an independent telecom regulatory authority with appropriate powers need not be impressed. In a multi-operator environment, an independent evaluation of the economic needs for a new service provider is a condition precedent for on the one hand maintaining investors' confidence and on the other achieving public policy objectives. This is particularly so at this point in India when the Government in the DoT combines itself the roles of a licensor policy maker and service provider'

The creation of the new regulatory agency was a significant event in the need to establish an institutional framework capable of achieving the objectives of NTP 1994. A key defect in implementation of policy was the failure to create a regulatory body prior to inviting bids for private participation in the sector.

Source: Kathuria (2007).

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Each transport sector is governed by numerous legislations. It is therefore imperative to simplify the legal structure. Existing sector-specific enactments need to be unified into a single statute.

accepted TRAI's request for independent funding through a percentage of the revenues of regulated firms. Depoliticising the regulatory process will thus remain an important long-term goal in transport. Financial autonomy, however, may or may not guarantee independence. An additional safeguard to prevent 'political capture' is to make appointment processes transparent and grounds for removal clear and structured for all regulatory institutions. Thus, legislation should guarantee stringent conditions for removal of Member or Chairman of any Authority. For example, the term of the first TRAI was reduced from five to three years after bruising collisions between the newly-established regulator and government, indicating the political control over regulatory institutions[68].

Each of the transport sectors is governed by numerous legislations. It is therefore imperative to simplify the legal structure. This has begun to happen in sectors such as ports and civil aviation but clearly a lot more needs to be done. Existing sector-specific enactments need to be unified into a single statute. This will simplify procedures and make compliance easier. Certain sections of the existing Acts that are anachronistic would also have to be deleted and even some of the Acts repealed. But such unification may not be an easy task, and cannot be achieved within a short period of time. The process of private sector participation should not however be held up, pending completion of the work. Needless to say, a beginning must be made now, even though completion may take some time. Unification of the legislations must be supplemented by the setting up of a statutory regulatory agency for each transport sector as detailed above. Without statutory powers, the effectiveness of this regulatory agency will be lost. This regulatory body could be set up at a central level for sectors such as Civil Aviation. Where a similar body already exists, its role and powers could be suitably modified. Thus, the DGCA and AERA should be replaced by the Civil Aviation Authority (CAA) along the lines described here. If a sector is under state jurisdiction, a regulatory body could also be set up at the state levels. For sectors such as urban transport, different levels of government may be involved—municipalities, provinces or the Central Government. It is recommended that the Metropolitan Urban Transport Authority (MUTA) proposed in Chapter 5, Volume III on Urban Transport also serve as a regulatory body for urban transport in metropolitan areas.

As independent regulation becomes more the norm rather than the exception, other questions about institutional design arise, namely: should regulation and dispute resolution institutions be created for each sector and sub-sector, or should certain functions be consolidated across sectors? India's piecemeal approach to infrastructure reform has led to the proliferation of regulatory bodies and tribunals. 'Regulatory proliferation' is seen as creating continued employment for the bureaucrats and judges, while professionals with technical expertise have been conspicuous by their absence. Commissions tend to be made up of retired civil servants or retired judges. This is worrisome and therefore it is vital to create a cadre of professional regulators with technical expertise for the complex tasks of managing the regulatory processes. If this implies revising the terms and conditions of appointment to these positions to make them attractive for professionals as is the case in the UK and US, then it should be done. The selection process itself should be transparent and based on skills needed for the discharge of regulatory responsibilities.

The alternative to sector-specific regulation (to mitigate institutional proliferation) is a single-umbrella transport regulator with specialised departments, or multi-industry regulators. In the UK, sector-specific regulatory agencies are the norm while 'multi-industry' regulatory agencies are typical of most state public utility commissions in the US. The primary argument in favour of the single-industry regulatory agency approach is that it ensures deep technical and economic expertise about the attributes of the industry within each agency's regulatory jurisdiction, and that this in turn leads to more effective regulatory decisions. The arguments in favour of a multi-industry or super transport regulator include wide-ranging deployment of common skills avoiding unnecessary duplication, opportunities for cross-learning and adoption of new practices across different sectors. Most importantly, it checks the potential for capture of regulatory agency by single interest groups, especially the firms that are being regulated[69]. There is enough overlap in regulatory issues to make it possible for a single agency to regulate transport. The thematic commonality across the different transport sectors suggest that adopting a multi-industry regulator might make the regulatory process more efficient and transparent. However, it will be a lot more difficult to implement because of the volume of regulation required in the medium term future. There is going to be enough sector-specific regulation necessary in the initial years to warrant deep expertise to be created and this is best done at the level of the sector. For regulation at the state level, they should apply the rules and standards set by the central regulatory body. The NTDPC

68. In a letter to the Minister, the TRAI Chairman sought extension of the tenure of the Authority from three to five years as is the case with other regulators, *The Hindu*, 15 August 2006.
69. Joskow (1998).

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therefore recommends the continuance of sector-specific regulators.

In Australia, Brazil, Canada, Germany, Japan, Russia and the US, among others, unitary transport ministries at the level of the central government level have been created whose role is to develop and administer policies to protect and promote public interests across the transport sector. The reason is that integrated national transport policies transcend or augment individual modal interests and achieve superior coordination. China is a partial exception, although it has recently enhanced the Ministry of Transport to bring together responsibilities for national highways, ports and waterways, shipping, airports, aviation and transport integration and most recently, the railways. In India, attempts at merging the broadcasting and communication ministries met with fierce opposition in 2001 and the proposal had to be dropped. To try and integrate all transport ministries under a single integrated ministry will be difficult. However, NTDPC has taken a view that, consistent with almost all other countries, it is desirable to set up a unified Ministry of Transport (Chapter 5, Volume II). It has also recommended the immediate setting up of the Office for Transport Strategy (OTS) to coordinate transport policy in the country. As of now, however, it is neither feasible nor desirable to set up a unified transport regulator, which must remain a long-term vision. There is no doubt that all transport sectors will require coordination even in the short term. Policy on a common platform encompassing the entire transport network spanning different modes and addressing critical issues such as pricing, timely deliveries, and cost effective service need to be positioned.

ENSURING COMPETITION

First, we need to re-examine sector policies to assess whether policy is limiting the competition that is technologically possible, and if so, that the rationale for these policies remains valid.

On occasions, 'natural monopolies' could be driven by policy, even though it might be possible to introduce competition owing to technological advances in certain segments. For example, in telecommunications, it has been possible to introduce competition in the local loop ever since the divestiture of AT&T in the US in 1984[70]. There may however be legitimate reasons for policy to restrict entry even in the seemingly competitive segments in public interest or in the transition period to introducing competition. The latter is especially relevant given that the competitive model poses significant risks if not accompanied by appropriate structural and regulatory safeguards.

As of now, it is neither feasible nor desirable to set up a unified transport regulator, which must remain a long-term vision. Policy on a common platform encompassing the entire transport network and addressing critical issues need to be positioned.

Second, there is need to focus regulatory effort on the segments of infrastructure delivery that are not naturally competitive, a process that would be helped by the kind of separation of powers mentioned earlier.

The prospects for competition can change over time with technological progress. Technological progress along with new ways of provision has indeed diluted, although not eliminated, the natural monopoly characteristics in certain segments of telecommunications and electricity infrastructure. Horizontal and vertical unbundling can help to separate the potentially competitive components from the natural monopoly segments. For example, in electricity, transmission and distribution have been successfully unbundled from generation in a number of Indian states[71]. Likewise, in telecommunications, technological progress and advanced thinking have ensured that the local loop can be operated separately from long-distance and value-added services. This has helped deliver an improved package of service to consumers.

In transport, railroads, tracks, signals and other fixed facilities could in principle be separated from train operations and maintenance. Sunk costs are less significant for investments in rolling stock or freight-handling equipment than for the fixed facilities. In general, it is easier for firms to enter and exit activities with a relative absence of sunk costs i.e., a feature of markets that economists describe as 'contestable'. Similarly, airport facilities can be operated separately from passenger and freight services and port facilities can be 'unbundled' from handling and maintenance services. Segments where natural monopoly conditions persist and are unavoidable (generally because they involve substantial sunk capital) should be regulated and/or perhaps operated by the public sector[72]. Privatising transport facilities is much less compelling than that for services operating on the network. For rail track, basic and access port infrastructure, and portions of airport facilities—where monopoly is unavoidable or substantial sunk capital is involved—public regulation or even operation is essential[73]. Thus, in the case of both airports and ports, the public authority can act as a landlord, providing all public services, whereas private operators can provide all terminal and other services, while paying user charges to the landlord.

70. Divestiture of AT&T in 1984. For an argument in favour of public policy to support monopoly in the face of declining unit costs see Baumol et al. (1982). It was not until 1994 in India that the National Telecom Policy (NTP 1994) first debated the efficacy of private entry.
71. Dubash and Rao (2007).
72. Kessides (2004).
73. Ibid.

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According to the World Bank, regulating unbundled utilities is harder than regulating vertically-integrated utilities, and may require aggressive pro-competition policies. But in some transport infrastructures, like rail track and airports, monopolies are unavoidable.

On the other hand, where competition is possible, greater reliance should be placed on market forces for resource allocation, with regulatory intervention used as an exception to address the underlying market failure.

While unbundling promotes competition in downstream markets, it brings in its wake a need for providers of competitive final services to access the infrastructure network of the monopoly providers-the so called 'bottleneck' services. An important task for regulation is to ensure fair access to the monopoly network. In one sense, unbundling makes the regulatory task more complex, and requires compelling institutional capacity to drive the reform agenda since new entrants will need constant access to the monopoly network. Coordination is likely to be difficult especially since the incentives of the new entrant and the monopolist are likely to be divergent. For example, DoT's incentives to provide access to its infrastructure to new entrants (who were DoT's competitors in the downstream market) were at best limited; the non existence of an independent and neutral regulatory body exacerbated the problem (Box 6.5). *Although unbundling can reduce the need for regulation by isolating monopoly segments, and replacing regulation with competition, performance becomes much more sensitive to regulatory efficacy because the underlying monopoly segment requires much more effective regulatory oversight.*

In addition, some inefficient practices (such as internal cross-subsidies) that are possible in a monopoly environment are impractical and actually undesirable in the new setting and must be regulated. For example, the State-owned incumbent DoT, in principle, was tasked with fulfilling the Universal Service Obligation (USO) in India, which it did with the higher margins from provision of high value services, such as national long distance (NLD) and international long distance (ILD) and from the higher revenues from commercial and residential customers in urban areas[74]. Once telecom was liberalised in the mid-1990s, sustaining this form of cross-subsidy became difficult since new entrants predictably focused on the lucrative long distance segments adversely impacting the incumbent's profitability. In general, competition puts pressure on the ability of the incumbent to use cross-subsidies to fund its rural and other obligations. Since network expansion, universal access and inclusion are vital public policy goals under most circumstances, regulatory intervention becomes necessary to achieve these goals even after the introduction of competition in the unbundled segments.

According to the World Bank, regulating unbundled utilities is harder than regulating vertically-integrated utilities, and may require aggressive pro-competitive policies[75]. In many segments of transportation, such as urban transport, airlines, rail and port services, pursuit of aggressive pro-competitive policies is justified, indeed desirable. For transport network infrastructure such as rail track, port infrastructure and airports, however, monopolies are unavoidable and because substantial amounts of sunk capital are involved, these segments must be regulated or even operated by the public sector.

While the new model offers benefits, these can be realised only if the model is implemented correctly. If not accompanied with effective regulation and regulatory safeguards, the model poses considerable risks. The competitive segments need access to bottleneck monopoly or 'essential facilities' to make competition in these supply segments possible (Box 6.6)[76]. Duplication of infrastructure facilities is costly and therefore the incentives between bottleneck components and competitive segments need to be aligned to avoid distortions such as those witnessed during the early years of telecom liberalisation (Box 6.5). These can be precluded by designing effective regulation with a clear dispute resolution mechanism.

A vexing task for regulators has been designing terms and conditions of access to bottleneck infrastructure facilities by competing service providers. These facilities are essential inputs in the production or delivery of final products, and cannot be economically duplicated. Examples include the local loop ('final mile') in telecommunications, the transmission grid in electricity, the network of pipelines in natural gas, the track in railroads, access to airport terminals and slots and berthing services in a port. The essential facilities doctrine has emerged in response to these challenges.

Economic theory offers two main approaches to efficiently price essential input facilities: the efficient component pricing rule (ECPR-also known as parity

74. The Universal Service Obligation is an obligation which can be imposed upon the dominant telecom operator (usually the incumbent). This obligation includes a demand to meet any request for provision of a particular telecom service to anybody within the country. The purpose of having such an obligation is to ensure national coverage of a particular telecom service also in remote rural areas, where provision of telecom service may become less profitable. International Telecommunications Union (2008). Universal access policies could be cultural, based on citizenship, equality, and inclusiveness (Goggin and Newell 2006; Preston and Flynn (2000). Others have argued that universal service resulted from interest group conflicts for the reallocation of economic resources from business users to residential users, or from urban to rural areas (Crandall and Waverman 2000). Or the state could actively pursue policy options intended to gain or perpetuate the legitimacy of state institutions.
75. Kessides (2004).
76. Joskow (1998).

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Box 6.6
The Essential Facilities Doctrine

An 'essential facilities doctrine' (EFD) specifies when the owner(s) of an 'essential' or 'bottleneck' facility is mandated to provide access to that facility at a 'reasonable' price. For example, such a doctrine may specify when a railroad must be made available on 'reasonable' terms to a rival rail company or an electricity transmission grid to a rival electricity generator. The concept of 'essential facilities' requires there to be two markets, often expressed as an upstream market and a downstream market. Typically, one firm is active in both markets and other firms are active or wish to become active in the downstream market. A downstream competitor wishes to buy an input from the integrated firm, but is refused. An EFD defines those conditions under which the integrated firm will be mandated to supply. While essential facilities issues do arise in purely private, unregulated contexts, there is a tendency for them to arise more commonly in contexts where the owner/controller of the essential facility is subject to economic regulation or is State-owned or otherwise State-related. Hence, there is often a public policy choice to be made between the extension of economic regulation and an EFD under the competition laws. Further, the fact of regulation of pricing through economic regulation, State-control, or a prohibition of 'excessive pricing' in the competition law, has implications for the nature of an EFD. Essential facilities doctrines vary significantly among legal regimes. They may vary according to the types of 'facilities', ownership and market structures to which they apply, and according to who makes the determination that a facility is 'essential'.

In the US, four elements are seen as necessary to establish liability under the essential facilities doctrine:

1) control of the essential facility by a monopolist;
2) a competitor's inability practically or reasonably to duplicate the essential facility;
3) the denial of the use of the facility to a competitor;
4) the feasibility of providing the facility.

In Australia, the report on National Competition Policy (the Hilmer Report) recommended that the following criteria must be met for right of access:

1) Access to the facility in question is essential to permit effective competition in a downstream or upstream activity [Access must be essential rather than merely convenient].
2) That it is in the public interest, having regard to:
   a) the significance of the industry to the national economy; and
   b) the expected impact of effective competition in that industry on national competitiveness.

These criteria may be satisfied in relation to major infrastructure facilities such as electricity transmission grids, major gas pipelines, major rail-beds and ports, but not in relation to products, production processes or most other commercial facilities. While it is difficult to define precisely the nature of the facilities and industries likely to meet these requirements, a frequent feature is the traditional involvement of government in these industries, either as owner or as extensive regulator.

Source: OECD (1996).

pricing) and the Ramsey pricing rule. It is however difficult to translate either approach into workable rules and access pricing schedules[77]. Interconnection pricing in telecommunications and access pricing in electricity are two familiar examples of access pricing in India where the political economy pressures have been strong[78]. More often than not, the judiciary has had to intervene to sort regulatory decisions, causing avoidable delay in the implementation of decisions. Drawing from this experience and acknowledging the special circumstance of the transport sector in India, the newly-created regulators will need to identify variants of these rules that are technically less demanding and whose information requirement is reasonable, at least to begin with. Regulation thus needs to adapt to the local context, the changing circumstances, and new information and experiences in other regulated sectors.

To secure regulatory fairness in decisions, regulatory bodies should be independent from political interference, be staffed with sufficient skills and use their autonomy to improve transparency in the process (Box 6.4). Often the transition into this new role poses, on the one hand, the risk of 'regulatory capture', a process in which the regulatory body ends up

77. Op.cit.
78. See for example Desai (2006); Dubash and Rao (2007).

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The boundaries between the Competition Commission and sector regulators will have to be established. One possibility is having the sector regulator focus on ensuring a level-playing field, and the Commission identifying anti-trust behaviour given the playing field.

identifying mostly with the concerns of the industry, or on the other, it succumbs to excessive government interference resulting in what has been sometimes referred to as 'partial expropriation'. Empirical evidence shows that institutional capacity is a strong determinant of outcomes in regulated sectors, along with a host of other variables such as business culture, interest groups, patterns of social conflict, and codes of conduct[79]. Inevitably local variables or 'country characteristics' strongly affect performance i.e., the local context matters. The structure of ownership (public versus private) on the other hand, is not a key explanatory variable for differences in performance of infrastructure utilities across emerging markets[80].

Third, we need to decide who actually regulates competition. The Competition Commission of India (CCI) established in 2002 will remain the body to resolve anti-trust and competition-related issues. Consolidating competition oversight in the CCI limits fragmentation of scarce expertise and avoids inconsistent policies across sectors that may be administratively distinct but technologically interrelated. While elements of competition oversight are common across sectors, there is a delicate balance between judicial review of regulatory decisions and enforcement of anti-competitive actions by industry players. In the early stages, there is therefore a useful ongoing monitoring role for the sectoral regulatory agency which is likely to have the best information to monitor the sector. Jurisdictional overlap between the regulator and economy-wide Competition Commission is inevitable; neither has the division been clearly established by law or by precedent. One division could be for the sector regulators to set the technical rules and enforce them, while the CCI restricts itself to issues that harm competition such as predatory conduct or cartelisation by players. But ex-ante creating a watertight division between regulation and competition issues is tricky due to the fine line between the two sets of issues. Admittedly CCI's role in enforcement of competition will be a more efficient use of scarce expertise. A consistent approach to competition issues will be good for reducing political risk and cost of finance, and increasing attractiveness for investors. Finally, strengthening the CCI and creating sub-groups with technology expertise would be a more flexible structure to be able to adapt as technology changes. For example, TRAI was given the additional charge of handling broadcasting regulation, since convergence made it possible and indeed more efficient to do so.

CCI's capacity to detect and establish anti-competitive behaviour in transport services will have to be strengthened substantially, as will its independence. The Commission will often have to rule on cases involving public and private entities. Seddon and Singh, for example describe one such case[81]:

'Private participation in inland container depots and logistics is technically open, but on terms set by the Railways Ministry. Private participants compete with Indian Railways and some have sued. Kribhco Rail Infrastructure and Aril Rail Infrastructure, for example, took a case to the Competition Commission of India arguing that CONCOR and Indian Railways work as a group entity and engage in discriminatory pricing. The CCI dismissed the case, arguing that CONCOR and Indian Railways could not be treated as a group entity and neither was dominant'.

The boundaries between the CCI jurisdiction and the sector regulators will have to be established over time by precedent. The option we have discussed here, of having the sectoral regulator focus on technical aspects of ensuring a level playing field, while the CCI focuses on identifying and penalising anti-competitive behaviour given the playing field is one such possibility.

PPP FRAMEWORKS AND MANAGEMENT

Governments around the world have adopted PPP programmes to complement traditional public works to improve their deficient infrastructure. Private sector participation (PSP) in infrastructure financing and service delivery are based on the common principle that PPP is a process for delivering infrastructure and services in which the private and public parties share rights, responsibilities, and risks during the duration of the contract. These differ from standard procurement in that the contract is meant to govern an ongoing relationship rather a one-time transaction. Under such an arrangement, the private sector party usually agrees to undertake the following[82]:

- design and build, expand, or upgrade the public sector infrastructure;
- assume substantial financial, technical, and operational risks;
- receive a financial return through payments over the life of the contract from users, from the public sector, or from a combination of the two;

79. Andrés et al. (2008).
80. Spiller (1990).
81. Seddon and Singh (2012).
82. World Bank (2011a).

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- usually return the infrastructure to public sector ownership at the end of the contract.

PPP schemes are often categorised as BOT (build, operate and transfer) and DBFO (design, build finance and operate). When the underlying asset is not returned to the public sector, it is sometimes referred to as a BOO (build, own and operate) contract, but the procedures to select, prepare, and bid these types of projects are usually[83] no different. Each sector may have its own specific issues, but there are commonalities that apply across the range of transport and other infrastructure sectors. When the private party charges a user-fee (for example, a road toll), the public authority grants the private party the right to design, build (or refurbish or expand), maintain, operate and finance an infrastructure asset owned by the public sector[84]. Such concession agreements under a user-fee PPP contract are usually for long durations, 25-30 years, after which responsibility for operation reverts to the public authority. In the Republic of Korea, the PPP programme also has a mechanism for providing construction subsidies to qualifying projects.

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

In the case of monopoly infrastructure, direct state provision has been the norm in India and elsewhere, although recently private participation in roads, ports and airports is noticeable in the form of PPP contracts. As stated elsewhere, fiscal stress facing the government makes PPP not only attractive but sometimes the only viable alternative for creating the bottleneck infrastructure.

Available information (Annex) suggests that total investments committed under PPP projects in the transport sector over the last two decades is high for India compared to other developing countries. The PPP model for transport was popular in China through the 1990s, while it picked up in India in the new millennium. The Government of India's data on PPPs shows that road projects account for 53.4 per cent of the total number of PPP projects and 46 per cent by value because of the small average size of projects. However, ports account for 8 per cent of the total number of projects but contribute 21 per cent in terms of value. The states in India with the highest number of PPPs are Karnataka, Andhra Pradesh and Madhya Pradesh. Domestic Competitive Bidding yielded almost 84 per cent of the total investments under PPP, followed by International Competitive Bidding at 11 per cent[85].

PPP must be viewed as an instrument to not only ease capacity and financing constraints, but also as an effective tool to promote competition in service delivery and improve the quality of service. Access to finance, although commonly cited as the rationale for engaging in PPPs, is one of the weaker reasons to enter into such arrangements for project or service delivery. Governments are generally able to access finance at lower cost than private companies, and any departure from this norm may be due to distortions in intergovernmental relations that should be directly addressed rather than alleviated by market borrowing[86]. Private borrowing also creates long-term economic liabilities that may be difficult to justify if private sector efficiencies do not reduce the overall financing required relative to public finance and implementation[87]. These economic liabilities are not always readily visible in standard public accounting and so may accumulate outside of public expenditure accountability frameworks[88].

An evaluation of the outcomes and impact of the PPP transport projects in the last 20 years shows that on an average these projects have brought significant benefits, in themselves and when compared with the public works alternative, though variance has been high[89]. The main benefits of PPP have been to accelerate infrastructure deployment, provide possible short-term release of fiscal pressures, and more importantly for India, these partnerships have often offered better value for money. This implies better services over the long term, significant enhancement in the quality of service, and quality of assets and improved productivity and coverage. A critical benefit of PPP comes as a result of the usual bundling of construction, maintenance and rehabilitation for the life of the project/concession, usually from 25 to 30 years. Specifically, the benefits of transport PPPs have been in realising productivity gains ranging from 10-20 per cent to over 70 per cent, improvements in quality of service sometimes

83. Ibid.
84. The demand risk may be shared by the public sector by underwriting minimum usage.
85. Public Private Partnerships in India, Ministry of Finance, GOI.
86. Engel et al. (2007) use a variant of this argument to show that PPPs cannot be justified by their ability to free up public funds.
87. Engel et al. (2007); Hellowell (2010); World Bank (2007).
88. Engel et al. (2009) find empirical evidence that policymakers in Latin America, for example, renegotiated roads concessions in order to prepone pre-election expenditure, at the cost of incurring greater post-election liabilities.
89. This part draws from Guasch (2012).

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The critical components of success of PPPs are the design of the concession/contract and associated processes, the clarity and transparency of the rules of the game and the regulatory framework, along with conflict resolution mechanisms.

over 60 per cent, and accelerating coverage of service. Experience has shown that reductions in tariffs are difficult to achieve (although there are notable examples such as road PPPs in Brazil and Mexico) given the often poor initial state of assets requiring investment and that the original prices tended to be highly subsidised.

Unsuccessful PPPs in transport reflect several common weaknesses. A review of 20 years of projects in transport shows that unsuccessful PPPs had weak feasibility studies, unresolved land allocation issues, overly aggressive bids, unpredictable and lengthy conflict resolution mechanisms, ambiguous tariff adjustment guidelines, ambiguous risk allocation and a lack of comprehensive planning and use of best practices[90].

The upshot is that PPP projects in transport have brought benefits, but these benefits could have been even larger and more general had best practices been followed. At the same time PPP projects also have had a number of systemic problems that have reduced their potential benefits. For example, in India, many contracts have suffered from large time and cost overruns and over the years they have been unable to meet expectations regarding transparency and accountability. The Dabhol power project had to be terminated as its tariffs turned out to be exceptionally high; the NOIDA Toll Bridge Company claimed extension of its 30-year concession to 70 years, besides grant of real estate rights; private terminal operators at major ports such as the Jawaharlal Nehru Port and Tuticorin have been charging tariffs that can be regarded as almost twice their entitlement[91].

Well-designed PPP contracts have the potential to deliver benefits and the way they are structured and bid out will influence their outcome. A crucial element in this process is the concession agreement, which as a matter of principle should not be drafted by the potential concessionaire[92]. A model concession agreement (MCA) and other bidding documents that reduce transaction costs and ensure that project terms are fair, competitive, transparent and enforced in a non-discriminatory manner will go a long way in securing for India success that PPP projects have enjoyed elsewhere in the world. This implies creating an enabling environment for PPPs, including a clearer legal and regulatory framework; improved competitive bidding procedures; more consistent sector policies, and tariff regimes that allow for greater, if not complete cost recovery.

Although the performance of PPP contracts in infrastructure in India has left much to be desired, the clear lesson that emerges from the experience is that governance needs to improve significantly for PPPs in India to deliver value commensurate with their potential. Transport PPPs can induce large benefits and increases in efficiency, but the legal, institutional, procedural and regulatory framework and the PPP contract design and proper oversight are critical[93].

The critical components of success are the design of the concession/contract and associated processes, the clarity and transparency of the rules of the game and the regulatory framework, capacity and instruments, along with conflict resolution mechanisms. Concession design and regulatory oversight are the best predictors to reduce regulatory risk and of sector performance and ex-post management problems. An excellent concession design but poor regulatory oversight will lead to deficient sector performance. An excellent regulatory oversight but with poor concession design will lead to deficient sector performance. Both are needed both for effective sector performance and to secure the gains from private sector participation[94]. Hidden subsidies must be costed and accounted for in an open and transparent manner, and evaluated in the context of competing demands for allocation of public resources (Box 6.7).

The basic principles for PPPs should be established by an overarching legal framework, but contracting and oversight would be under specific sectoral agencies.

Over time, the approach of these sector-specific agencies should become more coordinated. Sector specific tribunals have become popular in India due in part to the overburdened court system, but there are also arguments for more integrated treatment of public-private disputes, and even for moving these back into the mainstream judicial system at arm's length from regulators. Vesting judicial power and delegated legislative power within the same institution has been the subject of recurrent litigation in the case of the securities markets regulator, the telecom regulator and more recently the competition authority[95].

PRICING, SUBSIDIES AND INCLUSION

Policy reforms that usually accompany restructuring and private entry—such as eliminating cross-subsidies and moving toward cost-based prices—are

90. This part draws from Guasch (2012).
91. Haldea (2011).
92. Ibid.
93. Guasch (2012).
94. Ibid.
95. Ibid.

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Box 6.7

Why Rebalancing is Necessary before Introducing Competition: Example from Telecom

Technological progress has convincingly undermined the natural monopoly argument for telecom markets and it is now widely recognised that enhancing efficiency and investment requires the introduction of competition, which in turn needs a regulatory mechanism to facilitate competition. An essential ingredient of transition from a protected market to competition is alignment of prices to costs (i.e., cost-oriented or cost-based prices), so that prices better reflect their likely levels in a competitive environment. Tariff 'rebalancing' involves reducing tariffs that are above cost while increasing those which are below cost.

A major departure from cost-based pricing involves a high degree of cross-subsidisation. i.e., a small proportion of the subscribers account for a major share of all revenue, and these subscribers are inevitably the subject of competitive churn when private sector operators enter the market. Loss of such customers will have a significant adverse impact on the revenue situation of the incumbent, making it difficult to meet the objectives of universal service and network expansion. Under these circumstances, tariff rebalancing helps prepare for competition and avoids a number of pitfalls. Cost-based prices restrict the possibility of cream skimming by new operators, facilitate smooth inter-flow of traffic, and reduce the dependence of operators on narrow market segments for maintaining their financial viability. This in turn also promotes a greater concern among operators for a wider set of its subscriber base, and to focus on quality of service, improving technology and service options. Traditionally, DoT tariffs cross-subsidised the cost of access to the telecom network by excessive domestic and international long-distance usage charges. Thus, in order to promote desired efficiencies, 'rebalancing' of tariffs became a condition precedent to the conversion of a single operator system to a multi-operator environment. Thus, while tariffs have to be reduced for the services which are priced much above cost (e.g., long-distance and international calls), tariffs for below-cost items need to be increased. Such a rebalancing exercise is common when preparing the situation for competition. Otherwise, competition will result in a decline in above-cost prices without any compensating charge in the below-cost prices.

After a comprehensive consultation procedure covering service providers, consumers, policy makers and parliamentarians, TRAI issued a Telecommunication Tariff Order (TTO) on 9 March 1999. The Order was a landmark for infrastructure regulatory agencies in India in terms of attempting to rebalance tariffs to reflect costs more closely, and to usher in an era of competitive service provision. *The chief features of the tariff order were substantial reductions in long distance and international call charges, increase in rentals and local charges and steep reductions (an average of about 70 per cent) in the charge for leased circuits*. These changes were achieved after extensive consultation and considerable political opposition. Over time, prices have now become better aligned with underlying costs. And services have become more responsive to consumer and business needs and to opportunities for innovation.

Source: Kathuria (2000); TRAI (1998).

also politically difficult to implement (Box 6.7 for an example from Indian telecom). It is alleged that restructuring and private entry often lead to higher prices that hurt the poor, especially when they already have access to some sort of infrastructure services. In some cases, for example, the urban poor have access to power, so radical tariff hikes that accompany restructuring could have harsh adverse effects. If they do not have access, then tariff rebalancing is irrelevant for them. In India's context, where there is limited access to some transport services, the key is not to stop reform but to ensure that tariff rebalancing schemes wherever implemented by independent regulators, do not involve extreme price increases and are, at the same time accompanied by transparent subsidy mechanisms that cover the poor. Insufficient targeting and lack of transparency in subsidies has meant that a large proportion of subsidies has gone to people other than the intended beneficiaries. The emphasis should not be on setting 'optimal' tariffs but on reforming tariffs—to find feasible changes in tariff structures that both improve welfare and generate adequate revenue[96].

It is inevitable that most tariff increases, especially radical hikes, will be subject to relentless politi-

96. Armstrong and Rees (2000).

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Unsound pricing policies and hidden subsidy mechanisms of the past have seriously undermined the financial viability of service providers, resulting in frequent undersupply and rationing of infrastructure services.

cal resistance. For example, in July 2013, the Delhi Electricity Regulatory Commission (DERC) announced a 5 per cent increase in power tariffs and although energy experts believed that the hike ought to have been more, opposition political parties exploited the increase to try and drive political advantage[97]. Arm's length regulation is best equipped to handle such political pressures that more often than not trade off long-run sector interest for the short-term gains of electoral politics[98]. Such shortsightedness can have detrimental effects. For instance, relying on populist measures (and welfare subsidies), while attractive in the short term, can lead to deficit spending and asset quality degradation in the long term, which is likely to impose greater costs on society than current tariff increases. Independent and effective regulation is therefore necessary to balance these conflicting goals and to make up for the lack of competitive alternatives for the consumers while allowing a fair return on operator investment. At the same time, newly-created regulators should eschew abrupt price changes that could result in significant adjustment costs for consumers (and service providers). There exist several models of pricing reform for infrastructure sectors that regulators will be well advised to consider and adapt to local conditions while ensuring a gradual transition to efficient pricing levels and structures[99].

Admittedly, this is no easy task. Pricing of transport infrastructure services often turns out to be the most contentious aspect of sector reform. Pricing policies and associated subsidy methods play a decisive role in achieving the goals of affordable access and infrastructure development. As stated here, cross-subsidisation, the most popular means for dealing with this issue, is not sustainable in a competitive environment and creates perverse incentives against infrastructure expansion to serve the poor. With competitive entry and reform, new sources of subsidy must be established and/or rates should gradually reflect the underlying costs. A range of possibilities exist in which service levels can vary with price, reflecting consumer preferences and their ability to pay. Alternatively, the regulator can develop tariff schemes that include explicit and well-targeted subsidies, ensuring that users do not spend an unreasonable share of their incomes on infrastructure services. A common rule of thumb is that poor individuals should spend no more than 15 per cent of their income on utilities and transportation[100]. Subsidies for operators can be targeted through 'reverse auctions' or 'negative concessions' (where bidders compete on the basis of the least subsidy needed to deliver the service) or performance-based grants for specified service levels[101]. In least-cost subsidy auctions, qualified applicants bid for the lowest subsidy to provide a non-economic service as part of the universal service provision. The subsidy thus represents an amount that bridges the operator's financing gap, known in certain circumstances as viability gap funding (VGF) in India. Auctions can also be based on any other measurable characteristic such as the lowest consumer tariff to be charged or the greatest level of service to noneconomic areas.

It is important to reiterate the fact that unsound pricing policies and hidden subsidy mechanisms of the past have seriously undermined the financial viability of service providers, resulting in frequent under supply and rationing of infrastructure services, and actually exacerbated inequality. Lack of infrastructure services are a drag on the general functioning of the economy and on economic growth. Better infrastructure promotes general economic growth and enhances economic opportunities, especially for the poor. There is some evidence to suggest that increased productivity brought about by introduction of competition and related reforms in infrastructure seems to benefit the poor more than other groups[102].

The challenge for regulation therefore is to reduce (or eliminate) interest group and political pressure that is often exercised through untargeted hidden subsidies and which undermines the economic viability of each infrastructure sector and frequently becomes a significant impediment to the introduction of competition. To the extent possible, universal service and social equity goals should be implemented separately from pricing policies governing the transport sectors by designing competitively neutral mechanisms. This can be done through either a non-distortionary levy on the sector as a whole (for example, USOF in Telecom and EASF in Civil Aviation) or through the general tax system, although it is preferable to use the former. Universal service funds are desirable especially in the context of liberalised transport sectors to provide financial assistance for

97. According to BSES, over the last 10 years Delhi power tariffs have gone up by 65 per cent when the increase should have ideally been 90 per cent. This 25 per cent gap in tariff increase has led to an estimated under-recovery of Rs 200 billion. In the corresponding period, CPI increased by 120 per cent, fuel by 190 per cent and bulk power cost by 300 per cent. In light of this, Delhi's tariff hike of 5 per cent is deemed to be inadequate. See BSES (n.d.). Note that BSES is an interested party in the matter and has an incentive to inflate tariff hikes. Nonetheless, Delhi's electricity tariffs are lower than in other metros.
98. In their campaigns for the Delhi legislative assembly elections in December 2014, both the new Aam Aadmi Party (AAP) and the Bharatiya Janata Party (BJP) had placed electricity tariffs high on the election agenda in direct conflict over the ruling Congress party over the hike in power tariff.
99. Briceño-Garmendia et al. (2004).
100. Ibid.
101. A reverse auction is the standard way in which the government typically procures any good or service When the government needs to purchase something, it issues a request for proposals (RFP) describing specifically what it wants. Firms reply to this request, and the government picks the firm that submits the best bid. The best bid may be the lowest, but the government may also take other factors into account.
102. Benitez et al. (2001).

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meeting sector-specific goals such as infrastructure expansion and inclusion. The goal of inclusion will be much more effectively served by ensuring the coexistence of several features in each transport sector, including a robust regulatory framework, a transparent pricing and subsidy mechanism and above all competition in supply, wherever feasible and possible.

REGULATION AND STANDARD SETTING

Poor infrastructure services can threaten health and safety, and the regulation of their quality is an important policy concern. Quality has many dimensions, and regulating quality is perhaps more complex than regulating price. Like economic regulation, quality regulation is also motivated by market failure and accordingly the nature of intervention should be guided by the type of market failure that is sought to be corrected. For quality dimensions such as safety, health and the environment, defining and enforcing minimum quality requirements is crucial. For example, for consumers of urban bus services, safety is a key concern. Standards above the minimum are equivalent to changing the economic value of the service for which there will be different willingness to pay by customer groups and can be left to the market.

In India, there has been a singular lack of setting and enforcing minimum safety standards for urban transport and roads, among other modes. The large number of road injuries/fatalities is evidence of laxity since these cannot be justified as mere accidents. Instead it is the result of individual and institutional apathy. Road crashes alone claim more than 118,000 lives every year, mostly pedestrians, cyclists and pavement dwellers. The pedestrian's right to safe and free passage has become a casualty[103]. It is a harrowing experience to walk in an Indian city. It is vital and urgent that Indian cities are made pedestrian-friendly and clean, efficient vehicle technology is promoted for both private and public modes in order to reduce fuel consumption and emissions. Fuel efficiency standards should be introduced in India and implemented effectively.

A beginning must be made now and virtually from scratch. There is little expertise, data or information available to address the transport safety problem in a scientific manner. The international professional consensus is that it is not very productive to focus on human error alone. According to the 1997 Swedish Road Safety Bill, *'The responsibility for every death or loss of health in the road transport system rests with the person responsible for the design of that system'*. This approach has not been internalised yet by any official organisation or institution dealing with safety in India. The predominant approach is still based on the outmoded principle of finding fault with an individual and then acting accordingly.

103. NTDPC (2013b).

An unfettered market for transport services will not resolve the related problems of safety, health and environment on its own. Such pervasive market failures obligate regulatory intervention, but only if such intervention works better than the market alone.

Demand for better knowledge and technologies in the transport sector can only be provided by public bodies such as central and state governments, and local bodies like municipalities and transit authorities. Accordingly, institutes for road, railways, water and air transport safety need to be set up to *inter alia* set standards, collect data and ensure that evidence of the effectiveness of safety countermeasures is made an integral part of decision-making at all stages, rather than just a reaction to observed safety failures or political demands. No country has been able to deal with the problem of safety without very strong professional institutional mechanisms, including enforcement. Safety Departments need to be set up within operating agencies (at different levels) for ensuring day-to-day compliance with safety standards as well as studying effectiveness of existing policies and standards, conducting safety audits and collecting relevant data.

An unfettered market for transport services will not resolve the related problems of safety, health and environment on its own. Such pervasive market failures obligate regulatory intervention, but only if such intervention can achieve a better outcome than the market alone, with all its imperfections. As a result, not only setting of standards is crucial but ensuring their compliance is equally if not more important to improve outcomes. The diffusion of responsibility and lack of coordination between existing agencies does not help. For example, in road safety, authorities like NHAI, PWDs in the states and local bodies are responsible for construction and maintenance of roads; State transport authorities are responsible for issue of driving licenses, registration of vehicles and fitness of vehicles; police is responsible for regulating traffic, enforcing laws and educating the public on road safety issues; urban development authorities deal with land use and urban road planning; health departments are responsible for medical care of accident victims; insurance companies provide insurance cover and compensation. Apart from the fragmented structure, there is no coordination among the different agencies.

Road safety and urban transport are reflective of the malaise across all transport sectors. Inadequate data, lack of expertise, absence of coordination and weak enforcement are universal weaknesses in all transport sectors and need immediate correction. By its very nature, setting and enforcing standards

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Table 6.3
Trends in Railway User Charges

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Passenger Fares	No increase	No increase	No increase	Reduction	Reduction	No increase	No increase	Fare increase proposed and retracted
Freight Charge	No increase	No across the board increase	No across the board increase	No across the board increase	No across the board increase	No increase	Price increase for 'inflation concession' for some commodities	Across the board increase

Source: Seddon and Singh (2012).

is an integrated activity involving multiple interventions. These interventions need to be combined and implemented in an integrated manner to derive the maximum benefits from each intervention.

BUILDING THE REGULATORY CONTEXT FOR TRANSPORT IN INDIA: SECTORAL DISCUSSION

In the following five sub-sections we discuss regulatory priorities for each of the major modes of transport, highlighting the key role of regulation as a part of the overall reform agenda discussed in more detail in other chapters.

RAILWAYS

The primary regulatory need for Railways is independent price regulation to reduce the persistent cross-subsidisation between freight and passenger services and begin to restore shift freight traffic toward railways. Over time, as policy opens more opportunities for private participation in railway services, the regulatory framework will need to ensure competitive access to trunk lines and include social regulation to reduce environmental impacts and increase safety.

Social expectations of widespread access to low cost passenger service and the financial imperative to generate sufficient revenues to expand and maintain its rail network, wagons, and other equipment create conflicts while politics plays a big role in determining tariffs. The ratio of passenger fares to freight charges is one of the lowest in the world.

Unlike other regulators who fix tariffs based on elements of cost, IR has been unable to increase rates causing increasing financial stress to IR (Table 6.3). An independent Rail Regulator could depoliticise the process of passenger fare revision and arbitrate disputes and grievances of freight customers.

Creating a Railways Tariff Regulatory Authority to provide 'a level playing field to all stakeholders' is one of the many recommendations made by various committees including the Rakesh Mohan Committee on Railway Reform in 2001, the Sam Pitroda-headed Expert Committee on Railway Modernisation and by the Planning Commission. The Government had recently approved the Rail Tariff Authority and this should be constituted early. In addition, an independent dispute settlement tribunal could also be created with the existing Railway Rates Tribunal (RRT) charged with this mandate, but the risk of regulatory institution proliferation as discussed earlier must be kept in mind. International experience does not suggest the best model one way or the other, but in India, there has been an increasing tendency to separate the dispute resolution process from the regulator[104].

In the meantime, freight transport in India is dominated by road, a situation that poses significant economic and social costs. The share of road in freight transport (tonne-kilometres) in India is around 57 per cent, against railway's share of 36 per cent. Railway's share (in originating tonnage) declined from 89 per cent in 1951 to 65 per cent in 1978-79, and from 53 per cent in 1986-87 to 30 per cent in 2007-08. Although it has increased recently, it is below the comparable share of about 50 per cent in similar large countries like US and China. A share of 50 per cent for railway freight is a desirable goal for sustainable long-run growth (Chapter 2, Volume II)[105]. Inability to service growing freight demand has been due to many factors, including severe capacity constraints. As a result, IR has been forced to focus on bulk cargo and even within bulk cargo there has been preference for certain types of cargo on public policy considerations, thereby sacrificing other major potential cargo such as automobiles and chemicals which are consequently transported by road.

Such a non-optimal intermodal distribution of freight traffic is estimated to have cost the Indian economy Rs 385 billion in the year 2007, constituting 16 per cent of the total transport cost. It has also

104. The Sam Pitroda Committee has recommended creation of a PPP Ombudsman under the aegis of the Railway Board.
105. McKinsey & Company (2010).

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Table 6. 4
Main Responsibility for Public Interest Roles

COUNTRY	INTEGRATED TRANSPORT POLICIES	RAILWAY SECTOR STRATEGY/ POLICIES	ECONOMIC REGULATION	SAFETY REGULATION
Australia	Department of Transport		Australian Competition Commission	Departments of Transport or Independent Regulators (varies by state)
Brazil	Ministry of Transport		National Agency for Land Transport	
Canada	Department of Transport		Canadian Transportation Agency	Transportation Safety Board
China	Ministry of Transport		Ministry of Railways	
Germany	Ministry of Transport		Federal Cartel Office	Federal Rail Agency
Japan	Ministry of Transport			Japan Transport Safety Board
Russia	Ministry of Transport		MOT and Ministry of Economic Development and Trade (MEDT)	Ministry of Transport
US	Department of Transport (DOT)		DOT-Surface Transportation Board	National Transport Safety Board/ DOT-FRA

Source: NTDPC (2011).

affected energy efficiency of transport: a study by the Asian Institute of Transport Development (AITD) concluded that rail consumes 75-90 per cent less energy for carrying freight traffic and 5-21 per cent less energy for passenger traffic compared to road[106]. Similarly, railway scores over road in respect of financial, environmental and social costs by a huge margin by virtue of its scale economies and being a safer and less polluting mode[107]. The diversion of freight and passenger traffic to roads produces many undesirable consequences. There is revenue loss for IR, a larger freight cost to GDP ratio and higher environmental cost per route kilometre.

Any shift of traffic from road to rail, especially in freight, would, therefore, result in substantial savings in energy consumption as well as reduced economic and social costs. This has also been corroborated by the Total Transport System Study conducted by RITES for the Planning Commission[108]. McKinsey has estimated a loss of about 4.3 per cent of GDP due in large part by the inability of railways to enable a more balanced modal distribution. Independent price regulation alone will not achieve these goals– restructuring investment planning and improving the efficiency with which existing stock is managed are also important.

Restructuring of Indian Railways to operate on business lines is essential for enhancing capacity to meet country's social and economic aspirations in the 21st century. Several expert committees convened over more than a decade have made detailed recommendations on modernising IR's management, but political will to run IR as a commercial entity has been lacking. Nevertheless, railway restructuring must happen, and it is essential to put an appropriate regulatory framework in place before it does to address anti-competitive behaviour as well as pricing, not to mention environmental and safety goals (Chapters 7 and 12, Volume II).

The experience of rail freight liberalisation in various parts of the world has shown that there are considerable barriers to entry, so that competition is unlikely to be a strong force to encourage performance. In markets controlled by State-owned monopoly operators, there could be many barriers arising out of control of key assets and lack of effective regulation to enforce a level playing field. The level of non-discriminatory access to network and the relationship between the access provider and access seekers are also matters of considerable interest in any rail liberalisation exercise. The quantum and structure of access charges paid by entrants to the infrastructure operator play an important role in determining the extent to which effective competition can be achieved. It is a function ideally performed by an independent regulator since determining efficient level of access charges is far from straightforward[109]. For India, a vertically integrated, State-owned structure could be an enduring challenge for creating non-discriminatory access to core infrastructure. For an illustration of such risks due to the absence of institutional and structural prerequisites while introducing reform, see Box 6.5 for the experience in Indian telecommunications.

Similarly, the various roles in rail governance currently bundled together in the Ministry of Railways must be separated. All countries with significant rail systems have separated the public policy roles of the

106. AITD (2000).
107. Ibid.
108. Planning Commission (2010).
109. There are several different approaches to pricing of access. See World Bank (2011b).

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Lessons from major rail markets establish the sub-optimality of India's framework. The role of the Railways Ministry as licensor, regulator and key player is not conducive for attracting private investment, much less maintaining a competitive environment.

Ministry of Transport (no other major economy has separate ministries for each mode, and only a handful retain a separate Ministry for Railways) and sub-sectoral policy making from either the economic regulation and/or safety regulation roles (Table 6.4).

Lessons from major international rail markets clearly establish the sub-optimality of India's governance framework. The role of Ministry of Railways as licensor, regulator and a key player is not conducive for attracting private investment into IR, much less maintaining a competitive environment[110].

ROADS AND HIGHWAYS

Road transport includes a number of regulatory challenges, including managing PPPs in road construction; increasing safety and reducing environmental impact of road-based transport; ensuring competition in road transport services, and potentially using regulation among other tools to ensure widespread access to road transport.

The PPP option is on the agenda for all transport infrastructure, but particularly for roads in which technology is more straightforward and project structures can be replicated as 'model documents'. Expert regulation is particularly important for resolving disputes after the concession. Most competitive bidding processes effectively involve bets on future traffic flows. Bidding based on toll rates is obviously based on expectations about traffic. Rate of return expectations for competitive bidding for viability gap funding (VGF), as has been used by a number of state governments in India, also rests on traffic predictions. VGF allows a maximum subsidy of 40 per cent of the capital cost of the project. These funds are fully used during the high-cost construction periods where there is no offsetting revenue flow from user revenues. The road user toll is fixed, so private sector bidders bid the lowest VGF amount, in principle creating incentives for boosting efficiency. Disputes can arise when traffic flows vary substantially from projections, often provided by the public sector.

India's experience with road PPP illustrates the importance of managing disputes. Competition has grown tremendously, leading to aggressive bidding and unrealistic traffic forecasts. Together with human capacity constraints, unclear jurisdictions and institutional weaknesses, this has led to high incidence of renegotiation of contracts, and a reduction of the benefits of private participation. In recent awards, some bids have been overly aggressive, rendering the IRRs negative or lower than the cost of capital. For instance, the equity IRR for the Khagaria-Purnea annuity project was estimated as 7.8 per cent, while for the Barasat-Krishnagar project, the IRR is expected to be negative[111]. Land acquisition and clearance obligations for road sector concessions have also been frequently contentious leading to litigation and lengthy delays. According to IDFC, land acquisition and forest clearances are the biggest bottlenecks to timely completion of projects[112]. NHAI, which was constituted for execution of works on National Highways (NHs), has been involved in a number of disputes relating to its contractual obligations. NHAI has faced several claims under arbitration proceedings but progress on settling disputes has been limited. Only 14 per cent of the projects comprising less than 5 per cent of arbitration award were accepted by both parties involved in the dispute[113].

The combination of limited traffic data and weak dispute resolution can lead to a situation where private investment can only be attracted if the public sector bears demand risk, limiting one of the potential gains from PPPs. In these arrangements, the public sector makes fixed payments to the private party when, and to the extent that a service is made available. The demand risk in these availability-based PPPs is borne by the public authority. The UK pioneered the use of this form of PPP for the provision of social infrastructure (known as the Private Finance Initiative [PFI] Programme), and many other countries, such as Australia, Brazil, Canada, Japan, the Republic of Korea, Mexico and South Africa, are using this approach[114]. In India, this form of PPP is referred to as the annuity scheme.

As in rail, rationalising regulatory oversight of India's roads is important. The problem is in some ways the opposite of that described for railways: fragmented authority rather than overly consolidated powers (Table 6.5).

There is urgent need to create a strong and an independent regulatory mechanism for India's roads and highways sector, with expert staff tasked with making technical decisions. They should also ideally have incentives to serve long terms that allow the creation of a deep base of expertise and experience and like BPR should be shielded from direct

110. In 1997, regulatory powers of DoT were handed over to TRAI; in 2000 DoT was divested of its role as a service provider recognising that a service provider, licensor and regulator within the same jurisdictional boundary gives rise to conflict of interest.
111. IDFC (2012).
112. Ibid.
113. Ibid.
114. Op. cit.

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Table 6. 5
Regulatory Oversight for Roads

INSTITUTION	RESPONSIBILITY	GOVERNING ACT
Transport Wing - Ministry of Road Transport and Highways (MORTH)*	1) Licensing of Drivers of Motor Vehicles and conductors of Stage Carriages 2) Offences, penalties and procedures 3) Evolves road safety standards in the form of a National Policy on Road Safety and by preparing and implementing the Annual Road Safety Plan. (Some of these are applicable to urban transport)	Motor Vehicles Act 1988, Central Motor Vehicle Rules 1989 Road Transport Corporations Act 1950 Carriage by Road Act 2007, Carriage by Road Rules
Roads Wing - Ministry of Road Transport and Highways (MORTH)*	1) Planning, development and maintenance of National Highways in the country 2) Evolves standard specifications for roads and bridges in the country	National Highways Act 1956, National Highway Rules 1957 Control of National Highways (Land and Traffic Act) 2002 National Highways Fee (Determination of Rates and Collection) Rules
National Highways Authority of India (NHAI)	Responsible for the projects under National Highways Projects	National Highways Authority of India Act, 1998

Source: NTDPC (2013b).
Note: *MORTH formulates and administers policies in consultation with other central government ministries, state governments, and union territories. As per the governing acts, state governments are provided legislative authority to formulate select rules and regulations in order to enable efficient road transport system across the country.

political influence while simultaneously building a culture of professionalism. Theoretically, there may not be a need for an independent regulator (where concessions can be regulated by contract). However, the need for an independent regulatory mechanism is arising on account of institutional infirmities and shortcomings in contract designs. The jurisdiction of any proposed regulator is also an issue, given the concurrent status of the roads and highways sector (national highways with NHAI/MORTH; state highways, district and rural roads with the respective state governments. The functions of the regulatory mechanism inter alia would involve: (a) tariff setting; (b) monitoring and enforcement of uniform technical standards on construction, service quality and maintenance related benchmarks; (c) collation, analysis and dissemination of sector information; (d) ongoing review of concessionaire designs to correct inherent infirmities. Monitoring of contracts has been a vexing issue; an independent regulatory mechanism will be much better suited to monitor performance outcomes associated with all contract types such as turnkey contracts, O&M contracts, BOT contracts, corridor management, etc.

The Government is actively considering the setting up of an independent tribunal under the proposed Public Contracts (Settlement of Disputes) Bill to deal with the differences and disputes that may arise during the implementation of public contracts (which include PPP contracts), refer these disputes to arbitral proceedings over which it would adjudicate and exercise supervisory control. The proposed Act lays down the process for the adjudication proceedings, hearings and enforcement of orders by the proposed Tribunal, which may be challenged by the aggrieved party only in the Supreme Court. The proposed two-stage dispute resolution process is expected to reduce the time taken for resolution of disputes arising from PPP contracts.

India also needs to create a regulatory framework to guide the use of roads. One element of this framework, traffic management, is discussed in the subsection on Urban Transport. Regulation of interstate vehicle movements is a second area that requires rationalisation. Overlaps or ambiguity in mandates give rise to disputes and costly litigation. For example, the number of clearances that truck operators have to obtain from different agencies in order to operate is large and harrowing for the operators. The agencies involved are (a) Sales Tax, (b) Regional Transport Officer (RTO), (c) Excise, (d) Forest, (e) Regulated Market Committee, (f) Civil Supplies (check on the movement of essential commodities, black marketing, weights and measures, food adulteration) and (g) Geology and Mining. These checks are generally conducted by respective agencies at separate points, resulting in more than one detention. Detention of vehicles causes lower speed, loss of time, high fuel consumption and idling of vehicles, leading to under-utilisation of transport capacity and adversely affecting their operational viability. Besides, it imposes economy wide costs that are not easy to assess. By introducing checks at each interstate border the road freight transport experiences significant inequity compared to the freight/cargo transport by the railways, aviation and even inland transport, which do not face such rigorous en-route checking. The system in vogue hinders rather than

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Table 6. 6
Regulatory Oversight in Civil Aviation

INSTITUTION	CIVIL AVIATION RESPONSIBILITIES	GOVERNING ACT
Directorate General of Civil Aviation (DGCA)	1) Responsible for regulation of air transport services to/from/ within India and for enforcement of civil air regulations, air safety, and air worthiness standards. It also coordinates all regulatory functions with the International Civil Aviation Organisation (ICAO) 2) DGCA issues licenses to pilots, aircraft maintenance engineers, flight engineers, and air traffic controllers 3) Carries out amendments to the governing acts/ rules to comply with the amendments of the International Civil Aviation Organisation (ICAO)	Aircraft Act of 1934, Aircraft Rules, Civil Aviation Requirements, Aeronautical Information Circulars
Bureau of Civil Aviation Security (BCAS)	Regulatory Authority for Civil Aviation Security in India. It is responsible for laying down standards and measures in respect of security of civil flights at International and domestic airports in India	Aircraft Act of 1934, Aircraft Rules, Civil Aviation Requirements, Aeronautical Information Circulars, The Suppression of Unlawful Acts against Safety of Civil Aviation Act (1982 and 1994)
Airports Economic Regulatory Authority	1) To determine tariff for aeronautical services 2) To determine the amount of Development Fees at major airports 3) To determine the amount of Passengers Service Fee	The Airports Economic Regulatory Authority of India Act, 2008; Aircraft Rules 1937, Aircraft Act 1934
Airports Authority of India (merged National Airports Authority and International Airports Authority)	Responsible for creating, upgrading, maintaining, and managing civil aviation infrastructure both on the ground and air space in the country. The functions of AAI are as follows: 1) Design, development, operation and maintenance of international and domestic airports and civil enclaves 2) Control and management of the Indian airspace extending beyond the territorial limits of the country, as accepted by ICAO 3) Construction, modification and management of passenger terminals 4) Development and management of cargo terminals at international and domestic airports 5) Provision of passenger facilities and information system at the passenger terminals at airports 6) Expansion and strengthening of operation area, viz. Runways, Aprons, Taxiway, etc. 7) Provision of visual aids 8) Provision of communication and navigation aids, viz. ILS, DVOR, DME, Radar, etc.	Airport Authority of India Act, 1994 As amended by the Amendment Act 2003

Source: NTDPC (2013a).

facilitates smooth flow of freight and passenger movement across the country and has thwarted the formation of single common market.

CIVIL AVIATION[115]

There are three main regulatory priorities for the civil aviation sector: managing PPPs and the terms for private investing in aviation infrastructure, including dispute resolution; regulating pricing and access to core facilities to ensure healthy competition among service providers; and strengthening oversight of airline practices to ensure safety and compliance with minimum standards of service delivery.

The aviation sector in India can be broadly classified into three distinct functional segments: (a) operations of public and private airlines; (b) infrastructure, under the purview of the Airports Authority of India (AAI) and the newly-created Airports Economic Regulatory Authority (AERA); and (c) regulation and development, the responsibility of the Directorate General of Civil Aviation (DGCA) and the Bureau of Civil Aviation Security (BCAS) (Table 6.6).

As detailed in the chapter on civil aviation (Chapter 3, Volume III), stronger regulatory oversight over the sector is warranted by several factors. First, despite strong growth in demand for both domestic and international air travel, and for the movement of cargo, the airline sector itself remains weak. Many domestic airlines operate on the strength of precarious balance sheets. Meanwhile, offshore carriers dominate the market for international aviation. This may not be a bad outcome in itself if it is the result of careful policy planning. However, given India's geographical advantages and a strong home market, a sense prevails that Indian airlines competing in the overseas market have not made full use of their bilateral flying entitlements

115. The Civil Aviation sector consists of Airlines (scheduled and non-scheduled) Airports, Maintenance Repair and Overhaul (MRO), Air Cargo and Express, Ground Handling and Aviation Academies.

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and landing slots. These and other issues of concern to the airline industry are documented more fully in the chapter on civil aviation.

Second, with airports being monopoly providers of critical aviation infrastructure, the regulatory imperative is clear. India is a signatory to the Chicago Convention on Civil Aviation (1944), one of the founding documents of international civil aviation. Amongst other things, the convention establishes the sovereignty of a state over territorial airspace, defines rules for international scheduled air transport, and the basic rules of aircraft safety and registration. In setting out the basic policy on airports and air navigation systems, the Convention also notes that regulatory oversight over these cannot vest with the operators, and instead must do so with the contracting states themselves. In view of the monopolistic nature of airport and air navigation services, the State is required to assume responsibility for protection against monopolistic abuses.

The practical aspects of this regulatory objective are the following[116]:

- to ensure non-discrimination in the application of charges;
- to ensure there is no over-charging, anti-competitive practice or abuse of the dominant position;
- to ensure transparency and the ready availability of financial data;
- to establish and review standards, quality and service delivery;
- to assess and encourage efficiency amidst the service providers.

These aspects are intended for consideration within the broader objectives of the development of civil aviation, promoting non-discriminatory access to airport services, and the balancing of interests between airport and users. ICAO identifies five different regulatory options that can address these goals[117]:

(a) Minimum intervention in the form of self-regulation or market regulation through competitive forces. This strategy may be appropriate whenever, for example, an airport earns a large proportion of its revenues from commercial activities, thereby giving it an incentive to minimise aeronautical charges to attract traffic, or when an urban conurbation is served by several airports in competition with each other.

(b) Systems of institutionalised checks and balances such as through joint ownership of airports by airlines, or by airlines in partnership with the government, or when the airport's charter specifies financial goals as not intended to generate profit.

(c) Stakeholder oversight in the form of a third-party advisory commission made up of representatives of airlines, governments and passengers, with powers to call for mandatory consultation on pricing and investment.

(d) Contract regulation such as through a PPP charter document, or a delegated management contract.

(e) Maximal regulation through economic measures. This can take place through specification of a defined rate of return or from a cost-plus pricing concept for airport operators. Essentially, it allocates wide-ranging powers to a third-party regulator to assess and authorise an airport's planned tariffs and to review its performance.

India's civil aviation sector suffers from the problem of multiple regulatory bodies with overlapping jurisdiction and often lack of clarity on their sphere of influence.

The necessary development of the sector has seen several of the systemically important airports converted to joint-venture enterprises as partnerships between the AAI and private entities. The regulation of these new enterprises brings another catalogue of issues for consideration such as on the pricing and enforcement of development and investment contracts; on the pricing of aeronautical and non-aeronautical services and so forth.

There is no doubt that the regulatory mechanism has to be strengthened in civil aviation. Similar to other infrastructure sectors, there are multiple regulatory bodies with overlapping jurisdiction and often lack of clarity on their sphere of influence (Table 6.6). For example, AERA, which was established in October 2008 as an independent authority to set policies crucial for a level playing field, only regulates private airports; the others are managed—and regulated—by AAI. Contracts awarded under PPP for private participation were given without a regulatory mechanism being in place. Disputes in the agreements made prior to the birth of regulator were transferred to the AERA, leading to uncertainty and the risk of regulatory capture. Concession contracts should ideally be monitored by the regulator from the beginning, ensuring minimum deviation from the performance outcomes. Such piecemeal attempts at institutional reform are best avoided since they add to the number of regulatory agencies, render existing regulatory mandates unclear, and risk the possibility of 'forum shopping' that was common in the telecommunications sector in India when the institutions of oversight were being established.

It is imperative that the existing institutional framework be overhauled. With respect to other airports run by the AAI, the government should clarify the

116. http://www.icao.int/sustainability/Documents/Doc9562_en.pdf (accessed on 10 August 2012).
117. Ibid.

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In civil aviation, the public policy role of the Ministry should be separated from the economic and safety regulation roles. A vexing issue here has been establishing a level playing field between Air India and other carriers.

future role of the agency. As a first step, the AAI should be separated into two distinct functions: Airport Operations and Air Navigation Services. The civil aviation chapter provides further detail on the desired functions, which will, ideally, be corporatised. The AAI should then turn its attention to developing new airports in partnership with state governments, leaving the operation detail to the dedicated bodies noted here.

Over the next 20 years, the essence of the institutional reforms will be to separate the regulatory function from the policy function: these should be clearly independent of each other. While there is an active and welcome proposal to create a civil aviation authority along the lines of UK CAA, the existing proposals essentially imply that the DGCA will be renamed a CAA without fundamental or meaningful changes in its role. What is required is for the new CAA, is to include the DGCA as one of its wings (covering airworthiness, safety, air licensing and certification); and in addition to have separate, expertly manned divisions responsible for airspace management, environment, competitiveness and customer protection. This will then bring it into line with the UK's CAA that is being adopted as a role model.

Separately, a fully autonomous Accident Investigation and Safety Board should be constituted with a lean group of full-time experts, and the empanelment of a larger group of experts drawn from different disciplines and who can be quickly be assembled for the investigation of specific accidents. The DGCA cannot both define the safety environment and then be the investigating authority when there is a breach of safety. All accident investigation reports must be published, as is done abroad, to ensure the lessons from the investigation are shared as widely as possible with the airline community in India and abroad. That leaves the Ministry of Civil Aviation to focus on the larger issues of aviation within the national and international context, to develop and fine-tune policy, all the while being advised by the expertise within the CAA.

In the radically changed, competitive (and increasingly private sector-dominated) environment, the existing institutional framework is inadequate and counterproductive. A dispute settlement body separate from the CAA as has become the practice in India in other sectors will serve to fast track disputes in the sector (see Box 6.8 for the nature of some recent disputes). The relationship between the sector-specific dispute settlement authority and the CCI will evolve over time and should be guided by the same principles that underpin this institutional relationship in other sectors.

Due to, *inter alia*, the capital-intensive nature of the industry, competition may not always be effective. Oversight or regulation in the presence of such failures is de rigueur; however the extant regulation should be carefully designed so as not be become a burden on the operators. Thus, regulatory costs should be kept to a minimum if competition is sought to be increased. In some trunk routes, the market will function adequately with light-touch regulation, but not everywhere. However, given the significant externalities associated with aviation infrastructure, increased connectivity is desirable but will need to be traded off with viable commercial operations. There is a mechanism currently in place for 'route dispersal', but it is not satisfactory. In the US, after deregulation, routes are determined by individual market participants in accordance with customer demand and financial feasibility, while underserviced routes are subsidised through the Essential Air Services Programme[118].

There is also a need to transparently and explicitly provide support for socially desirable but uneconomical services, whether airport or carrier. Therefore, a fund to replace the route dispersal guidelines should be non-lapsable and exclusively aimed at providing explicit and direct subsidies to airlines to make up for viability gaps on defined routes. Budgetary support will be required for this fund but the Ministry may also consider augmenting the fund through a cess on domestic passengers chargeable through tickets issued by airlines.

In civil aviation, as in other sectors, the public policy role of the Ministry should be separated from the economic regulation and/or safety regulation roles[119]. A vexing issue in this respect has been establishing a level playing field between Air India and domestic private airlines. The existing regulation lacks competitive neutrality with regard to private airlines in terms of access to government funds for capital expenditures and potential bailout. Privatisation as a solution has often been contemplated but has been politically difficult to implement. Privatisation will depoliticise the sector and limit the use of Air India for social policy goals and effectively decouple financial resources from the government's general budgetary and fiscal situation. Privatisation though is not an end in itself but rather a means to promoting a level playing field and competition in the sector.

118. US Department of Transportation (n.d.).
119. NTDPC (2011).

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Box 6.8

Nature of Litigation in Civil Aviation

A case was filed with the Competition Commission of India alleging that airline operators had simultaneously withdrawn the promotional offers and increased tariffs by 25 per cent across the board in February 2009. The petitioner further alleged that airlines had again raised fares simultaneously around Diwali in 2010. Private airlines naturally denied charges of cartelisation. Following the investigation, DGCA stated that a high degree of transparency over prices and volumes exists in the airline industry. Similar fares could reflect the forces of competition. Also, most airlines follow a dynamic pricing principle, where fares move according to factors like capacity, market demand, seasonality and time of flight. The basic tenets of pricing by airlines are 'Price Parallelism' or 'Price Parity'. For these reasons, CCI did not find evidence of collusive/anti-competitive conduct during the investigation. The case however highlights the need for effective data collection and analysis by the regulator, a standard practice in mature markets.

In a case filed by the Society for Welfare of Indian Pilots against the DGCA, which brought in a few private airlines as respondents, a difference was noticed in the medical standards applicable for Indian and foreign pilots operating Indian aircrafts. The lower standards applied to foreign pilots was cited as a reason for the rise in aircraft accidents. After receiving the writ petition, DGCA, under the Aircrafts Act of 1934, issued an amendment correcting the anomaly. The case highlights the need to separate the responsibility of the licensor and regulator to enable a mechanism for regulatory checks.

Source: Competition Commission of India, Directorate General of Civil Aviation.

This must remain a medium- to long-term objective, notwithstanding the political impediments. The Naresh Chandra Committee had recommended as much in 2003[120].

PORTS AND SHIPPING

Shipping remains by far the main mode for international transport of goods since 95 per cent of India's international trade is waterborne. Of this, over 60 per cent is handled by the 12 major ports while the rest is handled by the 200 non-major ports, of which only around 60 handle export-imports cargo with others being mainly fishing harbours. Changing trade patterns and new trade relations are driving trade volumes and thus there is need for capacity expansion to handle the increased trade volumes and also accommodate changing vessel sizes. The neglect of port expansion in the 1980s because of low investments has led to deteriorating port services, obsolete equipment and infrastructure and, hence, a decline in the quality of port services.

The existence of two fundamentally different systems for governance of Major Ports (tariff regulated) and Non-Major Ports (tariff deregulated) creates hurdles to achieving balanced growth while rendering it difficult to draw on the experiences of either of the two or to leverage possible synergies. The current governance structure of Major Ports—the public service port model—is archaic and lacks potential to attract private capital and therefore competitiveness. Given that the Non-Major Ports under the management of maritime states have demonstrated greater success as compared to Major Ports, any progressive regulatory shift for Major Ports should attempt to bring uniformity in the approach along with desired cooperation and participation of maritime states.

Till now, investment in both Major and Non-Major Ports has been done in a somewhat haphazard piecemeal fashion, primarily due to lack of a comprehensive and coherent national strategy for port development in India. In addition to making focused investments in capacity creation, the existing regulatory structure for the Major Ports needs overhaul and a new set of incentives needs to be put in place as part of regulatory restructuring. The existing Ministry-centric port management system is a complex bureaucratic process and distorts incentives. There are unnecessary delays and opportunities for wielding political influence.

The dominance of the public sector, the inimical institutional structure and lack of sufficient hinterland connectivity have all been detrimental to promoting competition. India needs legislation which is *inter alia* compatible with the functioning of a market-oriented economy and the global character of the maritime transport. Furthermore, the tendency to introduce more and more control elements in the port management should be eschewed. This is easier said than done and therefore a phasing out of intru-

120. Ministry of Civil Aviation (2012a, 2012b).

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Table 6.7
Regulatory Structure of the Indian Port Sector

	RESPONSIBILITY	GOVERNING ACT
Ministry of Shipping	Coordinates the various activities related to ports, shipping and inland water transport	Merchant Shipping Act 1958
Port Trusts	Manage the daily activities of major ports in the country	Major Ports Trust Act 1963
State Maritime Boards/State Government Departments	Govern the non-major ports	Indian Ports Act 1908
Tariff Authority for Major Ports (TAMP)	Regulates tariff setting in major ports	Major Ports Trust Act 1963

Source: TERI (2008).

sive regulation is recommended. A snapshot of the regulatory structure of the Indian port sector has been provided (Table 6.7).

Attempts to modernise the port sector in the last two decades in India have proved futile. An analysis of the various attempts at port reform makes it clear that a rational framework at transforming the Major Ports into viable and autonomous undertakings capable of functioning within a market economy has been absent. Some of the measures aimed at structural changes have not been executed. For example, the Landlord Port Model for the major ports has not been fully implemented despite its apparent attractiveness. The trouble with reform in the port sector and indeed in other infrastructure sectors in India has much to do with piecemeal changes and the inability to separate policy making, regulation and commercial operations. International best practice suggests that these three functions ought to be separate—the Ministry should be charged with policy formulation, an independent regulator should exercise oversight and a public or private sector entity should run the enterprise on commercial principles responding to incentives created by the market and within the constraints set by independent regulation.

Regardless of the path taken in restructuring ports policy, important segments will continue to be natural monopolies. Accordingly, the success of restructuring depends in part on the creation of effective regulatory institutions to exercise oversight and ensure competition, since most of the benefits of private participation in port activities result from competition. Several types of competition are possible (Box 6.9). Governments and port authorities can take a number of steps to enhance competition, including introducing new berths and terminals, dividing ports into competing terminals (terminalisation), dividing port operations within terminals, and introducing short-term operating leases or management contracts. The form of competition and regulatory requirements are closely related and largely depend on the size of the port, the extent of external competition, and the degree of captive traffic that needs protection[121].

While the term 'privatisation' has often been used in the context of port reform processes, it actually refers to introduction of the private sector into the public domain by privatising terminal services under a landlord port regime. The essence of such a regime is to have major port authorities, disengaged from direct terminal operations while acting as neutral landlords to both private and corporatised public sector terminal operators. The corporatisation of port authorities, however, might need to be done through a customised act that allows considerably more room for socio-political objectives rather than just maximisation of value for shareholders. Corporatisation, apart from its other advantages for port development, opens the possibility for direct participation of the concerned maritime states by means of acquisition of shares in the Port Authority of the port(s) located within its territory (see Box 6.10 for the Gujarat example). Such shareholding should be substantial and not symbolic. In that way, the state will participate in the benefits of the development and expansion of the (former) Major Ports. The new Port Authorities should be allowed to have autonomous powers within the policy framework of the central and state governments to enable them to function efficiently within a commercial setting. All Major Ports should be unbundled and the terminal services also corporatised. It is clear that this unbundling is a complicated issue especially for the older ports. Therefore, necessary changes in legislation should allow a reasonable time for this tran-

121. Kessides (2014).

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Box 6.9
Types of Competition in Ports

- *Inter-port competition* can be fierce, as between the major container ports of East Asia. A port's success depends on its ability to process traffic quickly and reliably and integrate its activities with inland or feeder networks.
- *Intra-port competition between terminals* allows technically-efficient integration of port functions without sacrificing competitive pressure within the port. Terminal operators have complete jurisdiction over their terminal areas, from berth to gate. This approach was adopted to great effect in the liberalisation of the port of Buenos Aires.
- *Intra-terminal competition between service suppliers* is encouraged by many ports. Competition in stevedoring, warehousing, forwarding and other services is highly desirable whenever it can be physically accommodated. From a port authority's viewpoint, such competition may be influenced by licensing requirements, which limit the number of competitors but make the concessions attractive for competitive tendering.
- *Competition for the exclusive right to provide services* is an extension of the competitive tendering of licenses and may be the only way to attract private investment in small ports. When local monopoly rights are granted, the question usually arises: to prevent monopoly exploitation, should contracts be used or a regulatory authority established?

Source: Kessides (2004).

Box 6.10
The Gujarat Example

The state of Gujarat came into existence in May 1960 and state ports, including all Non-Major Ports, except Kandla port, were under the control of state government. The ports were administered by the Roads & Buildings Department of Government of Gujarat. Traffic of all Gujarat ports was almost stagnant from 1960 to 1982. The subsequent progress in Gujarat occurred due to state initiatives. Decentralisation played a major role in the process whilst the Centre followed a laissez faire approach.

Considering the long coastline of 1,600 kms and opportunity for development of industries in the state, the Gujarat Maritime Board was established in April 1982, under the Gujarat Maritime Board Act, 1981. This was done to give certain liberties for the development of ports. Industrial and trade representatives were included as members of the Board, along with experts from financial institutions, engineering and navigation. The Board formulated the captive jetty policy in 1986, which encouraged industries to develop their own captive harbour facilities and were given certain concessions/incentives in wharfage charges.

This policy saw traffic of Gujarat state ports increase from 2.7 million tonnes in 1986 to 16 million tonnes in 1995. The prosperity of the coastal area increased simultaneously with the establishment of many industries such as cement, petroleum, fabrication, chemical and refining. Coal imports started , which was beneficial to the foundry industries of Jamnagar and Rajkot. In 1995, the GMB announced a policy for privatisation of ports; Gujarat was the first state to take such step. All the above changes happened only because the ports were a state subject and there were no restrictions from the Centre for development.

Source: Government of Gujarat (2012).

sition process tailored towards the specific situation in each Major Port.

As a guide to the recommended shift to a landlord model of port governance for Major Ports, simplification of the regulatory framework in the ports sector, the following guidelines are worth considering:

- Corporatised Port Authority to be professionally run, insulated as much as possible from government intervention.

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- State governments to be encouraged to have substantial shareholding to ensure their participation in development and expansion of these ports.
- Autonomy of the Port Authority with respect to financial issues. There should be a separate budget unrelated to the state budget.
- Transparency of port accounts.
- Clear financial relation between the State (Ministry of Transport/Shipping) and the Port Authority. No hidden subsidisation, no financing of terminal equipment and superstructure.
- Equal treatment of all port and terminal users, be it shipping lines, terminal operators or other service providers.
- Equal access for port and terminal service providers, no monopolies for the provision of terminal services, except in case of dedicated terminal.
- Fair competition within the ports between terminal operators and marine service providers (intra-port competition).
- Fair competition between ports, no cross-subsidisation by Port Authority between various traffic categories.

In the current regulatory configuration, the Tariff Authority of Major Ports (TAMP), a regulatory body established in 1997 under the Major Ports Trust Act, 1963, is responsible for tariff fixation for Major Ports. TAMP determines tariff ceilings for Major Ports, while Non-Major Ports are sufficiently autonomous and exercise market-driven efficient pricing. Reducing tariffs below the ceiling as a means of promoting competition is almost nonexistent in the case of major ports. Port operators also do not have much incentive in promoting inter and intra-port competition, as almost all ports in India today operate at full capacity. For instance, JNPT has three container terminals catering for similar cargo and each one is operating at full capacity. One of the private terminals, GTI, has tariffs almost 30 per cent higher than the other two terminals, but it continues to attract sufficient traffic. The second container terminal at Chennai, to compete with the existing terminal operated by DP Port (earlier P&O Ports), as well as a fourth container terminal expected to come up at JNPT, is likely to see intra-port competition emerging in India.

Besides regulating both vessel-related and cargo-related tariffs, TAMP regulates rates for lease of properties in respect of Major Port Trusts and the private operators located therein. Despite being a regulatory body, the TAMP has limited autonomy, being largely under the central government's control[122]. It has rarely used its powers to motivate efficiency of port and terminal services, while it does not have jurisdiction over selection of private parties for contracts, an increasing occurrence given the move and preference toward adopting the Landlord Port model.

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. Therefore, tariff setting should be deregulated and its determination should be left to market forces. 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. Only in cases of inadequate competition between terminals in a port or among ports, or serious market imperfections, may some pricing control be required. Tariff regulation by exception rather than by rule should be the operating principle. TAMP could 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 the major and non-major ports in the country. This might create overlapping jurisdiction between the new sector regulator and the economy-wide competition regulator, the 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, it is best to empower the port regulator 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 thereof may be incompatible with the promotion of competition. The sector (port) 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 are best understood and addressed by the regulator. It is also important for the regulatory agency to focus on identifying serious, long-term performance problems, rather than to become a micromanager of the sector as has been the experience with regulation, both in India and elsewhere[123].

Questions relating to a continuing role for the regulator in promoting competition or alternatively, whether ongoing competition issues should be left to the antitrust authorities are not new. There is a delicate balance between the two but there is a useful continuing role for the regulatory agency. Besides, the sector regulator should be independent of any Government and have its own sources of income. This issue confronts all regulators in India and is discussed further in the conclusions.

122. CUTS C-CIER (2010).
123. Paul Joskow (1998).

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It is also recommended that the two Acts governing 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.

URBAN TRANSPORT

Economic activity in the city depends *inter alia* on efficiency of mobility. Urban transport is a key urban service that imparts efficiency by providing mobility to the workforce in the city and hence productivity. By all estimates, the magnitude of the expenditure required to develop and upgrade India's urban transport system is enormous. A majority of this requirement will be for roads and urban transport. The level of investment required can be realised only if there exists an extensive and effective institutional framework including clear regulation on the terms of investment and PPPs, competitive access to infrastructure, and pricing of services as well as social regulation promoting environmental sustainability and safety.

Urban planning received scant attention in India's initial Five Year Plans. The 74th Constitutional Amendment Act (CAA) of 1992 was pathbreaking since it provided legitimacy to the third tier of government, i.e., the urban local bodies. It envisaged the creation of empowered local governments, which would take on the responsibility of city planning and management[124]. The Act was a major milestone in recognising the role and importance of cities in economic development and sought the devolution of powers to local bodies. Urban Transport (UT), however, was not devolved. It remains a policy area where multiple national and state agencies are involved with limited coordination and some competition between their efforts.

Among all transport infrastructures in India, UT is easily the most complex. UT is made up of about 20 components and is currently managed by as many agencies[125]. The governance structure for UT is fragmented and the division of responsibility among the various agencies is unclear. The regulatory regime then suffers: the fragmentation handicaps the potential for strategic coherence between infrastructure investment and regulation of its use.

Coordination of regulation with investment planning is critical in three areas in particular[126]:

- Road investment and traffic management
- Traffic management and public transport
- Traffic management and transport demand management

Where *road investment and traffic management functions* are not integrated, there is a tendency for the roads unit to see the transport problems of the city purely in terms of road congestion and the solution purely in terms of increases in road capacity rather than in more effective use of existing capacity. That road infrastructure investment bias is often amplified by the lack of effective management of the existing road system. Failure to integrate *traffic management and public transport* functions has similar policy consequences. In most cities—even very large cities—road-based public transport predominates. The majority of people move in buses, yet traffic management concentrates on securing increased average speed of movement of vehicles rather than of people. Public transport vehicles tend to hamper this because of their frequency of stops. The priority of private transport over public transport tends to be institutionalised in the way in which traffic signal settings are established. Third, even within the traffic function, the absence of strategic integration results in an emphasis on traffic engineering rather than traffic restraint to increase traffic speeds. Parking policies, for example, often concentrate on increasing the quantity of off-road parking in order to increase effective road capacity to improve traffic flow, rather than managing parking capacity to restrain the volume of traffic to improve flow[127].

Among all transport infrastructure in India, urban transport is the most complex, with about 20 components and managed by as many agencies.

A paradigm shift is needed in the approach towards urban transport. Demand management will play an important and crucial role in the quest for reducing congestion on city roads as will supply-side strategies. Congestion is commonplace in metropolitan centres during peak hours and the dramatic growth in vehicle ownership during the past decade has degraded rush hour speeds especially in the central areas of major cities. For example, peak vehicular densities will likely reach as high as 610 vehicles per lane kilometre. At such densities, an average journey may take up to five hours in peak morning traffic—similar to the acute congestion that disfigures some Latin American countries. The peak private vehicular density has already touched 170 vehicles per lane kilometre—50 per cent higher than the

124. The 12th Schedule, introduced with the passing of the 74th Amendment lays down 18 functions to be performed by local bodies, the major ones being: Urban planning including town planning, Water supply for domestic, industrial and commercial purposes, Public health, sanitation conservancy and solid waste management, Roads and bridges, Fire services, Slum improvement and upgradation, Urban poverty alleviation, Provision of urban amenities and facilities such as parks and gardens, Public amenities including street lighting, parking lots, bus stops and public conveniences, Urban forestry and protection of the environment.
125. Gwilliam (2012).
126. Ibid.
127. Chennai's new parking policy, modeled after a payment system use in Budapest, is a a notable exception.

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basic requirement. Additionally, lack of investment in public transportation has resulted in a significant decline in share of public transportation, from nearly 40 per cent in 1994 to 30 per cent today[128].

Global evidence shows that an effective shift to public transport can occur only if transport demand management measures are adopted in tandem with increased provision of public transport[129]. A slew of demand management measures have been used across cities; success of each will depend upon, *inter alia*, local conditions. Decentralisation and empowerment will be necessary to achieve the desired outcomes. Use of information technology to reduce demand for travel, congestion pricing, restrictions on vehicles use, road space reallocation, priority for bus and non-motorised modes are some common demand management techniques. Methods such as high occupancy requirements that restrict access to certain lanes during peak hours have been adopted in some countries. New electronic techniques of monitoring road use may eventually make it technically feasible to treat many urban roads almost as private goods. Whether this is also desirable will depend on the local context and circumstances. Consider, for example, water supply, that used to be unmetered but the increasing scarcity and supply cost triggered technical innovations that have made it possible (and desirable) to price these services like other private goods.

In addition to establishing an appropriate framework, implementing modal integration and creating competition, an independent regulator will need to deal with the complex issue of transport pricing. This has to be handled by a professional body.

Multiple modes of transport coexist in Indian cities, but the pattern of use is not accurately known due to data inadequacies, although one estimate puts the use of public transport at 22 per cent[130]. The objective is to raise this percentage to 60 per cent by 2017 and this can only happen if public transport becomes efficient, convenient and accessible. At present there is a huge deficit in urban public transport services and infrastructure both in quality and quantity and a 'business as usual' scenario will detract from achieving the laudable objective of increasing the share of public transport in cities.

There is, at present, no legislation that enables a regulatory framework for modern, integrated UT. The Motor Vehicles Act deals with the licensing of vehicles, Railway Act covers inter-city traffic, Metro Construction Act deals with the specific issues related to construction of the metro rail, Tramways Act deals with tramways within the road surface with free access across it. Other modes of mass rapid transit such as the bus rapid transit, the light rail transit the mono rail and several other guided modes of transport and issues of transport planning, multi-modal integration, safety, tariff and financing are not covered under any Act. Clearly, the institutional and regulatory framework for UT is antiquated, not having kept pace with rapid urbanisation, technological advancements and the needs of citizens. The emergence of Mass Rapid Transit (MRT) in certain cities has resulted in a larger system; in general the greater the number of modes involved, the more complex will be the co-ordination.

The new regulatory mechanism must recognise this reality. Often, regulatory structures in India have become a liability because of multiple reasons, such as lack of capacity, a narrow and isolated approach, lack of independence and unclear mandates, besides human capital deficiencies. MRT comprises a spectrum of modes of urban public transport and success, as in other areas of transport logistics, will depend upon effective modal integration. The key to effective modal integration is the existence of a strong local coordination authority backed by different levels of government. The city should carry the primary responsibility for UT and the role of the Centre and the state should gradually get reduced. Decentralisation should be engendered by legislation and the regulatory functions of licensing, vehicle inspection and enforcement should continue with the Transport Commissioner.

In addition to establishing an appropriate framework, implementing modal integration and creating competition, an independent regulator will need to deal with the issue of transport pricing. This is a complex matter and needs to be handled by a professional regulatory body. The National Urban Transport Policy 2006 envisaged the creation of a dedicated Unified Metropolitan Transport Authority (UMTA) to be set up in each city with population in excess of 1 million and dedicated cells in smaller cities for integrated planning and coordination and delivery of urban transport services. The current UMTAs, however, act more like advisory committees and not as empowered technical decision making and coordinating bodies. While being supportive of this broad approach, NTDPC is proposing that such a metropolitan level organisation should be designated as 'Metropolitan Urban Transport Authority (MUTA)'. The MUTA should be a professional technical body with adequate technical staff strength (Chapter 5, Volume II and Chapter 5, Volume III). Whether regulatory functions related to standards, demand management and pricing are handled by MUTA or a specialised and independent regulatory body is a matter of semantics; the core point is that these skills must exist in an agency at the metropolitan level, and they must be protected from political pressures.

128. McKinsey Global Institute (2010).
129. Ghate and Sundar (2012).
130. Planning Commission (2011).

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Box 6.11

The Namsan Tunnels in Seoul: Simple Road Pricing Reduces Congestion and Finances Traffic Management

Traffic congestion in Seoul increased dramatically during the 1980s and early 1990s despite extensive construction of new urban freeway and subway lines. In 1996, the Seoul metropolitan government commenced charging 2,000 won ($2.20) for the Namsan #1 and #3 tunnels, two corridors with high private vehicle use linking downtown Seoul to the southern part of the city. Charges were set for one- and two-occupant private vehicles (including driver) and collected in both directions per entry or exit from 7:00 a.m. to 9:00 p.m. during weekdays and from 7:00 a.m. to 3:00 p.m. on Saturdays. Private cars with three or more passengers, taxis, and all kinds of buses, vans and trucks were exempted from charges, as was all traffic on Sundays and national holidays.

In the two years following commencement of the congestion pricing scheme, there was a 34 per cent reduction in peak-period passenger vehicle volumes, the average travel speed increased by 50 per cent, from 20 to 30 km/h, and the number of toll-free vehicles increased substantially in both corridors. On the alternative routes, traffic volumes increased by up to 15 per cent, but average speeds also increased as a result of improved flows at signalised intersections linked to the Namsan corridors and increased enforcement of illegal on-street parking on the alternative routes.

The whole of the annual revenue from the two tunnels (equivalent to about $15 million) goes into a special account used exclusively for transport projects, including transport systems management and transport demand management measures throughout the city.

Source: Hwang et al. (1999), quoted in World Bank (2002).

The biggest challenge for the regulating authority will be to evolve a price policy so as to balance equitably the demands of a very heterogeneous passenger travel market in urban areas. In the presence of economic growth, increasing use of personalised transport is one of the key reasons for the growing urban transport problems including that of increased energy consumption. In cities, there is heavy demand for road space combined with undercharging for its use, thus contributing to shortfall in resources to support the investments in urban transport infrastructure. A shift from personal vehicles to other mass transit and non-motorised modes is also necessary to reduce energy demand from cities. As established in the introduction, one role of prices is to allocate resources; the other to raise revenue.

Urban transport pricing is however complicated by the multiplicity of objectives and by the institutional separation of road infrastructure from operations, of infrastructure pricing from charging, and of roads from other modes of transport[131]. In the interests of urban transport integration and sustainability, a move towards prices that reflect full social costs for all modes; to a targeted approach to subsidisation reflecting strategic objectives; and to an integration of urban transport funding are desirable. This means that public transport fares should reflect the extent to which road infrastructure is adequately charged[132]. Congestion pricing, fuel tax, and parking fees are methods that have been applied in practice to charge for urban transport infrastructure and this should be reflected in the pricing for public transport modes (Box 6.11).

To the extent there are non-commercial objectives imposed on suppliers of public transport services, these should be compensated directly and transparently by the government. Efficiency demands that transport operators should operate competitively, whether they are public or privately owned. Overall, pricing and financing regimes for individual transport modes should be designed within an integrated urban transport strategy. This means that the institutional arrangement transcending traditional modal barriers and vertical integration from local to national levels.

For the proposed MUTA to be successful therefore, skills in planning, design, management and in regulation of urban transport are essential. Urban transport professionals, as a rule, are not employed by cities. Given the paucity of transport professionals in India, capacity building is crucial. It will be an ongoing effort and hence this activity ought to be institutionalised. A pool of professionals should be developed through academic institutions for employment by agencies responsible for urban transport. Data deficiencies in UT, as in the roads sector, are enormous and diminish the quality of policy advice.

131. World Bank (2002).
132. Ibid.

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Restructuring of erstwhile monopolies and introducing competition are necessary but not suffient conditions to improve technical performance of transport sectors. There will be limits to competition due to the high initial and 'lumpy' investment in fixed facilities.

A beginning has been made by Ministry of Urban Development to set up a central 'knowledge management and database centre' in the central government with the help of UNDP. It is necessary that collection of data in this sector also be institutionalised. In the future similar database centres should be set up by state governments and independently by some large cities as well. The Institute of Urban Transport should be strengthened as a central repository of information and to provide support to cities. Above all, MUTA should be a statutory autonomous body with full technical and financial authority and accountable for its decisions.

The regulatory functions of pricing, standards and demand management could be entrusted to a specialised independent body, subject to the caveat that 'regulatory proliferation' in India has been criticised as a strategy aimed at defending specific interests rather than improving sector outcomes. We return to this point in the conclusions. In case these regulatory functions are to be handled separately, independent regulators at the state and national level along the lines of Public Utility Commissions in the US is recommended. Inter-state disputes relating to UT can be addressed by the national government.

SUMMARY OF KEY RECOMMENDATIONS

NEED FOR REGULATION

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

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

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

Congestion is an externality that is customary on urban roads especially during peak hours. It is however not the only externality that transport infrastructure and services create. Decisions about infrastructure investment, for example in roads versus public transport, rail, and waterways affect energy efficiency and thus India's prospects for energy security and fiscal health. The current allocation of freight traffic between road and rail is one such negative externality. Transport services and

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choice of vehicle and fuel affect air pollution, which in turn negatively affects public health. Transport safety is also an externality from investments in particular forms of infrastructure as well as an 'invisible' aspect of service delivery. Regulation is thus required to reduce incentives to cut corners in parts of service provision that customers cannot readily assess when choosing which services to purchase.

As a result, regulation of various parts of the transport network is needed for various reasons: to limit the potential monopoly power exercised by owners of networks with high capital costs; manage congestion, air pollution, and other negative externalities from use of transport networks; achieve positive externalities including network effects; and motivate investments in 'invisible' consumer goods such as safety. Regulation can be used to encourage extension of access to infrastructure and services to lower-income or remote services, though other instruments such as subsidies to providers or targeted transfers.

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

CROSS-CUTTING THEMES

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

India's regulatory capacity in each of these areas requires strengthening to achieve minimum capabilities. Institutional capacity has been weak, as it has in many emerging markets. A unitary Transport Ministry is a vital step towards good regulatory design along with independent regulatory institutions in each transport sector that includes a separate dispute settlement arrangement. Ministries are reluctant to relinquish control of the sector since it serves short-term political goals. Political constraints and ministerial preferences over time seem to have dominated the reform agenda in different infrastructure sectors. It is time to recognise that institutionalising a robust regulatory philosophy based on a framework with adequate capacity is a necessary, although not sufficient, condition for accelerated and sustainable growth. Evidence shows that regulatory strengthening must also happen before restructuring of ownership or lifting of controls on private participation.

Financial autonomy is often linked to regulatory independence. In India, this has not been the practice. Depoliticising the regulatory process will therefore remain an important long-term goal in the transport sector.

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

Financial autonomy is often linked to regulatory independence. In India, this has not been the practice since regulatory institutions are supported by budgetary allocations that can compromise independence. TRAI's request for independent funding through a percentage of the revenues of regulated firms has not been accepted by the government.

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Regulatory structures in India have often become a liability due to multiple reasons, such as lack of capacity, a narrow and isolated approach, lack of independence and unclear mandates, besides human capital deficiencies.

Depoliticising the regulatory process will thus remain an important long-term goal in transport. Financial autonomy however may or may not guarantee independence. An additional safeguard to prevent 'political capture' is to make appointment processes transparent and grounds for removal clear and structured for all regulatory institutions. Thus, legislation should guarantee stringent conditions for removal of any Authority Member or Chairman.

As independent regulation becomes more the norm, questions about institutional design will arise, namely: should regulation and dispute resolution institutions be created for each sector and sub-sector, or should certain functions be consolidated across sectors? India's piecemeal approach to infrastructure reform has led to the proliferation of regulatory bodies and tribunals. 'Regulatory proliferation' is seen as creating continued employment for the bureaucrats and judges, while professionals with technical expertise have been conspicuous by their absence. Commissions tend to be made up of retired civil servants or retired judges. This is worrisome and therefore it is vital to create a cadre of professional regulators with technical expertise for the complex tasks of managing the regulatory processes.

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

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

KEY IN-PRINCIPLE SECTOR RECOMMENDATIONS

Each transport sector in India is beset with numerous legislations. It is therefore imperative to simplify the legal structure. This has begun to happen in sectors such as ports and civil aviation, but clearly a lot more needs to be done. Existing sector-specific enactments need to be unified into a single statute. This will simplify procedures and make compliance easier. Certain sections of the existing acts which are anachronistic would also have to be deleted and even some of the acts repealed. But such unification may not be an easy task, and cannot be achieved within a short period of time. The process of private sector participation should not however be held up, pending completion of the work.

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

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

The primary regulatory priority for Indian ports is to unify national and state regulatory structures. The existing regulatory framework, comprising many regulators and multiple legislations is complex and needs simplification to enhance integration and improved coordination. India needs legislation which is *inter alia* compatible with the functioning of a market-oriented economy and the global character of the maritime transport. A new set of incentives needs to be put in place as part of regulatory restructuring. The existing Ministry-centric port management system is a complex bureaucratic process and distorts incentives.

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

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

Urban transport is a key urban service that imparts efficiency by providing mobility to the workforce in the city and hence productivity. Among all transport infrastructures in India, UT is easily the most complex. UT is made up of about 20 components and is currently managed by as many agencies. The governance structure for UT is fragmented and the division of responsibility among the various agencies is unclear.

Modern legislation for integrated UT is necessary to replace the antiquated structure. Regulatory structures in India have often become a liability due to multiple reasons, such as lack of capacity, a narrow and isolated approach, lack of independence and unclear mandates, besides human capital deficiencies. The key is to create a strong local coordination authority backed by different levels of government. The city should carry the primary responsibility for UT and the role of the centre and state should gradually get reduced. Decentralisation should be engendered by legislation and a dedicated Metropolitan Urban Transport Authority (MUTA) should be set up in each city with population in excess of 1 million and dedicated cells in smaller cities for integrated planning and coordination and delivery of urban transport services.

Many governments implementing economic reform in recent years, including India, have increased the role of the private sector in provision of transport infrastructure and services recognising that under normal circumstances, the role of the state should be one of broad policy formulation and regulatory oversight. Ownership and operation by the public sector should be in extreme cases of market failure such as for infrastructure that is financially unviable and has high social value. At the same time, a robust regulatory governance structure is needed to ensure gains from the transition to this new model. Attributes of a good governance structure include *sufficient political and financial autonomy for the institutions charged with regulating the sector; structures for decision making that constrain regulatory discretion; adequate access to regulatory means, including legal provisions for effective enforcement of decisions; and efficient rules of accountability and review*.

Given the socio-economic-political context, robust institutions for regulatory governance in transport

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will no doubt take time, first to create and then for these to mature and gain legitimacy in India. Merely delegating regulatory powers, including enforcement, may not be enough to minimise regulatory risk. But good decisions are more likely if regulatory design is sound. Badly designed regulatory and legal institutions can become a source of performance problems. For example, the improper design of regulatory and ownership structures are believed to be major causes of poor performance in sectors such as gas, electricity and transportation leading to significant economic costs to the order of 1 per cent of GDP. The guiding principles of good regulatory institutions include independence, transparency, accountability, expertise, credibility and legitimacy. Although independent regulation in India is relatively new, there is a wealth of evidence from the telecom and power sectors that can help design and implement a performance enhancing regulatory mechanism for transport that emphasises local needs and the local context.

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Annex

Total Investment Commitments in PPI Projects in Transport Sector

[in current $ Million]

INVESTMENT YEAR	ARGENTINA	INDIA	CHINA	INDONESIA	BRAZIL	SOUTH AFRICA	COLOMBIA	RUSSIAN FEDERATION	TURKEY	CHILE
1990	2,088	1.9	173	116	-	0	-	-	-	-
1991	214	-	2,378.8	10.8	-	-	-	-	-	-
1992	814.7	-	532.6	114.5	-	-	40	0	-	-
1993	1,439.6	-	1,172	351.5	-	0	260.1	0	-	93.4
1994	940.5	125	2,086.1	26.7	328.1	-	518.9	0	20	27
1995	621.2	-	309.3	502.8	989.3	-	195.8	0		419.5
1996	930	182	5,084.42	-	4,357.2	-	148.9	-	85	190.4
1997	1,195	405	3,092.74	-	4,048.3	426	48.8	0	305	1,949.1
1998	1,911.3	301.6	1,670.5	-	7,808.7	165.7	284	406	-	168
1999	2,345	466.7	695.55	1,028	53.9	794.7	-	-	-	367.6
2000	129.8	96.4	1,558.5	-	1,373	3.7	1,047.7	109.4	-	201.5
2001	63.5	350.8	642.23	-	917.2	484	60.5	-	-	2,340.6
2002	6.9	719.17	1,787.11	-	157.8	-	10.8	-	-	1,045
2003	0	579.14	4,054.65	0	107.8	17	110.4	-	85	18
2004	3.4	1,141.4	782.58	159.2	224.2	-	26	0	155.6	791
2005	-	1,526.51	6,628.9	-	376.5	-	242	-	2,848.2	434.6
2006	337	10,028.47	8,351.01	372	233.5	3,483	672.36	144	217	147
2007	728.7	3,924.92	4,494.38	1,139.5	3,336	-	474	23	2,578	423
2008	331	5,423.65	436.75	-	9,967.1	-	956	24	1,491.5	260.1
2009	5.89	4,871.75	2,512.87	220	8,550.3	-	-	-	0	290
2010	0	14,220.87		-	1,440.8	-	2,359	4,595.9	332.7	823
2011	0	16,087.4	1,012.09	-	4,057.2	97	-	4,284.6	1,740.35	282
Cumulative Total	14,105.49	60,452.68	49,456.08	4,041	48,326.9	5,471.1	7,455.26	9,586.9	9,858.35	10,270.8

Source: World Bank and PPIAF, PPI Project Database (http://ppi.worldbank.org [accessed on 8 August 2012]).

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ANNEXES TO PREFACE

ANNEX P.1

CONSTITUTION & TERMS OF REFERENCE OF THE COMMITTEE

F. No. 571/2/3/2010-Cab.III
Government of India
Cabinet Secretariat
Rashtrapati Bhawan

New Delhi, the 11th February, 2010

OFFICE MEMORANDUM

Subject: Setting up of the National Transport Development Policy Committee as a High Level Committee.

It has been decided to constitute a High Level Committee, the National Transport Development Policy Committee (NTDPC) under the chairmanship of Shri Rakesh Mohan who will hold this assignment in an Honorary capacity with the status of a Minister of State.

2. The Terms of Reference of the Committee will be as under: -

(i) To assess the transport requirements of the economy for the next two decades in the context of economic, demographic and technological trends at local, national and global levels.

(ii) To recommend a comprehensive and sustainable policy for meeting the transport requirements keeping in view the comparative resource cost advantages of various modes of transport i.e. road, rail, air, shipping and inland water transport with a special focus on the modes that have developed less than economically desirable and the need to:

(a) encourage a rational mix of various modes of transport in order to minimize the overall resource cost to the economy,
(b) ensure balance between the ability of transport to serve economic development and to conserve energy, protect the environment, promote safety, and sustain future quality of life,
(c) ensure universal rural connectivity,
(d) address the special problems of remote and difficult areas on the one hand and of urban and metropolitan areas on the other, and
(e) adopt and evolve suitable technologies for cost effective creation, economical maintenance and efficient utilization of transport assets.

(iii) To assess the investment requirements of the transport sector and to identify the roles of state and private sector in meeting these investment needs and to suggest measures for greater commercial orientation of transport services. In this context the Committee should pay particular attention to reviewing the experience with the PPP approach or suggest ways of modifying it further.

(iv) To examine the laws, rules and regulations pertaining to various modes of transport and traffic and to suggest measures for strengthening their enforcement in the interest of the community and streamlining the procedures and processes in line with the needs of a fast growing modern economy.

(v) To identify areas where data base needs to be improved in order to formulate and implement policy measures recommended by the Committee.

(vi) To suggest measures to improve the capacity to evolve and implement projects.

(vii) To suggest measures for implementing various components of the recommended policy within a specified time frame.

(viii) To recommend any other measure which the Committee consider relevant to the items (i) and (vii) above.

3. The Committee may get special studies carried out by expert bodies. The Headquarters of the Committee will be at New Delhi. The Committee may visit such places and consult such stakeholders and experts as may be considered necessary for its work. The tenure of the Committee shall be 18 months.

4. The Committee will be serviced by the Planning Commission.

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5. The composition of the NTDPC shall be as under:
-

Chairman
Shri Rakesh Mohan
(in Honorary capacity, with status of MoS).

Members:
Chairman, Railway Board
Secretary, Ministry of Urban Development
Secretary, Ministry of RT&H
Secretary, Ministry of Civil Aviation
Secretary, Ministry of Shipping
Secretary, Department of Financial Services
Secretary, Ministry of Coal
Secretary, Ministry of Power
Secretary, Ministry of Petroleum & Natural Gas
Adviser to DCH, Planning Commission
Chairman, RITES

Asian Institute of Transport Development
Shri K.L. Thapar, Chairman,

Former Chairman, Railway Board
Shri M. Ravindra

Former Secretary, Transport & Shipping
Shri S. Sundar

Former DG, Ministry of Road Transport & Highways
Shri D.P. Gupta

Indian Institute of Technology, Delhi
Prof. Dinesh Mohan

M.D., Great Eastern Shipping
Shri Bharat Sheth

MD,IDFC
Shri Rajiv B Lall,

Infosys Technology
Shri Mohandas Pai

AFL Group
Shri Cyrus Guzder, Chairman

Member Secretary
Shri B.N. Puri

Sd/-

(Puneet Agarwal)
Deputy Secretary
Tele : 23016576

To

Chairman and Members of the Committee

Copy forwarded to:-
(1) Smt. Sudha Pillai, Secretary, Planning Commission.
(2) Shri Davinder P.S. Sandhu, Director, Prime Minister's Office with Reference to their U.O. No. 430/31/C/12/2010-ES.I, dated 9.2.2010.

Sd/-
(Puneet Agarwal)
Deputy Secretary
Tele : 23016576

ANNEX P.2

WORKING GROUPS

1. RAILWAYS

No.-3/1/2010-Tpt
GOVERNMENT OF INDIA
Planning Commission
National Transport Development Policy Committee (NTDPC)

Capital Court, Olof Palme Marg
Munirka, New Delhi-110067
Dated: 19th July, 2010

Subject: Working Group on Railways for the National Transport Development Policy Committee (NTDPC).

It has been decided by the National Transport Development Policy Committee (NTDPC) to constitute a Working Group on Railways Sector. The Composition and Terms of references of the Working Group are as under:

1. Composition

1 Chairman, Railway Board - Chairman
2 Shri K.L. Thapar, Member, NTDPC
3 Shri M. Ravindra, Member, NTDPC
4 Member Secretary/Co-ordinator, NTDPC
5 Ms. Sowmya Raghavan, Financial Commissioner of Railways.
6 Member Traffic, Railway Board
7 Adviser (Infrastructure), Railway Board
8 MD, Container Corporation of India (CONCOR)
9 Professor S. Sriraman, Walchand Hirachand Professor of Transport Economics, University of Mumbai
10 Dr. Ram Singh, Associate Professor, Delhi School of Economics, New Delhi.

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11 Shri S.K.N. Nair, Sr. Consultant, National Council for Applied Economic Research (NCAER), New Delhi
12 Shri Saurabh Srivastava, Chairman, CA Group
13 Shri R. Gopalakrishnan, Executive Director, Tatasons.
14 Representative of financial sector (nominated by Secretary, Department of Financial Services)
15 Representative of IT Sector
16 Shri S.K. Mishra, Executive Director/Traffic/PPP- Convenor

2. Terms of Reference

1. Determine the role of railways in meeting transport requirements of the Indian economy over the next two decades, keeping in view the need to
   a. Conserve energy and protect the environment,
   b. Promote safety, sustain future quality of life and reduce logistics costs,
   c. Create an optimal intermodal mix.

The group may also keep in view the recommendations of various committees including those of National Transport Policy Committee, 1980, and the Expert Group on Railways, 2001.

2. Estimate the share of railways in total transport in 2020 and 2030 consistent with the role envisaged for Railways and the projected macro-economic scenario.

3. Estimate:
   a. Passenger traffic for the year 2020 and 2030 along with broad break-up of passenger traffic in terms of long distance (1000 km and above), overnight, intercity (250 km to 1000 km), local and suburban in both premium and value segments.
   b. Freight traffic for the year 2020 and 2030 including expected composition in terms of specific segments and leads.

4. Consistent with the above, assess the current capacity and recommend the magnitude and type of capacity creation/augmentation/modernization required in the railway system. The following aspects may also be kept in view while assessing the requirements:
   a. Special problems of remote and underdeveloped areas including the north-east region.
   b. Rail connectivity with power plants, water fronts and mines.
   c. Rail connectivity with neighbouring countries.
   d. Development of regional and international railway corridors.

5. In light of the above,
   a. Assess the investment required to achieve the projected traffic growth.
   b. Identify sources of funding and assess fund requirements from budgetary, non-budgetary and private sources for different areas in rail infrastructure.
   c. Identify areas for PPP and the requirement of private and public funding in these areas.
   d. Examine the existing PPP policy framework and policy initiatives including regulatory and institutional framework and suggest changes necessary to attract greater private investment.
   e. Suggest measures for greater commercial orientation of railways.

6. Assess the full costs of rail transport, including the costs of externalities, and suggest appropriate pricing regimes for various transport products in both passenger and freight traffic, including institutional arrangements for rational pricing.

7. To suggest policy framework for provision of rail connectivity to remote areas and under developed areas.

8. Estimate the energy requirements necessary for rail infrastructure and suggest measures to put the railways sector on a sustainable low carbon path and promote energy efficiency, emission reduction and environment protection.

9. Suggest the role of railways in promoting the development and growth of integrated logistics solutions and reduction in intermodal interface impedances. This would include the development of sustainable integrated rail/road, rail/air, and rail/port transport systems.

10. Assess the availability of human resources for the railways and suggest measures for skill development and institutional capacity building for various stakeholders.

11. Suggest measures for promotion of research and development and technology upgradation in the railways, including institutional development.

12. Indicate broad areas and investment for IT in the railways to improve customer interface/satisfaction and internal efficiency.

13. Examine the issue of land availability as a critical resource and technological solutions to reduce potential land requirements. Also, suggest measures for speedy acquisition of land for railway infrastructure, along with rehabilitation and resettlement of persons affected.

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14. Identify data deficiencies in railway sector and suggest measures for improving, maintaining and updating the database, including institutional measures.

15. Suggest broad areas for business process re-engineering in railways to improve its customer and business orientation as well as project execution capability.

16. Study and evaluate the international experience in rail transport with particular stress on institutional design, business strategies and freight and passenger transport products (heavy haul high speed and customer focused services), quality of service (reliability, speed, elimination of accidents), productivity and technology and development of competitive world class rail equipment industry and its relevance to IR.

3. Additional guidance for the Working Group

a. The Group may get special studies carried out by experts.

b. The Group may visit such places and consult such stakeholders, key users and experts as may be considered necessary for its work.

c. The Group may examine the laws, rules and regulations pertaining to roads in connection with the TOR above and suggest legal, organizational, institutional and procedural reforms as necessary.

4. The Chairman may co-opt up to two additional members.

5. The expenditure on studies commissioned by the Working Group would be borne by the Ministry of Railways.

6. The Working Group shall submit its report within nine months.

7. The non-official members of the Working Group will be paid TA/DA in accordance with the guidelines of NTDPC. The official Members will be paid TA/DA as per their entitlement by concerned Ministry/Departments where they are working.

Sd/-
(B.N. Puri)
Member Secretary
(NTDPC)

Copy to

1. Chairman, NTDPC
2. All the Members of the Working Group

2. ROADS

No.-3/1/2010-Tpt.
GOVERNMENT OF INDIA
Planning Commission
National Transport Development Policy Committee (NTDPC)

Capital Court, Olof Palme Marg
Munirka, New Delhi-110067
Dated: 19th July, 2010

Subject: Working Group on Roads for the National Transport Development Policy Committee (NTDPC).

It has been decided by the National Transport Development Policy Committee (NTDPC) to constitute a Working Group on Roads Sector. The Composition and Terms of references of the Working Group are as under:

1. Composition

1 Secretary (Road Transport & Highways)- Chairman
2 Shri S. Sundar, Member, NTDPC
3 Shri D.P. Gupta, Member, NTDPC
4 Member Secretary/Co-ordinator, NTDPC
5 Chairman, National Highway Authority of India (NHAI)
6 Director General, Roads, Ministry of Road Transport & Highways
7 Principal Secretary (Transport), Government of Andhra Pradesh
8 Principal Secretary (PWD), Government of Assam
9 Joint Secretary (Road Transport), Ministry of Road Transport & Highways.
10 Joint Secretary (Rural Roads), Ministry of Rural Development
11 Professor Geetam Tiwari, Indian Institute of Technology, Delhi
12 Shri Partha Mukhopadhyay, Centre for Policy Research, New Delhi.
13 Shri Athar Shahab, Dy. MD, IDFC Projects and Chairman, CII Roads Committee
14 Shri O.B. Raju, MD, GMR Highways Pvt. Ltd., Bengaluru.
15 Shri Parvesh Minocha, MD, Transportation Division, Feedback Ventures
16 Representative of financial sector (nominated by Secretary, Department of Financial Services)
17 Representative of IT sector
18 Adviser (Transport Research), Ministry of Road Transport & Highways - Convenor.

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2. Terms of Reference

1. Determine the role of road transport in meeting transport requirements of the economy over the next two decades, keeping in view the need to
   a. Conserve energy and protect the environment,
   b. Promote development of remote and inaccessible areas through universal connectivity,
   c. Promote safety and sustain future quality of life,
   d. Create an optimal intermodal mix.

2. Estimate the growth in road traffic, passenger and freight, by 2020 and 2030 in the context of economic, demographic and technological trends at local, national and global levels.

3. Consistent with the above, assess the current capacity and required capacity in future, of the physical road infrastructure. The requirements may be grouped into different categories:
   a. Expressways
   b. National Highways
   c. State Highways and Major District Roads
   d. Rural Roads – both PMGSY and non-PMGSY (urban road requirements would be addressed by the working group on urban transport).

   The following aspects may also be kept in view while assessing the requirements:
   a. Universal rural connectivity.
   b. Special problems of remote, difficult and border areas including the north-east region.
   c. Road connectivity with ports, power plants, water fronts.
   d. Road connectivity with neighbouring countries.
   e. Development of regional and international road corridors.

4. In light of the above,
   a. Assess the investment required to achieve the projected road traffic growth.
   b. Identify sources of funding and assess fund requirements from budgetary, non-budgetary and private sources for different areas in road infrastructure.
   c. Identify areas for PPP and the requirement of private and public funding in these areas.
   d. Examine the existing PPP policy framework and policy initiatives including the regulatory and institutional framework, and suggest changes necessary to attract greater private investment.
   e. Suggest measures for greater commercial orientation of road transport services.

5. Assess the full costs of road transport, including the costs of externalities, and suggest appropriate pricing regimes, both direct and indirect, including institutional arrangements for rational pricing.

6. Estimate the energy requirements necessary for road infrastructure and suggest measures to put the road construction and road transport sector on a sustainable low carbon path, promoting energy efficiency, emission reduction and environment protection.

7. Review status of road quality and safety measures and ways to ameliorate road accidents and make roads more user friendly.

8. Assess the availability of human resources for the road sector and suggest measures for skill development and institutional capacity building for various stakeholders.

9. Suggest measures for promotion of research and development and technology upgradation in the road transport sector, including institutional development.

10. Indicate broad areas and investment for IT in road transport to improve customer interface/ satisfaction and internal efficiency.

11. Suggest measures for speedy acquisition of land for roads, along with rehabilitation and resettlement of persons affected.

12. Identify data deficiencies in road transport and suggest measures for improving, maintaining and updating the database, including institutional measures.

13. Assess the current industry structure, including the role played by the public and private sectors and suggest policies to promote adequate competition in road transport with the objective of enhancing access and affordability.

14. Examine the barriers to free flow of road freight traffic and suggest measures to promote seamless movement of road freight across India, including in particular the use of IT.

15. Suggest measures towards consolidation and preservation of road assets.

16. Identify social disconnects arising out of construction of roads and suggest measures for their mitigation.

17. Suggest measures for upgrading and modernizing the trucking industry.

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3. Additional guidance for the Working Group

1. The Group may get special studies carried out by experts.

2. The Group may visit such places and consult such stakeholders, key users and experts as may be considered necessary for its work.

3. The Group may examine the laws, rules and regulations pertaining to roads in connection with the TOR above and suggest legal, organizational, institutional and procedural reforms as necessary.

4. The Chairman may co-opt up to two additional members.

5. The expenditure on studies commissioned by the Working Group would be borne by the Ministry of Road Transport and Highways.

6. The Working Group shall submit its report within nine months.

7. The non-official members of the Working Group will be paid TA/DA in accordance with the guidelines of NTDPC. The official Members will be paid TA/DA as per their entitlement by concerned Ministry/Departments where they are working.

Sd/-
(B.N. Puri)
Member Secretary
(NTDPC)

Copy to

1. Chairman, NTDPC
2. All the Members of the Working Group

3. CIVIL AVIATION

No. 3/1/2010-Tpt.
GOVERNMENT OF INDIA
Planning Commission
National Transport Development Policy Committee (NTDPC)

Capital Court, Olof Palme Marg
Munirka, New Delhi-110067
Dated: 19th July, 2010

Subject: Working Group on Civil Aviation for the National Transport Development Policy Committee (NTDPC).

It has been decided by the National Transport Development Policy Committee (NTDPC) to constitute a Working Group on Civil Aviation Sector. The Composition and Terms of references of the Working Group are as under:

1. Composition
   1 Secretary, Ministry of Civil Aviation — Chairman
   2 Shri K.L. Thapar, Member, NTDPC
   3 Shri Cyrus Guzder, Member, NTDPC
   4 Member Secretary/ Co-ordinator, NTDPC
   5 Managing Director, National Aviation Company of India Limited
   6 Director General, Civil Aviation
   7 Chairman, Airports Authority of India
   8 Dr. Shashanka Bhide, Senior Fellow, National Council for Applied Economic Research (NCAER), New Delhi.
   9 Shri Rakesh Gangwal, Former Chairman and CEO, US
   10 Capt. G.R. Gopinath, CMD, Deccan 360.
   11 Shri Sanat Kaul, Chairman, International Foundation for Aviation and Aerospace Development.
   12 Shri Sanjay Reddy, MD, GVK, Mumbai & Benguluru International Airports.
   13 Representative of financial sector (nominated by Secretary, Department of Financial Services)
   14 Shri U.G. Krishna, GM, ECTI, Wipro Limited.
   15 Joint Secretary, Ministry of Civil Aviation-Convenor

2. Terms of Reference
1. Determine the role of air transport in meeting transport requirements of the economy over the next two decades, keeping in view the need to
   a. Conserve energy and protect the environment,
   b. Promote development of remote and inaccessible areas,
   c. Promote safety and sustain future quality of life,
   d. Create an optimal intermodal mix.

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2. Estimate the growth in air traffic by 2020 and 2030 in terms of both passengers and freight by:
   a. Total volume of traffic, domestic and international.
   b. Domestic origin – destination pairs.

3. Consistent with the above, assess the current and the required capacity in future, of civil aviation sector:
   a. Aircraft fleet
   b. Infrastructure in terms of
      i. On the ground, including airport terminals, runway capacity, apron – parking space, access to terminal buildings etc.
      ii. Airspace and air traffic control.
      iii. Creation of additional/greenfield airport infrastructure and its role in promoting regional development.

4. In light of the above,
   a. Assess the investment required to achieve the projected air transport traffic growth.
   b. Identify sources of funding and assess fund requirements from budgetary, non-budgetary and private sources for different areas in air transport.
   c. Identify areas for PPP and the requirement of private and public funding in these areas.
   d. Examine the existing PPP policy framework and policy initiatives including the regulatory and institutional.

5. Assess the full costs of air transport, including the costs of externalities, and suggest appropriate pricing regimes, both direct and indirect, including institutional arrangements for rational pricing.

6. Estimate the energy requirements necessary for air transport infrastructure and suggest measures to put air transport sector on a sustainable low carbon path and promote energy efficiency, emission reduction and environment protection.

7. Review the impact of ongoing developments of international air transport in the world and India and suggest changes in policy for India in following areas:

   a. Licensing of airlines for scheduled, non-scheduled and cargo services.
   b. Safety, security, economic and environmental issues, keeping in view the recommendations of ICAO, international practices and the conditions in India.
   c. Taxation policy affecting various sub-sectors of civil aviation, including taxes on aviation turbine fuel.

8. Assess the current industry structure, including the role played by public and private sector and suggest policies to promote adequate competition in air transport with the objective of enhancing access and affordability.

9. Assess the availability of human resources for the air transport sector and suggest measures for skill development and institutional capacity building for various stakeholders.

10. Measures for promotion of research and development and technology upgradation in air transport, including institutional development.

11. Identify data deficiencies in air transport and suggest measures for improving, maintaining and updating the database, including institutional measures.

3. Additional guidance for the Working Group

1. The Group may get special studies carried out by experts.

2. The Group may visit such places and consult such stakeholders, key users and experts as may be considered necessary for its work.

3. The Group may examine the laws, rules and regulations pertaining to air transport in connection with the TOR above and suggest legal, organizational, institutional and procedural reforms as necessary.

4. The Chairman may co-opt up to two additional members.

5. The expenditure on studies commissioned by the Working Group would be borne by the Ministry of Civil Aviation.

6. The Working Group shall submit its report within nine months.

7. The non-official members of the Working Group will be paid TA/DA in accordance with the guidelines of NTDPC. The official Members will be paid TA/DA as per their entitlement by concerned Ministry/Departments where they are working.

Sd/-
(B.N. Puri)
Member Secretary
(NTDPC)

Copy to

1. Chairman, NTDPC
2. All the Members of the Working Group

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4. PORTS AND SHIPPING

No.-3/1/2010-Tpt.
GOVERNMENT OF INDIA
Planning Commission
National Transport Development Policy Committee (NTDPC)

Capital Court, Olof Palme Marg
Munirka, New Delhi-110067
Dated: 19th July, 2010

Subject: Working Group on Ports and Shipping for the National Transport Development Policy Committee (NTDPC).

It has been decided by the National Transport Development Policy Committee (NTDPC) to constitute a Working Group on Ports and Shipping Sector. The Composition and Terms of references of the Working Group are as under:

1. Composition
   1 Secretary (Shipping) - Chairman
   2 Shri Bharat Sheth, Member, NTDPC
   3 Shri Gajendra Haldea, Member, NTDPC
   4 Member Secretary/ Co-ordinator, NTDPC
   5 Director General, Shipping
   6 Director General, Foreign Trade (DGFT), M/o Commerce & Industry
   7 Additional Member, Planning, Railway Board)
   8 CMD, Shipping Corporation of India
   9 Joint Secretary, Ports
   10 CEO, Gujarat Maritime Board
   11 MD, Container Corporation of India
   12 Chief Engineer, Planning, Ministry of Road Transport & Highways
   13 External Academic Expert
   14 External Academic Expert
   15 Shri Jimmy Sarbh, Sarbh Consultancy
   16 Shri Krishna Kotak, Managing Director, J.M. Baxi & Company
   17 Shri Thomas Netzer, Director, McKinsey & Company.
   18 Representative of financial sector (nominated by Secretary, Department of Financial Services)
   19 Representative of IT Sector
   20 Adviser, (Transport Research) - Convenor

2. Terms of Reference

1. Review and determine the role of the maritime sector in meeting transport requirements of the economy over the next two decades, keeping in view the need to
   a. Conserve energy and protect the environment,
   b. Promote safety and sustain future quality of life,
   c. Create an optimal intermodal mix.

2. Estimate the potential growth in waterborne traffic by 2020 and 2030 in terms of both passengers and freight by
   a. Sea borne, Coastal and Inland Water.
   b. Major ports and non-major ports.

3. Consistent with the above, assess the current capacity and the required capacity in future, maritime infrastructure, including:
   a. Port infrastructure.
   b. Shipping.
   c. Creation of additional port infrastructure or the creation of ports at new, greenfield sites, and their role in promoting regional development.

4. In light of the above,
   a. Assess the investment required to achieve the projected maritime infrastructure capacity.
   b. Identify sources of funding and assess fund requirements from budgetary, non-budgetary and private sources for different areas in maritime infrastructure.
   c. Identify areas for PPP and the requirement of private and public funding in these areas.
   d. Examine the existing PPP policy framework and policy initiatives including regulatory and institutional framework and suggest changes necessary to attract greater private investment.

5. Examine the regulatory issues including the role of the Tariff Authority for Major Ports (TAMP) and suggest changes in policies concerning ports and shipping.

6. Review the relative role of major and non-major ports and suggest measures for integrated development of the ports sector, including a review of the current legislative provisions.

7. Estimate the energy requirements necessary for port infrastructure and shipping and suggest measures to put water transport sector on a sustainable low carbon path and promote energy efficiency, emission reduction and environment protection.

8. Review the status of rail-road connectivity of ports to the hinterland and make recommendations for development of multi-modal transport systems.

9. Assess the availability of human resources for the maritime sector and suggest measures for skill development and institutional capacity building for various stakeholders.

10. Suggest measures for promotion of research and development and technology upgradation in the

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water transport sector, including evaluation of technology trends in global shipping.

11. Indicate broad areas and investment for IT in water transport to improve customer interface/ satisfaction and internal efficiency.

12. Identify data deficiencies in water transport and suggest measures for improving, maintaining and updating the database, including institutional measures.

13. Review the processes, productivity and efficiency of ports and shipping development and operations and make appropriate recommendations for their improvement.

3. Additional guidance for the Working Group

1. The Group may get special studies carried out by experts.

2. The Group may visit such places and consult such stakeholders, key users and experts as may be considered necessary for its work.

3. The Group may examine the laws, rules and regulations pertaining to maritime sector in connection with the TOR above and suggest legal, organizational, institutional and procedural reforms as necessary.

4. The Chairman may co-opt up to two additional members.

5. The expenditure on studies commissioned by the Working Group would be borne by the Ministry of Shipping.

6. The Working Group shall submit its report within nine months.

7. The non-official members of the Working Group will be paid TA/DA in accordance with the guidelines of NTDPC. The official Members will be paid TA/DA as per their entitlement by concerned Ministry/Departments where they are working.

Sd/-
(B.N. Puri)
Member Secretary
(NTDPC)

Copy to

1. Chairman, NTDPC
2. All the Members of the Working Group

5. URBAN TRANSPORT

No. 3/1/2010-Tpt.
GOVERNMENT OF INDIA
Planning Commission
National Transport Development Policy Committee (NTDPC)

Capital Court, Olof Palme Marg
Munirka, New Delhi-110067
Dated: 19th July, 2010

Subject: Working Group on Urban Transport for the National Transport Development Policy Committee (NTDPC).

It has been decided by the National Transport Development Policy Committee (NTDPC) to constitute a Working Group on Urban Transport Sector. The Composition and Terms of references of the Working Group are as under:

1. Composition
   1 Secretary, Ministry Urban Development - Chairman
   2 Prof. Dinesh Mohan, Member, NTDPC
   3 Shri S. Sundar, Member, NTDPC
   4 Member Secretary/ Co-ordinator, NTDPC
   5 Secretary, Urban Development Department, Government of Maharashtra
   6 Representative from Railways (urban/suburban/metro transport)
   7 Shri P. S. Kharola, Commissioner, Department of Commercial Taxes, Benguluru.
   8 Shri S. N. Sahai, Managing Director and Chief Executive Officer, Delhi Integrated Multi Modal Transit System Ltd. (DIMTS)
   9 Professor Sudhir Chella Rajan, Indian Institute of Technology, Madras, Chennai.
   10 Professor Geetam Tiwari, Research and Injury Prevention Programme, Indian Institute of Technology, Delhi.
   11 Dr Ashwin Mahesh, Indian Institute of Management, Bangalore.
   12 Shri K. Ramchand, Director, IL&FS Transport Network
   13 Shri Vinayak Chatterji, MD & CEO, Feedback Ventures.
   14 Representative of financial sector (nominated by Secretary, Department of Financial Services)
   15 Shri C.N. Raghupathi, Vice President, Infosys.
   16 OSD/Director, Ministry of Urban Development- Convenor

2. Terms of Reference
1. Determine the role of urban transport in meeting transport requirements of the economy over the next two decades and develop a rolling plan for 2030 in consonance with the National Urban Transport Policy. The plan should cover urban

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agglomerations as well as satellite towns, including integrated suburban rail based systems, and should be based on the following considerations:

a. Promote access of all citizens to jobs, education and recreation at affordable costs and within reasonable time.
b. Minimise overall production of green house gases and pollution (well to wheel) per passenger km.
c. Minimise financial costs of transportation.
d. Minimise overall demand for transportation.
e. Achieve minimum service level benchmarks.
f. Aim towards zero traffic fatalities.

2. Estimate the growth in passenger traffic by 2020 and 2030 in the context of economic, demographic and technological trends at local, national and global levels.

3. Consistent with the above, assess the current capacity and recommend the magnitude and type of capacity creation/augmentation/modernization required in urban transport.

4. In light of the above,
   a. Assess the investment required to achieve the projected urban transport capacity.
   b. Identify sources of funding and assess fund requirements from budgetary, non-budgetary and private sources for different areas in urban transport.

5. Identify the roles of state, the private sector and the financial sector in meeting the investment needs of the urban transport sector. This would include examination of the current modes of financing urban transport and review of the Public Private Partnership (PPP) experience, which is designed to attract greater private participation.

6. Assess the full costs of urban transport, including the costs of externalities. Suggest appropriate pricing regimes including appropriate taxation measures, that would achieve the desired mode mix keeping in view affordability and access.

7. Estimate the energy requirements necessary for urban transport and suggest measures to put the urban transport sector on a sustainable low carbon path and promote energy efficiency, emission reduction and environment protection.

8. Assess the availability of human resources for urban transport and suggest measures for skill development and institutional capacity building for various stakeholders.

9. Suggest measures for promotion of research and development and technology upgradation in urban transport sector, including institutional development.

10. Indicate broad areas and investment for IT in urban transport to improve customer interface/ satisfaction and internal efficiency.

11. Identify data deficiencies in urban transport sector and suggest measures for improving, maintaining and updating the database, including institutional measures.

12. Review status of quality and safety measures and ways to ameliorate accidents and make urban transport more user friendly.

3. Additional guidance for the Working Group

1. The Group may get special studies carried out by experts.
2. The Group may visit such places and consult such stakeholders, key users and experts as may be considered necessary for its work.
3. The Group may examine the laws, rules and regulations pertaining to roads in connection with the TOR above and suggest legal, organizational, institutional and procedural reforms as necessary.

4. The Chairman may co-opt up to two additional members.

5. The expenditure on studies commissioned by the Working Group would be borne by the Ministry of Urban Development.

6. The Working Group shall submit its report within nine months.

7. The non-official members of the Working Group will be paid TA/DA in accordance with the guidelines of NTDPC. The official Members will be paid TA/DA as per their entitlement by concerned Ministry/Departments where they are working.

Sd/-
(B.N. Puri)
Member Secretary
(NTDPC)

Copy to

1. Chairman, NTDPC
2. All the Members of the Working Group

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6. NORTH EAST

No. 5/1/2010-NTDPC
GOVERNMENT OF INDIA
Planning Commission
National Transport Development Policy Committee (NTDPC)

Capital Court, Olof Palme Marg
Munirka, New Delhi-110067
Dated: 8th August, 2011

Subject: Working Group on Improvement and Development of Transport Infrastructure in the North East for the National Transport Development Policy Committee (NTDPC).

It has been decided by the National Transport Development Policy Committee (NTDPC) to constitute a Working Group on Improvement and Development of Transport Infrastructure in the North East. The Composition and Terms of references of the Working Group are as under:

1. Composition:
   1 Shri Vivek Sahai, former Chairman, Railway Board, Chairman
   2 Shri B.N. Puri, Member Secretary, NTDPC, Member
   3 Chairman Inland Waterways Authority of India (IWAI) or her representative, Member
   4 Director General, Roads, Ministry of Road Transport & Highways, Member
   5 Director General, Boarder Roads Organisation (BRO), Member
   6 Shri Rohit Nandan, Joint Secretary, Ministry of Civil Aviation, Member
   7 Joint Secretary (BSM), Ministry of External Affairs, Member
   8 Executive Director (Projects), Railway Board, Member
   9 Prof. Mahendra P. Lama, Vice Chancellor, University of Sikkim, Member
   10 Representative of North East Council (NEC), Member
   11 Representative of Planning Commission, Transport Division, Member
   12 Representative of Customs & Excise Board, Member
   13 Representative of Asian Institute of Transport Development (AITD), Member
   14 Ms. Jayashree Mukherjee, Joint Secretary, DONER, Convenor

2. Terms of Reference:

1) To assess the Transport Infrastructure Deficit in the North East Region.
2) To assess the role of each mode of transport for improving the accessibility and mobility of both people and goods.
3) To make recommendations for provision of transport infrastructure and facilities keeping in view:
   (a) the role of each mode of transport
   (b) the requirement of traffic demand, particularly, that relating to movement of essential commodities
   (c) need to ensure balance between the ability of transport to serve economic development of the region and to conserve energy, protect environment, promote safety and sustain good quality of life.
   (d) Need to adopt and evolve suitable technology for cost effective creation, economical maintenance and efficient utilisation of transport assets.
4) To assess transport infrastructure, requirement of providing connectivity with the neighbouring countries with a view to enabling trade between North Eastern Region and neighbouring countries.
5) To assess the investment requirement of Transport sector and to recommend measures to fund the projected investment.
6) To suggest measures to improve the capacity to evolve and implement projects in North East.

3. The Chairman may co-opt up to two additional members.

4. The representatives of the North Eastern States will be special invitee to the meeting of the Working Group.

5. The Working Group shall submit its report within three months.

6. The non-official members of the Working Group will be paid TA/DA in accordance with the guidelines of NTDPC. The official Members will be paid TA/DA as per their entitlement by concerned Ministry/Departments where they are working.

Sd/-
(B.N. Puri)
Member Secretary
(NTDPC)

Copy to:-
1. Chairman, NTDPC
2. All the Members of the Working Group

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7. TRANSPORTATION OF ENERGY COMMODITIES

No. 3/1/2010-Tpt.
Government of India
Planning Commission
National Transport Development Policy Committee (NTDPC)

6th Floor, Capital Court,
Olof Palme Marg, Munirka,
New Delhi-110 067.
Dated: 5th April, 2011.

Subject: Working Group on Integrated Strategy for Bulk Transport of Energy and Related Commodities in India.

The surge in economic growth witnessed in recent years in India has strained the capacity of its transport system as well as energy supply, particularly electric power. The government's ambitious development targets and plans as well as popular discourse attest to importance of addressing such binding infrastructure constraints in a decisive manner over the next decade in order to sustain high levels of economic growth and to make it more inclusive.

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

The future poses more profound challenges. Even if ambitious aims to improve energy intensity of the Indian economy are achieved, sustaining economic growth at 8-10% per annum over the next two decades will require massive increases in power generation and transportation of bulk commodities such as coal, iron and steel. The Integrated Energy Policy foresees generation capacity increasing six-fold to 960 GW by 2031-32 and coal requirements expanding commensurately to 2-3 BT p.a. Out of this requirement, approximately 10 to 15% will be imported coal. The task ahead is also rendered more difficult by the evolving economic geography and structural changes in the energy system, such as the increasing role of natural gas and growing imports of coal that will impose major new demands on the transport networks. Current projections for coal imports in 2031-32 and LNG imports in 2029-30 for example, are 930 million tones and 162 MMSCMD respectively.

Finally, there is increasing recognition of the adverse environmental impacts, including not just local pollution and damage to habitats and/or livelihood of vulnerable groups but also global climate change that need to be addressed in an economically efficient, equitable and effective manner.

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

Keeping in view what is stated above, it has been decided by the National Transport Development Policy Committee (NTDPC) to constitute a Working Group on Integrated Strategy for Bulk Transport of Energy and Related Commodities in India. The composition and Terms of Reference of the Working Group are as under:-

1. Composition
    1. Shri P. Uma Shankar, Secretary, Ministry of Power — Chairman
    2 Shri B.N. Puri, Member – Secretary, NTDPC
    3 Shri Pradeep Bhatnagar, Additional Member (Traffic), Railway Board
    4 Representative* of Ministry of Coal
    5 Representative* of Ministry of Shipping
    6 Representative* of Ministry of Steel.
    7 Representative* of Ministry of Petroleum & Natural Gas
    8 Representative* of Ministry of Road, Transport & Highways
    9 Representative* of Ministry of Environment and Forest
    10 Representative of State Govt.
    11 Representative of State Govt.
    12 Representative of CEA
    13 Private Sector Representative, Power
    14 Private Sector Representative, Gas
    15 Private Sector Representative, Steel
    16 Dr. Anupam Khanna, Principal Adviser, NTDPC — Convenor

    ** Not below the rank of Joint Secretary.*

The Chairman of Working Group may co-opt/invite representative, special experts, functionaries including that of Central Public Sector.

2. Terms of Reference

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1. Develop demand scenarios for electric power and natural gas and steel for final consumption at 5-year intervals (2017, 2022, 2027 and 2032) disaggregated into a suitable number of spatial locations (transmission nodes) and consumer type.
2. Identify production locations (existing and potential) for the following:
   a. Electric Power Generation, separating out current and potential hydro- and nuclear power plants.
   b. Iron & Steel plants
   c. Coal Mines (differentiated by type of coal and ash content)

3. Indicate current and potential port terminals for
   a. Coal
   b. LNG
   c. Landing site for offshore natural gas

4. Indicate current and potential transport links
   a. Railway corridors
   b. Road Corridors
   c. Inland Waterways
   d. Possible Coal Slurry pipelines
   e. Natural Gas pipelines
   f. Coastal Shipping options for coal

5. Study the economics of transmission of energy vs. transportation of fuel (coal, natural gas) within a coherent and analytically tractable framework.

6. Make recommendation for rationalization of coal linkage by optimizing the distance of coal transportation from source of coal supply to power station taking into account economic and environmentally significant variables such as calorific values, ash and sulfur content, carbon emissions, etc.

7. Estimate the rail, road and port capacities required and associated investment to meet the demand.

8. Develop estimates of both environmental externalities as well as economic cost of shortage of energy and transport services.

9. Examine laws, rules and regulations pertaining to transport in connection with the ToR above and suggest legal, organizational, institutional and procedural reforms needed to achieve the objectives of the integrated strategy.

3. The report of the Working Group should pay due regard to the uncertainties inherent in the development of such a complex system over a long period of twenty years. Thus it is necessary to distinguish what is clearly known now and what the Group believes needs to be known through suitable an analyses. The aim should be to set robust directions for the long-term that can be adapted as events unfold but also recommend immediate concrete actions that address critical bottlenecks and identify promising options (e.g. for new corridors, dedicated facilities) in order to begin planning investments in a timely manner.

4. The Group may get special studies carried out by experts.

5. The expenditure on studies commissioned by the Working Group would be borne by the Ministry of Power.

6. The Group may visit such places and consult such stakeholders, key users and experts as may be considered necessary for its work.

7. The Chairman may co-opt up to two additional members.

8. The Working Group shall submit its report in July, 2011.

9. The non-official members of the Working Group will be paid TA/DA in accordance with the guidelines of NTDPC. The official Members will be paid TA/DA as per their entitlement by concerned Ministry/Departments where they are working.

Sd/-
(B.N. Puri)
Member Secretary
(NTDPC)

Copy to

1. Chairman, NTDPC
2. All the Members of the Working Group

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ANNEX P.3

COMPOSITION OF THE WORKING GROUPS AND SUB-GROUPS

1. RAILWAYS

WORKING GROUP

Chair: Chairman, Railway Board. Shri K.L.Thapar, Member, NTDPC & Chairman AITD. Shri M. Ravindra, Member, NTDPC, Shri B.N.Puri, Member Secretary/Co-ordinator, ShriR.Gopal Krishnan, Executive Director, Tatasons, Professor S.Sriraman, Walchand Hirachand Professor of Transport Economics, Dr.Ram Singh, Associate Professor, Delhi School of Economics, Shri S.K.N. Nair, Sr.Consultant, National Council for Applied Economic Research (NCAER), Shri Saurabh Srivastava, Chairman, CA Group, Shri Anil Kumar Gupta, MD, CONCOR, Representative of the Department of Financial Services, Representative of the Ministry of Power, Shri R.K.Jain, CAO/FOIS, Dr. Badrinarayan, GM/UTS, CRIS, MD/RITES

SUB-GROUPS

External/Policy Environment Market Analysis and Demand assessment: Chair: Shri S.K.N.Nair. Sr. Consultant, NCAER Shri Sanjeevan Kapashe, CCE/WCR, Shri Jatin Sarkar, GGM/RITES), Representative of Planning Commission, Shri Manoj Singh, Dy.COM, South Eastern Railway, Shri S.K.Das, ED/TT/F, Ms.Suhash Kumar, Adv/FM, Railway Board, Shri M.K.Reddy, EDPM, Railway Board, Shri Mukesh Nigam, ED/Coaching, Railway Board, Shri Naveen Kumar Shukla, ED/PP- Convener.

Survey of International Experience & Railway Reforms: Chair: Shri M.Ravindra, Former Chairman, Railway Board . Shri Raghu Dayal, AITD, Shri Jit Sondhi, Shri Rajiv Memani, Managing Director, Ernst & Young, Shri.Adil Zainulbhai, MD, Mc Kinsey & Company India, Shri S.K.Mishra, ED/T/PPP, Shri Naveen Kumar Shukla, ED/PP – Convener, Special Invitee: Representative of Country-Head, World Bank.

Capacity Planning and Resource Mobilization: Chair: Shri S.B.Ghosh Dastidar, Former Member Traffic, Railway Board. Shri R.K.Sinha, Director (Finance), DFCCIL, Shri TCA Srinivas Raghavan, Shri Amrit Pandurangi, Price Waterhouse Coopers, Dr.Ram Singh, Professor, Delhi School of Economics, Shri Vinay Singh, ED/Works, Railway Board, Shri Naveen Kumar Shukla, ED/PP, Shri Cherian Thomas, IDFC, Representative of Finance Directorate, Railway Board, Representative of Planning Commission and Ministries of Finance, Shipping and Rural Development, Shri M.Madhusudan Rao, ED/Planning – Convener.

Strategic Planning, Organisational & HR Challenges: Chair: Shri R.Gopal Krishnan, ED, Tata & Sons. Shri R.K. Jain, CAO/FOIS, Prof. Sekhar Chaudhury, Director, IIM, Kolkata, Prof. S. Mani Kutty, IIM, Ahmedabad, Shri R.Mukundan, ED(E)N, Railway Board, Shri S.K. Mishra/ED/T/PPP – Convener.

Technology and High Speed Rail: Chair: Shri M. Ravindra, Former Chairman, Railway Board. Shri R.R.Bhandari, Ex.Member, Mechanical, Railway Board, Adv/Mech/Project, Railway Board, Shri R.M.Lal, AM/Electrical, Railway Board, Shri Rajeev Jyoti, CEO/Bombardier, India, TTCI, USA- Britto Raj Kumar, Shri S.K.Jain, CAO/Const, WR, Representative of DRDO, Shri Jit Sondhi, Shri A.K.Gupta, Advisor(T&E)/RITES, Shri Sumant Chak,, Shri Madhusudan Rao, ED/P, ED/E&R- Convener.

Information Technology: Chair: Shri Saurabh Srivastava. Shri R.K.Jain, CAO/FOIS, Representative of Chairman, ISRO/or Mr.Pai of Infosys, Ms.Achla Sinha, ED/Statistics & Economics, MD, CRIS, Shri Gopal Krishnan, Sr.DCM, Western Railway, Mumbai, R.B Das, ED/C&IS - Convener

Determination of full- costs, Accounting System and Tariff: Chair: Professor S.Sriraman, University of Mumbai . Adv/Rates, Railway Board, Adv/TT/M, Railway Board, Ms.Achla Sinha, ED/Statistics and Economics, Shri Raghu Dayal, AITD, Representative of Ministry of Finance, Representative of Finance Directorate of Railway Board, Dr.R. Badri Narain, GM/UTS, CRIS - Convener

Multi-modal & Non-Bulk Traffic: Chair: Shri R.N.Agha, Former Member Traffic. Shri Anil Kumar Gupta, MD, CONCOR, Association of Container Train Operators (ACTO), Representatives of Ministry of Shipping, Commerce, Road Trasnsport and Highways and Planning Commission, Ms. Suhash Kumar, Adv/FM, Shri H.D.Gujarati, ED/TT/S – Convener.

International rail linkage: Chair: Shri Raghu Dayal, AITD. Shri Sumant Chak, AITD, MD/CONCOR, Shri Naveen Kumar Shukla, EDPP, S.K.Das, ED/TT/F- Convener

Land use optimization: Chair: Shri Sudhir Chandra, Former Member Staff. Shri S.K.Jain, CAO/C/WR, Ms. Samantha Bastian, ED/L&A-I (Convener)

2. ROADS

WORKING GROUP

Chair: Secretary, Ministry of Road Transport and Highways. Shri S. Sundar, Member, NTDPC, Shri

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D.P. Gupta, Member, NTDPC, Shri B.N. Puri, Member Secretary, NTDPC, Chairman, National Highways Authority of India, Director General (Roads), Ministry of Road Transport and Highways, Principal Secretary (Transport), Government of Andhra Pradesh, Principal Secretary (PWD), Government of Assam, Joint Secretary (Road Transport), Ministry of Road Transport and Highways, Joint Secretary (Rural Roads), Ministry of Rural Development, Professor Geetam Tiwari, Indian Institute of Technology, Delhi, Shri Partha Mukhopadhyay, Centre for Policy Research, New Delhi, Shri Athar Shahab, Dy. MD, IDFC Projects and Chairman, CII Roads Committee, Shri O.B. Raju, MD, GMR Highways Pvt Ltd, Bengaluru, Shri Parvesh Minocha, MD, Transportation Division, Feedback Ventures, Representative of the Department of Financial Services, Representative of IT Sector, Advisor (Transport Research), Ministry of Road Transport and Highways – Convener

SUB-GROUPS

Estimate the growth in road freight /passenger traffic by 2020 and 2030 and Intermodality issues: Chair: Shri B.N. Puri, Member Secretary, NTDPC. Shri M.M. Hasija, Adviser (Statistics),Ministry of Road Transport & Highways, Transport Research Wing, Dr. Anupam Khanna, Principal Adviser, NTDPC, Shri Jatin Sarkar, General Manager (Economics & Transport), RITES, Convenor.

Road capacity (National/State Highways, Expressway) upto 2020 and 2030; Investment requirement; Mode of financing; Road Pricing (Tolling); PPP policy framework; Implementation Issues; Land acquisition and rehabilitation and; Consolidation and preservation of road assets. Chair: Shri A.V. Sinha, Director General (Roads Development) & Special Secretary, Ministry of Road Transport and Highways. Shri D.P. Gupta (Retd. DG, Roads), Director Roads & Highways, Shri Athar Shahab, Deputy Managing Director, IDFC, Projects, Shri O.B. Raju, MD, GMR Highways Ltd., Shri R.J. Chand, Ernst & Young Pvt. Ltd., Shri Vinayak Chatterjee, Chairman, CII Urbanisation & Future Cities Council, Shri Parvesh Minocha, MD, Transportation Division, Feedback Ventures, Shri V.L. Patankar, Member (Projects), NHAI, Shri J.N.Singh, Member (Finance), NHAI-Convenor.

Energy, environment, technology, modernization of trucking industry and R&D and sustainable transport: Chair: Dr. Surajit Mitra, Additional Chief Secretary(PWD & Water Resources), Government of Assam. Prof. Geetam Tiwari, TRIPP, IIT, Delhi, Shri Anupam Khanna, Principal Adviser, NTDPC, Shri R.Balasubramanian, Director, Central Institute of Road Transport, Pune-Nashik Road,Pune, Shri Partha Mukhopadhyay, Centre for Policy Research, Shri S.R.Marathe, Director, Automotive Research Association of India (ARAI).

Road Safety and HRD: Chair: Shri S.K. Puri, Additional Director General (RD), Ministry of Road Transport & Highways. Shri Saroj K. Dash, Joint Secretary (T&A), Ministry of Road Transport and Highways, Shri S.P. Singh, Principal Secretary (Transport Department), Govt. of Andhra Pradesh, Prof. Geetam Tiwari, TRIPP, IIT, Delhi, Shri Arvind Kumar-Convenor, Adviser (TR), Transport Research Wing, Shri D.P. Gupta (Retd. DG, Roads), Director Roads & Highways, Shri Kamlesh Kumar, Chief Engineer-Convenor, Ministry of Road Transport and Highways.

IT and Data Issues: Chair: Shri Arvind Kumar-Convenor, Adviser (TR), Transport Research Wing, Ministry of Road Transport and Highways. Shri Mahesh Chandra, Deputy Director General,National Informatics Centre (NIC), Shri A.S. Verma General Manager (IT & data issues), NHAI, Shri K. Sen Sarma, Director(TRW), Convenor, Ministry of Road Transport & Highways, Transport Research Wing

Public Transportation and Seamless Freight and Passenger Movement: Chair: Shri Saroj K Dash, Joint Secretary (T&A), Ministry of Road Transport and Highways. Shri S.P. Singh, Principal Secretary (Transport Department), Govt. of Andhra Pradesh, Shri Arvind Kumar-Convenor, Adviser (TR), Transport Research Wing, Ministry of Road Transport and Highways, Shri Partha Mukhopadhyay, Centre for Policy Research, Shri H.M.Naqvi, Head Research & Consulting Division, Central Institute of Road Transport, Pune-Nashik Road,Pune, Shri K. Sen Sarma, Director(TRW), Convenor, Ministry of Road Transport & Highways, Transport Research Wing

Rural Roads: Chair: Dr. P.K. Anand, Joint Secretary, Ministry of Rural Development. Representative from State Governments/NRRDA, Convenor: Director, (Projects), National Rural Road Development Agency

3. CIVIL AVIATION

WORKING GROUP

Chair: Secretary, Civil Aviation. Shri M Kannan, Economic Adviser, Ministry of Civil Aviation, Convenor, Shri K. L. Thapar, Chairman, AITD, Shri Cyrus Guzder, Chairman, AFL Group, Shri B. N. Puri, Member-Secretary, NTDPC, Shri Arvind Jadhav, Managing Director, Air India Limited, Shri E. K. Bharat Bhushan, Director General, Directorate General of Civil Aviation, Shri V. P. Agarwal, Chairman, Airports Authority of India, Dr. Shashanka Bhide, Senior Fellow, National Council for Applied Economic Reaserch (NCAER), Shri Rakesh Gangwal, Former Chairman and CEO, US Airways Group, M/s. InterGlobe Aviation Ltd., Capt. G. R. Gopinath, CMD, M/s.

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Deccan Cargo & Express Logistics Pvt. Ltd., Shri Sanat Kaul, Chairman, International Foundation for Aviation and Aerospace Development, Shri Sanjay Reddy, MD, (GVK, Mumbai & Bengaluru International Airports), The Secretary, Department of Financial Services, Shri U. G. Krishna, GM, ECTI, Wipro Limited, Shri Kapil Kaul, CEO- Indian Subcontinent & Middle East, Centre for Asia Pacific Aviation (CAPA), Dr Rajat Kathuria, International Management Institute, Shri G. K. Malhi, CoSCA, BCAS

SUB-GROUPS

I. Economic Advisor, Ministry of Civil Aviation, Smt. Savitri, Director, DGCA, New Delhi, Shri S. Raheja, Member, Airports Authority of India, Shri Kapil Kaul, CEO- Indian Subcontinent & Middle East, Centre for Asia Pacific (CAPA), Shri Amitabh Khosla, International Air Transport Association, Dr. Rajat Kathuria, International Management Institute, Shri Arvind Jadhav, Managing Director, Air India Limited, Prof. P. S. Senguttuvan, M/s. Delhi International Airport Limited (DIAL).

II. Director (P), Ministry of Civil Aviation, Director (S), Ministry of Civil Aviation, Shri Lalit Gupta, Director, DGCA, New Delhi, Shri Cyrus Guzder, Chairman, AFL Group, ALF House, Dr. Rajat Kathuria, International Management Institute (IMI).

III. AS&FA,Ministry of Civil Aviation, Joint Secretary (N), Ministry of Civil Aviation, Shri R. P. Sahi, JOG (Retch), DGCA, New Delhi, ED (Training), Airports Authority of India, Shri Arvind Jadhav, Managing Director, Air India Limited, Dr. T. S. Shaikh, J. R. D. Institute of Aviation Management, Shri Tomar, M/s. Kingfisher Airlines Ltd.

IV. Joint Secretary (P), Ministry of Civil Aviation, Dr. Anupam Khanna, Consultant, NTDPC, Dr. Kota. Harinarayanan, Emiritus, Professor, National Aerospace Laboratories, Bangalore, Dr. A. R. Jpadhya, Director, National Aerospace Laboratories, Bangalore, Dr. Prodipto Ghosh, The Energy and Resource Institute (TERI), Shri Somasundaram, Member, Airports Authority of India, Shri Amitabh Khosla, International Air Transport Association, Ms. Harpreet Singh, Air India Ltd

V. Joint Secretary (N), Ministry of Civil Aviation, Shri G. K. Malhi, CoSCA, BCAS, Shri M. S. Bali, Spl. DG (CISF), CGO Complex, Lodhi Road, New Delhi, Shri Arvind Deep, Joint Director IB (MHA), S. Shri D. S. Mathur, Director (Security), Air India Ltd., Shri Gyaneshwar Singh, GM (Security), Airports Authority of India, Shri S. I. S. Ahmed, Security Head, M/s. Delhi International Airport Limited (DIAL), Shri Rajiv Jain, President, M/s Mumbai International Airport Limited.

VI. Joint Secretary (S), Ministry of Civil Aviation, Shri E.K. Bharat Bhushan, Director General of Civil Aviation, Shri G.S. Malhi, CoSCA, BCAS, Shri V.P. Agarwal, Chairman, Airport Authority of India, Air Marshall V.K. Verma (Retd.), Director, Indira Gandhi Rastriya Uran Academy (IGRUA), Shri R.P. Sahi, JDG (Retd.), Director General of Civil Aviation.

4. PORTS AND SHIPPING

WORKING GROUP

Chair: Shri K.Mohandas, Secretary, Ministry of Shipping. Shri Bharat Sheth, Chairman, Great Eastern Shipping Company, Shri B.N. Puri, Member Secretary, NTDPC, Dr. S.B. Agnihotri, DG(Shipping), Dr.Anup K. Pujari, Director General Foreign Trade, Additional Member (Planning), Rail Bhavan, Shri S. Hajara, Chairman & Managing Director, The Shipping Corporation of India Ltd., Shri Rakesh Srivastava, Joint Secretary (Ports) Ministry of Shipping, Shri B.K. Sinha, Chairman & CEO, Gujarat Maritime Board, Shri Anil K. Gupta, Managing Director, Container Corporation of India, Shri S.K. Puri, Additional Director General (Roads), Ministry of Road Transport & Highways, Shri Jimmy Sarbh, Sarbh Consultancy, Mr. Krishna Kotak, G.M. Bakshi & Co., Shri Thomas Netzer, Director, Mckinsey & Company Inc., Shri Arvind Kumar-Convenor, Adviser (TR), Transport Research Wing, Additional Co-opted members were Shri R. Kishore, President, Indian Private Ports & Terminal operators Association, CEO & Director, Vizag Seaport Pvt Ltd., Shri Mark S. Fernandes, Chairman, Shipping & Aviation Committee, Indian Merchant Chamber, Prof G. Raghuram, Indian Institute of Management, Ahmedabad, Prof.S.C. Mishra, Director, National Ship Design & Research Centre (NSDRC), Shri Suresh Kumar Kantholy, General Manager (ODC), Crimson Logic India Pvt.Ltd, Shri Pradeep Roy, Financial expert, Smt Bhupendra Prasad, Chairperson, Inland Water Authority of India (IWAI), Shri A. Janardhan Rao, Managing Director, Indian Ports Association.

SUB-GROUPS

Cargo Traffic, Port Capacity, Investment requirements and review of processes and operation in the Port sector: Chair: Shri Rakesh Srivastava, Joint Secretary (Ports), Ministry of Shipping. Shri Arvind Kumar, Adviser (TR), Transport Research Wing, Dr.ArchanaMathur, Economic Adviser, Ministry of Petroleum and Natural Gas, Shri A. Janardhan Rao, Managing Director, Indian Ports Association, Representative of Ministry of Power, Shri R.Kishore, President , Indian Private Ports & Terminal operators Association, CEO & Director, Vizag Seaport Pvt Ltd., Capt.S.C.Mathur, Chief Nautical Officer, Gujarat Maritime Board, Shri Jatin Sarkar,General Manager (Economics & Transport),RITES, Shri M.M.Hasija, Adviser (Statistics)-Convenor, Ministry of . Road Transport & Highways, Transport Research Wing

Rail Road Connectivity with Ports to look into current status of Port Connectivity, contain-

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er/freight traffic flows and future connectivity requirements. Chair: Additional Member (Planning), Railway Board. Shri S.K. Puri, Additional Director General (Roads), Ministry of Road Transport & Highways, Shri Anil K. Gupta, Managing Director, Container Corporation of India, Shri A. Janardhan Rao, Managing Director, Indian Ports Association, Shri B. Poiyaamozhi DA (Ports) –Convenor, Ministry of Shipping.

Data: Chair: Shri Arvind Kumar, Adviser (TR), Transport Research Wing. Shri A. Janardhan Rao, Managing Director, Indian Ports Association, Shri Suresh Kumar Kantholy, General Manager (ODC), Crimson Logic India Pvt.Ltd, Shri J.Murgadas, GM(ERP), Shipping Corporation of India Ltd., Shri M.M.Hasija, Adviser (Statistics)-Convenor, Ministry of Road Transport & Highways, Transport Research Wing

R&D and Technology evolution in Shipping, energy requirements and initiatives to put the shipping sector on a sustainable low carbon path and promote energy efficiency, emission reduction and environment protection: Chair: Prof. S.C.Mishra, Director, National Ship Design & Research Centre (NSDRC). Shri Suresh Kumar, Chief Ship Surveyor, DG, Shipping, Mumbai, Shri J.V.S. Rao, Executive Director, Shipping Corporation of India (SCI), Shri D.J.Basu, Deputy Director, Development Adviser Ports Wing-Convenor, Ministry of Shipping

IT to examine broad areas of IT investment and interface with users: Chair: Shri Janardhan Rao, MD, IPA. Shri J.Murgadas, GM(ERP), Shipping Corporation of India Ltd., Shri Suresh Kumar Kantholy, General Manager (ODC), Crimson Logic India Pvt. Ltd, Shri Rajiev Puri, Deputy Director, IPA –Convenor

Existing framework of PPP, Private financing and bench marking of Indian Shipping and Port operations/practices and efficiency parameters. Chair: Shri Thomas Netzer, Director, Mckinsey & Company Inc. Shri Pradeep Roy, Prof G. Raghuram, Indian Institute of Management, Ahmedabad, Shri A. Janardhan Rao, Managing Director, Indian Ports Association, Smt. Geetu Joshi, Director, Ministry of Shipping, Shri C.S. Venkatraman, Secretary, TAMP-Convenor, Tariff Authority For Major Ports

Status of shipping and requirement, review of processes and operation in shipping, human resource requirement of the maritime sector and related policy issues and regulations: Chair: Dr. S.B. Agnihotri, DG(Shipping), Directorate General of Shipping. Shri S. Hajara, Chairman & Managing Director, The Shipping Corporation of India Ltd, Director General Foreign Trade, Ministry of Commerce, Shri Arvind Kumar, Adviser (TR), Transport Research Wing, Shri Jimmy Sarbh, Sarbh Consultancy, Mr. Krishna Kotak, G.M. Bakshi & Co. Sapt Building, Shri Mark S. Fernandes, Chairman, Shipping & Aviation Committee, Indian Merchant Chamber, Shri Bharat Seth, Chairman, Great Eastern Shipping Company, Shri V.K.Sharma, Chief Controller Chartering, Ministry of Shipping, Shri C. Rathina Das, Deputy Director General, DG Shipping, Directorate General of Shipping –Convenor.

Inland Waterways to look into status, growth in cargo traffic and its composition, future scenario; infrastructure; technical and regulatory issues related to its operation and potential. Chair: Smt Bhupendra Prasad, Chairperson, Inland Water Authority of India (IWAI). Shri Sunil Kumar, Vice Chairman,IWAI-Convenor, Inland Waterways Authority of India, Shri Jimmy Sarbh, Sarbh Consultancy, Shri Krishna Kotak, G.M. Bakshi & Co., Shri Suresh Kumar, Chief Ship Surveyor, DG, Shipping, Mumbai, Shri G.S.Bhalla, Sr Vice President, The Shipping Corporation of India Ltd

5. URBAN TRANSPORT

WORKING GROUP

Chair: Dr. Sudhir Krishna, Secretary, Ministry of Urban Development, Government of India. Shri B. N. Puri, Member Secretary, NTDPC, Planning Commission, Shri R. Gopalan, Secretary, Deptt. of Financial Services, Shri Manu Kumar Srivastava, Principal Secretary, Urban Development, Govt. of Maharastra, Shri Rajiv Chaudhry, Executive Director (WP), Ministry of Railway, Shri P. S. Kharola, Commissioner, Department of Commercial Taxes, Karnataka, Shri S. Sunder, Distinguished Fellow, The Energy and Resource Institute (TERI), Shri B.I. Singal, Director General, IUT, Prof. Dinesh Mohan, Transportation Research & Injury Prevention Programme (TRIPP), Indian Institute of Technology, New Delhi, Prof. Sudhir Chella Rajan, Department of Civil Engineering, India Institute of Technology, New Delhi, Prof. CSRK Prasad, Head Transport Division, NIT, Warangal (AP), Prof. Geetam Tiwari, Associate professor – TRIPP, Indian Institute of Technology, New Delhi, Prof. H. M. Shivanand Swamy, Professor and Associate Director, Centre for Environmental Planning & Technology (CEPT) University, Ahmedabad, Dr. Ashwin Mahesh, Indian Institute of Management, Bengaluru, Shri S. N. Sahai, MD & Chief Executive Officer, DIMMTS Ltd., Shri K. Ramchand, Director, M/s ILFS, Shri Vinayak Chatterjee, MD & CEO, M/s Feedback Ventures, Shri Ajai Mathur, MD, UMTC, Shri C. N. Raghupati, Vice President, M/s Infosys, Shri. S. K. Lohia, Convenor, OSD (UT) and EO Joint Secretary, Ministry of Urban Development, Government of India

SUB-GROUPS

Need Assessment: Prof. Shivanand Swamy, CEPT, Shri S.Sunder, TERI, Prof. Dinesh Mohan, IIT Delhi,

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Prof. Geetam Tiwari, IIT Delhi, Shri Ajai Mathur, MD, Urban Mass Transit Company, Prof. C.S.R.K Prasad, NIT, Warangal, and Prof. Sudhir Chella Rajan, IIT, Madras.

Financing mechanism for UT needs: Shri Vinayak Chatterjee, MD, M/s Feed Back Ventures, Shri K. Ramachandaran, MD, ITNL, Shri S.N. Sahai, MD, DIMTS, Prof. Shivanad Swamy, CEPT, Ahemdabad, and Shri P.S.Kharola, Commissioner, DoCT, Bangalore.

Energy & Environment: Shri S.Sunder, TERI, Prof. Sudhir Chella Rajan, IIT, Madras.

Capacity Building: Prof. Ashwin Mahesh, IIM, Bangalore, Prof. Dinesh Mohan, IIT, Delhi, Prof.C.S.R.K Prasad, NIT, Warangal, and Prof. Ashwin Mahesh, IIM, Bangalore.

IT Applications: Prof. Ashwin Mahesh, IIM, Bangalore, Shri C.N.Raghupathi, Infosys, Prof. R. Shivanandan, IIT, Madras, and Shri S.N.Sahai, MD, DIMTS.

Accessibility, Safety & Security. Prof. Geetam Tiwari, IIT, Delhi, Shri B.I.Singal, DG, IUT, Prof. C.S.R.K Prasad, NIT, Warangal, Prof. Dinesh Mohan, IIT Delhi, and Shri E. Sreedharan, MD, DMRCL.

Institutional Framework: Shri S. Sunder, TERI, Shri Ajai Mathur, MD, UMTC, Shri S. N. Sahai, MD, DIMTS, Prof. Shivanand, CEPT, Ahemdabad, and Shri P. S. Kharola, Commissioner, DoCT, Bangalore.

6. NORTH EAST

WORKING GROUP

Chair: Shri Vivek Sahai, former Chairman, Railway Board. Chairman, Inland Waterways Authority of India, Director General (Roads), Ministry of Road Transport and Highways, Lt. Gen. M.C. Badhani, VSM, DG, BRO, Shri Rohit Nandan, Joint Secretary, Ministry of Civil Aviation, Shri Harsh Vardhan Shringla, Joint Secretary (BSM), Ministry of External Affairs, Executive Director (Projects), Rail way Board, Prof. Mahendra P. Lama, Vice Chancellor, University of Sikkim, Shri U.K. Sangma, Secretary, North Eastern Council, Dr. Manoj Singh, Advisor, Transport, Planning Commission, Representative of Central Board of Excise and Customs, Representative of Asian Institute of Transport Development

7. INTEGRATED STRATEGY FOR BULK TRANSPORT OF ENERGY AND RELATED COMMODITIES IN INDIA

WORKING GROUP

Chair: Shri P. Uma Shankar, Secretary, Ministry of Power. Shri Pradeep Bhatnagar, Additional Member (Traffic), Railway Board, Shri H.D. Gujarati, Executive Director, Railway Board, Shri Shailesh Kumar Singh, Joint Secretary, Ministry of Coal, Shri Arvind Kumar, Economic Advisor, Ministry of Shipping, Shri Udai Pratap Singh, Joint Secretary, Ministry of Steel, Dr. (Ms) Archana S. Mathur, Economic Advisor, Ministry of Petroleum and Natural Gas, Shri Nitin Gokarn, Joint Secretary, Ministry of Road Transport and Highways, Dr. Nalini Bhat, Advisor, Ministry of Environment and Forests, Shri Manoj Ahuja, Principal Secretary, State Government of Orissa, Shri S. Bhattacharya, Principal Secretary, State Government of Andhra Pradesh, Shri Navneet Sehgal, Principal Secretary, State Government of Uttar Pradesh, Ms Neerja Mathur, Chief Engineer, Central Electricity Authority, Shri Harry Dhaul, DG, IPPAI, Shri S S Ramgarhia, Director, Petrofed, Shri Dileep Bhat, President, Jindal Steel Ltd, Shri Major Singh, CEA, Dr. Anupam Khanna, Principal Advisor, NTDPC, Convener and Shri Sudhir Kumar, Joint Secretary, Ministry of Power, Co-Convener.

SUB-GROUPS

Demand Scenarios: Chair: Shri Major Singh, Chief Engineer. Shri D.N. Prasad, Director, Ministry of Coal, Shri Sukhvir Singh, Director, Ministry of Petroleum & Natural Gas, Shri A.S. Firoz, Chief Economist, ERU, Ministry of Steel, Shri Rama Rao, Director, GRID, Govt. of Andhra Pradesh, Shri S.K. Agarwal, Director Finance, Department of Energy Government of Uttar Pradesh, Dr. Ritu Mathur, Associate Director, Modelling & Economic Analysis Division, The Energy and Resources Institute (TERI), Shri Bibhu Biswal, Independent Power Producers Association of India (IPPAI), Dr. Anoop Singh, Associate Professor, Energy, Infra. & Finance, IIT Kanpur, Shri Vikas Singhal, Head-Power & Fuel, ICF International.

Location of Production Facilities & Transfer Sites: Chair; Ms. Neerja Mathur, Chief Engineer, IRP Division, Central Electricity Authority. Shri D.N. Prasad, Director, Ministry of Coal, Shri N.R. Dash, Director, Ministry of Steel, Shri Arvind Kumar, Adviser (Transport), IDA Building, Shri P.L. Ahujarai, Director (PLA), Ministry of Environment & Forests, Shri Raghavendra Upadhyay, Senior Vice President, Independent Power Producers Association of India (IPPAI), Shri S.K. Chand, Senior Fellow, The Energy and Resources Institute (TERI), Dr. Anoop Singh, Associate Professor, Energy, Infra. & Finance, IIT Kanpur, Shri A.K. Varshney, Director, P&C (Parliament work), Ministry of New and Renewable Energy, Shri Vikas Singhal, Head-Power & Fuel, ICF International

Optimizing Fuel and Electricity Delivery System Networks: Chair: Shri Ranjan Jain, Adviser (Infrastructure), Railway Board, Ministry of Railways. Shri M.M. Hasija, Adviser (Transport), Ministry of Shipping, Shri Nitin Gokaran, Joint Secretary, Transport Bhawan, Ministry of Road Transport & Highways, Shri Manoj Ahuja, Commissioner–cum-Secretary, Department of Steel & Mines, Government of Orissa, Shri D.J. Pandian, Principal Secretary, Energy, Government of Gujarat, Shri Ramesh Kumar Khanna, Principal Secretary, Department of Energy, Government of Tamil Nadu, Shri Pradeep

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Jindal, Director, System Planning & Project Appraisal, Central Electricity Authority, Shri D.N. Prasad. Director, Ministry of Coal, Professor Yogesh K. Agarwal, Chairman, Decision Science, IIM Lucknow, Shri Vikas Singhal, Head-Power & Fuel, ICF International

Oil & Gas Pipelines & Terminals: Chair: Shri Vivek Kumar, Joint Secrtetary, Ministry of Petroleum & Natural Gas. Shri M.M. Hasija, Adviser (Transport), Ministry of Shipping, Shri Ajay Mishra, Pr. Secretary, Infrastructure & Investment Department, Government of Andhra Pradesh, Shri Anil Jain, Special Commissioner, Government of Madhya Pradesh, Shri Sukhbir Singh, Director, Ministry of Petroleum & Natural Gas, Shri S.P. Gupta, Director (Finance)/(I/C), Petroleum Planning & Analysis Cell (PPAC), Ministry of Petroleum & Natural Gas, Government of India, Prof. Priyadarshi Shukla, IIM, Ahmedabad, Shri P.K. Pal, Executive Director (Project Development), GAIL India Limited, Shri Rakesh Jain, Associate Director, Feedback Infrastructure Services Private Limited, Shri P. Raghvendran, Reliance Industries Limited, Shri S.N. Sukhwal, Deputy General Manager (Corporate Planning & Economic Studies), Shri Rahul Gautam, Dy. General Manager (Project Development), GAIL India Limited, Shri S.K. Jha, Chief Projects Manager (System), Pipelines, Shri Prabal Ghosh, Research Analyst, Integrated Research and Action for Development (IRADe)

Material Transport Needs of the Iron & Steel Industry: Chair: Shri Udai Pratap Singh, Joint Secretary, Ministry of Steel. Sanjay Misra, Adviser (Transport & Economics), RITES, Shri Arvind Kumar, Adviser (Transport), Ministry of Road Transport and Highways, Shri D.N. Prasad. Director, Ministry of Coal, Shri Dileep Bhatt, President, Corporate Affairs, Jindal Steel Limited, Shri Chanakya Choudhary, Tata Steel

ANNEX P.4

WORLD BANK TECHNICAL ASSISTANCE

1. LIST OF PAPERS SUBMITTED BY THE WORLD BANK

Railways (Mr. Paul Amos):

Summary Paper on Railways

1. Freight Railways Governance, Organizations and Management: An International Round-up
2. Passenger Railway Institutions and Financing: China, Germany, Japan and Russian Federation

Highways (Mr. Clell Harral)

Summary Paper on Highways by Kumares C. Sinha and Samuel Labi (Purdue University) and Clell Harral (Harral Winner Thomson Sharp Klein, Inc.)

1. Road Asset Management by Clell Harral, Graham Smith and William D.O.Paterson.
2. Government Policies to Encourage Energy-Efficient Vehicles on Roads by Kumares C. Sinha, Mohammad H. Arman, and Samuel Labi
3. Cost-Effective Standards for Different Types of Roads by Kumares C. Sinha, Samuel Labi and Menna Noureldin.
4. Intelligent Transportation Systems: Kumares C. Sinha, Samuel Labi, and Eleni Bardaka
5. Institutional and Regulatory Frameworks for Free Movement of Commercial Highway Vehicles Across States/Provinces by Kumares C. Sinha, Samuel Labi, and Bismark R.D.K. Agbelie
6. Traffic-Based Benchmarks for Widening Of National Highways versus Construction of Expressways by Kumares C. Sinha, Samuel Labi, and Qiang Bai
7. Direct Charging Mechanisms for Highway Use by Kumares C. Sinha, Samuel Labi, and Mohammad Arman
8. National Transportation Planning: Lessons from the U.S. Interstate Highways by Marlon G. Boarnet, Departments of Planning Policy, and Design and Economics, University of California, Irvine, and School of Policy, Planning, and Development, University of Southern California
9. Improving Road Safety Performance: Lessons From International Experience by Tony Bliss and Jeanne Breen
10. PPP in Transport: An Evaluation And Lessons From Twenty Years Of Experience-by Jose Luis Guasch

Ports & Shipping (Mr. Marten van den Bossche):

1. India Port Sector Policy Review Study: Policy papers, case study and capita selecta draft report by Marten van den Bossche , Eric van Drunen , Katrien Dusseldorp , Johan Gille and Hans Vogelaar

Urban Transport (Mr. Ken Gwilliam)

Summary Paper on Urban Transport

1. Overview Paper-The Issues for India
2. Financing Urban Transport
3. Costs of Externalities
4. Energy Efficiency in Urban transport
5. Developing public transport
6. Institutions for urban transport
7. Intelligent Transport Systems-Applications in urban areas
8. Case Studies in Urban Transport Development

2. DETAILS OF INTERNATIONAL CONFERENCES

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February 6-8, 2012: Practitioners' Workshop: National Transport Development Policy Committee (NTDPC)

Monday, February 6, 2012

8:30-9:30 Registration & Coffee

Plenary Session:
Chair: Dr. Rakesh Mohan, Chairman, NTDPC

9:30-9:45	Opening remarks Dr. Rakesh Mohan, Chairman, NTDPC
9:45-10:00	Welcome address Mr. Hubert Nove Josserand, Operations Adviser, World Bank
10:00-10:20	Key Note Speaker : Developing Sustainable Transport Infrastructure in India Mr. B. K. Chaturvedi, Member, Planning Commission
10:20-10:50	Overview of Integrated Transportation Planning - EU TENt experience Mr. Mathew Arndt, Head of Division of Road and Rail, European Investment Bank
10:50-11:00	Vote of Thanks Mr. B. N. Puri, Member Secretary, NTDPC
11:00-11:30	Coffee Break

Session on Highways, PPPs and Safety:
Chair: Mr. S. Sundar, Member, NTDPC, Co-Chair: Mr. D.P. Gupta, Member NTDPC,
Facilitator: Dr. Kumaresh C. Sinha and Mr. Anil Bhandari

11:30-12:30	Presentation on Highways: International Lessons and comment on the resource papers presented by the Bank Mr. Nazir Alli, CEO, South Africa National Road Agency Limited & Mr. William Dachs, Ex Head of PPP Unit, National Treasury, South Africa
12:30-1:30	Lunch Break
1:30- 1:45	Highlighting the key issues relevant for long term planning in the highway sector India – presentation by the Bank Consultants Dr. Kumares C. Sinha, Director, Joint Transportation Research Program of Purdue University and the Indiana Department of Transportation & Mr. Anil Bhandari, Ex Highway Advisor, World Bank
1:45-1:55	Highlighting the key issues relevant for Road safety in India – presentation by the Bank Consultant Mr. Tony Bliss, Ex Lead Road Safety Specialist, The World Bank
1:55-2:05	Highlighting the Key Aspects of Regulatory Framework for Developing Highway Infrastructure through PPPs in India – presentation by the Bank Consultant/Staff Mr. Jose Louis Guasch, Senior Regional Adviser in the LAC region, The World Bank
2:05-4:30	Open Forum – Discussion on Key Issues in the Highway Sector Session (Moderated by the Chair)

Tuesday, February 7, 2012

Session on Urban Transport
Chair: Secretary, Urban Development Ministry, Co-Chair: Prof. Dinesh Mohan, Member, NTDPC, Facilitator: Mr. Ken Gwilliam

9:30-9:50	Key Note Speaker: Issues and Challenges in Urban Transport Sector in India Mr. Arun Maira, Member, Planning Commission
9:50 – 10:30	Presentation on Urban Transport International Lessons and comment on the resource papers presented by the Bank Mr. Dayo Mobereola, Director, Lagos Metropolitan Transport Authority, Nigeria
10:30 – 11:00	Presentation on Urban Transport International Perspectives Mr. F.Q. Partida, Project Manager, Mass Transport, National Development Bank of Infrastructure, Mexico
11:00-11:15	Highlighting the key issues relevant for long term planning for the urban transport sector India – presentation by the Bank Consultant Mr. Kenneth Gwilliam, Visiting Professor at the Institute for Transport Studies, University of Leeds
11:15-11:30	Coffee Break
11:30-1:00	Open Forum – Discussion on Key Issues in the Urban Transport Sector Session (Moderated by the Chair)
1:00-2:00	Lunch Break

Session on Railways
Chair: Chairman, Railway Board, Co-Chair: Mr. M. Ravindra, Member NTDPC,
Facilitator: Mr. Paul Amos

2:00-3:00	Presentation on Passenger and Freight Railways: International Experience and comment on the resource papers presented by the Bank Mr. John Thomas, Rail Regulation Specialist, Arcadia, United Kingdom
3:00 – 3:15	Highlighting the key issues relevant for long term planning in India – Freight and Passenger Railways - Presentation by the Bank Consultant Mr. Paul Amos, Consultant to the World Bank
3:15-3:30	Coffee Break

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3:30-5:00 Open Forum – Discussion on Key Issues in the Railway Sector
Session (Moderated by the Chair)
5:30 onwards Informal Reception

Wednesday, February 8, 2012
Session on Ports
Chair: Ms. Rani Jadhav, Chairperson, TAMP, Co-Chair: Mr. K. L. Thapar, Member NTDPC, Facilitator: Mr. Marten Van Der Bossche

9:30-10:15 Presentation on Port Regulation – International perspective
Mr. Christiaan Van Krimpen, International Legal Counsel
10:15 – 10:45 Presentation on Ports: International Perspective on long term Port Planning
Mr. John DM Koppies, Koppies and Stevens BV, Nederland
10:45-11:00 Highlighting the key issues relevant for long term Port planning in India – Presentation by the Bank Consultant
Mr. Marten Van Der Bossche, Chairman, ECORYS, Nederland
11:00-11:30 Coffee Break
11:30-1:00 Open Forum – Discussion on Key Issues in the Port Sector
Session (Moderated by the Chair)
1:00-2:00 Lunch Break

Session on Intermodal transport and Concluding Session
Chair: Dr. Rakesh Mohan, Chairman, NTDPC

2:00-2:45 Presentation on Intermodal Coordination: International Best Practices
Mr. Stephen Perkins, Head of Research Centre, International Transport Forum (ITF)
2:45- 3:30 Presentation on Intermodal-Coordination, US Experience
Mr. Rakesh Tripathi, Director of Transportation Planning, Texas DOT, USA
3:30-4:30 Presentation of Key findings from the workshop and Way Forward -
Dr. Rakesh Mohan, Chairman, NTDPC
Mr. Ben L. J. Eijbergen, Lead Transport Specialist, World Bank
Members/Member Secretary, NTDPC
4:30-4:45 Concluding Remarks
Mr. Montek Singh Ahluwalia, Deputy Chairman, Planning Commission

June 15, 2012
Workshop on "Developing Integrated Strategy for Bulk Transport of Energy and other Key Commodities in India": National Transport Development Policy Committee (NTDPC)
Venue: Multi-Purpose Room, India International Centre (Main)
Agenda

Friday, June 15, 2012

9:00-9:30 Registration & Coffee
Plenary Session:
Chair: Mr P. Uma Shankar, Secretary , Ministry of Power

9:30-9:45 Opening remarks
Mr. P. Uma Shankar, Secretary, Ministry of Power
9:45 – 10:00 Welcome address
Mr. Hubert NoveJosserand, Operations Adviser, World Bank
10:00-10:45 Setting the Context – Medium- and Long-Term Issues in Transport of Energy &Bulk Commodities in India
Dr. Anupam Khanna, Chief Economist, NASSCOM and Convener, Working Group on Bulk Transport, NTDPC
10:45-11:00 Coffee Break

Session on International Experiences in Integrated Transportation Planning for Bulk Commodities - I:
Chair: Mr S.K. Srivastava, Secretary, Ministry of Coal; Discussant: Mr Ranjan Jain, Advisor (Infrastructure), Railway Board

11:00-11:45 Presentation on International Lessons in Bulk Transport of Energy and Related Commodities from the United Kingdom
11:45-12:00 Questions & Answers
Mr. Paul McMahon, Office of Rail Regulation, UK
12:00-12:45 Presentation on International Comparison of Bulk Transport by Rail
Questions & Answers
12:45- 1:00 Mr. Ralph Jahncke, Chairman, Trancare AG, Germany
1:00-2:00 Lunch Break

Session on International Experiences in Integrated Transportation Planning for Bulk Commodities - II:
Chair: Mr. A.S. Bakshi, Chairman, Central Electricity Authority; Discussant: Mr H.D. Gujrati, Executive Director (TTS), Railway Board

2:00-2:45 Presentation on International Lessons in Bulk Transport of Energy and Related Commodities from China
2:45-3:0 Questions & Answers
Dr. Zhaoguang Hu, Vice President, State Grid Energy Research Institute, Republic of China
3:00-3:15 Coffee Break (During Session)
3.15-4.00 Presentation on Lessons for India from Other Major Coal Transporting Countries
Questions & Answers
4.00-4.15 Mr. Ralph Jahncke, Chairman, Trancare AG, Germany

Concluding Session:
Chair: Dr Rakesh Mohan, Chairman, NTDPC

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NTDPC - South-South tour to South Africa				
Schedule - March 19 to March 28, 2012				
Time	**Official/Dept. to be met**	**Team**	**Venue**	
Monday March 19, 2012				
	Fly to Addis from New Delhi by Ethiopian Airlines ET 689, leaving 0245 AM, Reaching Johannesburg at 13:20 PM, stay in **Sheraton Pretoria Hotel**			
Tiesday March 20,				
3:00 PM	Meeting with Deputy Minster, Minstry of Transport	Indian Delegation	Minstry of Transport, Pretoria	
7:00 PM	Dinner Hosted by SANRAL			
Wednesday, March 21, 2012				
9:00 AM	Meeting with SANRAL Management Team	Indian Delegation	SANRAL Office, Johannesburg	
11:00 AM	Visit to SANRAL Overload Control Center	Indian Delegation	SANRAL Overload Control Center	
12:30 PM	SANRAL multi-lane toll system and ITS , Working	Indian Delegation	SANRAL Central Corridor Station	
4:00 PM	Back to Pretoria			
Thursday, March 22, 2012				
7:00 AM	Travel to Expressway N4, proceed to Malelane and visit Kruger National Park, stay the night in Nelspruit **Leaveslodge Hotel**			
Friday, March 23, 2012				
8:00 AM	Meet CEO MCLI (and officials from	Indian Delegation	MCLI office, Nelspruit	
9:00 AM	Proceed to Maputo, Working Lunch	Indian Delegation		
3:00 PM	Return to Nelspruit	Indian Delegation	Stay the night in Nelspruit in **Leaveslodge Hotel**	
Saturday, March 24, 2012				
	Return to Johannesburg by Road, Fly to Capetown by SA 347, stay in **Taj Hotel Cape Town** , departure 15:05 PM, Arrival in CT 1715			
Sunday, March 25, 2012				
Monday, March 26,				
9:00 AM	Meeting with CEO, Port Regulator	Indian Delegation		
11:00 AM	Visit to cape Town Port	Indian Delegation		
Tuesday, March 27, 2012				
	Fly to Johannesburg by SA 316 Departing from Capetown at 08:50 a.m., arriving in Johannesburg at 10:50			
	Fly to New Delhi via Addis, ET 808, departing J'burg 14: 20 PM			
Wednesday, March 28, 2012				
	Arriving in Delhi at 9:10 AM			

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ANNEX P.6

LIST OF PARTICIPANTS AT CONSULTATIONS WITH STATE GOVERNMENTS

1. State Consultation at Patna on October 8 - 9, 2012

Name of the Officer	Designation	Ministry/Department/ Organisation
NTDPC		
Shri K.L. Thapar	Member	NTDPC
Shri D.P. Gupta	Member	NTDPC
Shri B.N. Puri	Member Secretary	NTDPC
Shri M.M. Hasija	Adviser	Ministry of Shipping
Shri Shri R.K. Pandey	Chief Engineer	Ministry of Road Transport & Highways
Shri Davendra Singh	Director	Ministry of Railways
Shri Dipankar Khasnabish		Infosys
Dr. Krishna Dev	Consultant	NTDPC
Ms. Shruti Jain	Consultant	NTDPC
Government of Bihar		
Shri Vrishin Patel	Hon'ble Transport Minister	
Shri R.K. Mahajan	Pr. Secretary, Transport	Govt. of Bihar
Shri Pratyaya Amrit	Secretary	Road Construction Deptt., Bihar
Shri Udai Kumawat	Administrator	BSRTC
Shri N.P. Yadav	Joint Secretary	Transport Department, Patna
Md. Reyazuddin	Executive Engineer	BRRDA, Rural Works Department, Bihar, Patna
Shri Chandra Shekhar		Road Construction Deptt., Bihar
Shri Babban Ram		Road Deptt., Bihar
Dr. Neena Jha	ADPRO	Govt. of Bihar, Patna
Government of Chhattisgarh		
Shri Sanjay Singh	Jt. Tpt. Commissioner	Chhattisgarh, Raipur
Government of Jharkhand		
Shri A.K. Sinha	Secretary to Transport Commissioner	
C.B. Sahu	Programme-cum	
Government of Odisha		
Shri S. Mahapatra	Commissioner & Spl. Secretary, C&T Deptt.	
Ministry of Railways		
Shri Neeraj Ambastha	Chief Transport Planning Manager	
Ministry of Civil Aviation		
Shri Arvind Dubey	Director, AAI	
Ministry of Shipping		
Shri Gurmukh Singh	Director	IWAI, Patna
Shri K.K. Sahoo		IWAI, Patna
Urban Development Department, Bihar		
Shri S. Siddharth	Secretary	Urban Development Department
hri A.K. Singh	Joint Secretary	UD &HD
Stakeholders from State of Bihar		
Shri T.K. Sinha	Hony. Secretary	Automobile Association of Eastern India, Patna
Shri Anand K. Sinha	Hony. Joint Secretary	-do-
Shri Amit Mukherjee	Member	-do-
Shri Jagannath Singh		Bihar Motor Transport Federation, Patna
Shri Dhirendra Bhati		Bihar Motor Transport Federation, Patna
Shri Prabhat P. Ghosh	Director	Asian Development Research Institute, Patna
Shri Bhanu Shekhar Prasad Singh	President	Bihar Truck Owner's Association, Patna
Shri Shashi Shekhar	Member	-do-
Shri Arun Kumar	Principal	NINI (IWAI)
Shri Uday Shankar Singh	President	-do-
Shri Irfan Alam	Founder	Sammaan Foundation

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2. State Consultation at Mumbai on February 4 - 5, 2013

Name of the Officer	Designation	Ministry/Department/ Organisation
NTDPC		
Shri B.N. Puri	Member Secretary	NTDPC
Shri D.P. Gupta	Member	NTDPC
Shri Vivek Sahai	Member	
Shri Cyrus Guzdar	Member	NTDPC
Shri SK Lohia	OSD (UT)	M/o Urban Development
Shri M.M. Hasija	Adviser	Ministry of Shipping
Shri Anil Devli	CEO	INSA
Shri Kripakaran		Infosys
Dr. Krishna Dev	Consultant	NTDPC
Shri Honey Gupta	Consultant	NTDPC
Government of Maharashtra		
Shri Gulabrao Deokar	Hon'ble Transport Minister	
Shri JK Banthia	Chief Secretary	Government of Maharashtra
Dr. SK Sharma	Pr. Transport Secretary	Government of Maharashtra
Shri VN More	Transport Commissioner	Government of Maharashtra
Ms. K Vijaya Laxmi	Addl. Chief	MMRDA
Government of Madhya Pradesh		
1. Shri Anthony Desa	Addl. Chief Secretary	Government of MP
4. Government of Goa		
1. Shri Arun Desai	Director (Transport)	
Government of Gujarat		
1. Shri JP Gupta	Transport Commissioner	
UT of Dadra & Nagar Haveli and Daman & Diu		
1. Shri KT Parmar	Assistant Director, Transport	
Stakeholders from State of Maharashtra		
1. Shri Nitin Dossa	Executive Chairman	Western India Automobile Association
2. Shri Shirish Deshpande	President	Mumbai Grahak Panchayat
3. Shri Malkit Singh Bal	President	All India Motor Transport Congress
4. Shri Shashank Rao	President	Mumbai Autorickshawmens Union
5. Shri AL Quadros	General Secretary	Mumbai Taximen's Union
6. Shri Anil Garg	President	Bus Owners Association
7. Shri Prem Singh	President	Mumbai Taxi Association
8. Shri Ashok Datar	Chairman	Mumbai Environment Social Network
9. Shri Akshay Mani	Project Manager, Urban Transport	Embarq India
10. Shri Madhav Pai	Director	Embarq India
11. Shri Bhavesh Patel		Manavata
12. Shri Shailesh Goyal	Member Zonal Railway	
13. Shri Sudhir Badami	Transport Consultant	
14. Shri Daljeet Singh	President	Maharashtra Transporter's Welfare Association
15. Shri DS Naik	Secretary	School Bus Owner Association
16. Brahma Kumaris	Transport & Travel Wing	Brahma Kumaris

3. State Consultation at UT of Chandigarh on May 27, 2013

NTDPC		
Shri K.L. Thapar	Member	NTDPC
Shri B.N. Puri	Member Secretary	NTDPC
Shri D.P. Gupta	Member	NTDPC
Shri M.M. Hasija	Adviser	Ministry of Shipping
Shri OP Shemar	Adviser	M/o Road Transport & Highways
Shri Devendra Singh	Ed/Planning	Ministry of Railways
Dr. Krishna Dev	Consultant	NTDPC
Shri Honey Gupta	Consultant	NTDPC

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Name of the Officer	Designation	Ministry/Department/ Organisation
Government of UT of Chandigarh		
Shri Ajoy Sharma	Special Secretary (Tpt.)	Govt. of Chandigarh
2. Shri MM Sabharwal	Joint Secy. (Transport)	Govt. of Chandigarh
3. Shri Balbir Singh Dhol	Secy, STA	Govt. of Chandigarh
4. Shri Sanjay Gaur	Executive Engg.	M/oRT&H Regional Office, Chandigarh
5. Shri Mahesh Kumar	EIC, PW(B&R)	Govt. of Chandigarh
6. Shri SP Parmar	GM, CTU, Chd	Govt. of Chandigarh
Government of Haryana		
1. Shri Bhupendra Singh	Addl. Transport Commissioner	Govt. of Haryana
2. Shri NK Garg	Chief Engg,	ULB, Govt. of Haryana
3. Shri AK Bhardwaj	DSP Traffic, Highways (Karnal)	Govt. of Haryana
4. Shri Rakesh Sharma	Traffic & Highways, Karnal	Govt. of Haryana
5. Shri Gurmeet Singh		Govt. of Haryana
6. Shri Mandeep		Govt. of Haryana
7. Shri Jitender Singh	Sr. Town Planner	T&CP Deptt., Govt. of Haryana
8. Dr. Parveen K. Garg	Director, Health Service	Govt. of Haryana
9. Shri Deepak Bhardwaj	Chief Ground Instructor (HICA)	Haryana Institute of Civil Aviation
10. Capt. Kamal Kishor	Executive Director	Haryana Institute of Civil Aviation
11. Shri Naresh Kumar	Admn. Officer	Haryana Institute of Civil Aviation
12. Shri SB Boora	CE,	PWD, Govt. of Haryana
13. Shri Satish Kumar Ruhil	Jt. State Transport Controller	State Tpt., Haryana
Government of Himachal Pradesh		
1. Ms. Shubhra Tiwari	Addl. Secy. (Transport)	Govt. of Himachal Pradesh
Government of Jammu and Kashmir		
1. Shri MM Kakroo, IAS	Secretary, Transport	Govt. of J&K
2. Shri JS Tandon	MD, J&K SRTC	Govt. of J&K
Government of Punjab		
1. Shri A. Venu Prasad	Secretary, Civil Aviation, Punjab	Govt. of Punjab
2. Shri Amarpal Singh	Addl. Secretary, Transport	Govt. of Punjab
3. Shri Harmail Singh	Addl State Tpt Commissioner	Govt. of Punjab

4. State Consultation at Jaipur, Rajasthan on August 1, 2013

NTDPC		
Shri K.L. Thapar	Member	NTDPC
Shri B.N. Puri	Member Secretary	NTDPC
Shri S Sundar	Member	NTDPC
Shri DP Gupta	Member	NTDPC
Prof Dinesh Mohan	Member	NTDPC
Dr. Krishna Dev	Consultant	NTDPC
Shri Honey Gupta	Consultant	NTDPC
Shri Kripakaran		Infosys
Government of Delhi		
Shri Raj Kumar Singh	Addl Transport Commissioner	Govt of Delhi
Government of Rajasthan		
Shri RP Khandelwal	Secretary,	PWD
Shri Naresh Pal Gangwar	CMD	RSRTC
Shri GL Rao	CE (R)	PWD
Shri GP Meena	CTPM/NWR	Railways
Shri SP Mishra	Addl Transport Commissioner	Govt of Rajasthan
Shri JC Mohanty	Pr Secretary	PWD
Shri Viswas Jain	MD, CEG	
Shri Vishram Meena	ED	RSRTC
Shri Mukul Raj	Addl Transport Commissioner	Govt of Rajasthan
Shri Gorrmal	PRO	Govt of Rajasthan
Dr UN Pandey	MS	RSPCB

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Name of the Officer	Designation	Ministry/Department/ Organisation
Shri RRD Kirori	CEG Limited	
Ms Preeti Mathur	OSD, JSTSL	
Ms Suchi Sharma	MD	JCTSL
Shri Suresh Singhal	FA, Transport Deptt	Govt of Rajasthan
Shri Ravindra Yadav	Dy. Transport Commissioner (Modernisation)	Govt of Rajasthan
Shri RC Yadav	Dy. Transport Commissioner (Tax)	Govt of Rajasthan
Shri Satveer Yadav	Dy. Transport Commissioner	Govt of Rajasthan
Ms Nidhi Singh	Dy. Transport Commissioner	Govt of Rajasthan
Shri DS Rathore	Addl Transport Commissioner	Govt of Rajasthan
Shri Ravindra Joshi	Addl. Transport Commissioner	Govt of Rajasthan
Government of Uttar Pradesh		
Shri BS Bhullar	Pr. Secretary, Transport	Govt. of Uttar Pradesh
Shri Rajnish Gupta	Transport Commissioner	
Government of Uttarakhand		
Shri SK Singh	Dy. Transport Commissioner	Govt of Uttrakhand

5. State Consultation at Bangalore, Karnataka on August 26, 2013

NTDPC		
Shri S Sundar	Member	NTDPC
Shri B.N. Puri	Member Secretary	NTDPC
Shri D.P. Gupta	Member	NTDPC
Shri Vivek Sahai	Former Chairman	Railway Board
Prof Dinesh Mohan	Member	NTDPC
Ms Archana Srivastava	ED/Plg/LRDSS	
Shri Raj Kumar Singh	Director (UT)	Ministry of Urban Development
Shri OP Shemar	Adviser	M/o Road Transport & Highways
Shri Devendra Singh	ED/Planning	Ministry of Railways
Dr. Krishna Dev	Consultant	NTDPC
Ms Shruti Jain	Consultant	NTDPC
Shri Dipankar Khasnabish		Infosys
Shri Kripakaran		Infosys
Shri Ramesh K Sharma	AAO	NTDPC
Government of Andhra Pradesh		
1 Shri G. Anantha Ramu	Commissioner (Transport)	Govt of Andhra Pradesh
Government of Karnataka		
Shri SV Ranganath	Chief Secretary	Govt of Karnataka
Shri Rajkumar Khatri	Pr Secretary, IDD	Govt of Karnataka
Shri SK Pavithra	Superintendent Engg.	Office of KRDCL, Bangalore
Shri B. Chandapur	Under Secretary (EAP)	PWD
Shri Shivananda	Dy Chief Engineer	BMRCL
Shri C. Jayaram	Director (Project)	BARL
Shri Shailendra Singh	Special Officer, DLLT	UDD
Ms V Manjula	Pr Secretary, Planning	Govt of Karnataka
Shri NRN Sinha	KSIDC	
Shri Anjum Parwez	MD	BMTC
Shri MB Burji	Addl Secretary	KPWD
Shri PS Kharola	MD	BMRCL
Shri Rabi Satav	PPP (E) in IDD	ADB
Shri Manivannam P	CPO	Karnataka State Highway Improvement Project
Shri SN Srivastava	CS, HMRDC	K-RIDE
Shri G. Sreedhar Rao	Consultant	K-RIDE
Shri Pon. Semhalmathan	Assistant Secretary	State Transport Authority
Government of Kerala		
Shri Alex Paul	Joint Transport Commissioner	Govt of Kerala
Government of Tamil Nadu		
Shri R Radhakrishnana	Joint Transport Commissioner	Govt of Tamil Nadu

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ANNEX P.6

CONSULTATIONS WITH THE STATE GOVERNMENTS

REGIONAL CONSULTATIONS

States have a crucial role in assuring a healthy, comprehensive, and integrated transportation system in India. Therefore, the NTDPC organized 5 state level regional meetings in Patna, Mumbai, Chandigarh, Jaipur and Bengaluru, with the objective of building a common understanding on issues, interests, and concerns and to solicit inputs from the State Governments and other stakeholders on the formulation and implementation of the policy framework.

ISSUES HIGHLIGHTED AND THE WAY FORWARD:

A Roads Transport

Current Impediments:

a) Environmental, forest & wildlife clearances: Many projects face substantial delays in receiving environmental, forest or wild life clearances and permission to cut trees.

b) Need for a Regulator: India's Roads & Highways sector needs a regulator. Current arrangements at the centre and states (MORTH, NHAI, MPRDC, PWD etc.) can result in conflict of interest as the rule making body is also the implementing body and there is no independent assessment of its performance. Key functions of the proposed regulator can include tariff setting, regulation of service quality, assessment of concessionaire claims, collection and dissemination of sector information, setting service-level benchmarks, etc..

c) Tolling Issues relating to Private Parties: Leakages in toll collections because of presence of alternate routes to various stretches is a major issue.

d) Tolling Issues relating to Users: In 6-laning projects, users are required to pay the full toll rates applicable for 4/6 lane roads even during the upgradation, despite significant deterioration in the quality of service during that time.

e) Financing of Projects: An underdeveloped bond market has forced PPP road projects to mainly depend on debt from commercial banks.

f) Land Acquisition: Land acquisition is a long-drawn out process. There is no framework that outlines the role of a state government in providing assistance to NHAI in acquiring land.

g) Lack of consolidation and preservation of road assets: Lack of regular maintenance and repair, has qualitatively impaired the road network.

h) Institutionalization of a database system: The current data collection system for the road sector on topics like the road inventory, bridge inventory, condition of roads, bridges and other structures, road cost, traffic carried and accidents etc. is mainly ad-hoc. This hampers decisions-making processes in planning for road development and its regular maintenance.

i) Inter-disciplinary coordination: There is lack of synergy between the planning authorities, implementation authorities, and authorities responsible for monitoring projects.

j) Inadequate road network coverage: The National Highways constitute only 2% of the road network of India, but carry nearly 40% of the total traffic, leading to severe congestion. Thus, freight travels only a third of the distance in India as compared to the developed countries.

k) Poor road quality: It is estimated that less than 10% of the road network is motorable. Large stretches of National Highways are two-laned which reduces their traffic-handling capacity.

l) Human resources: The construction and ongoing maintenance of Indian roads is severely limited by a shortage of skilled professionals. Hardly any ITIs or training centers impart training to workers, equipment operators and work supervisors.

The Way Forward:

a) Toll pricing: Fixation of user fees should be based on the additional benefits accruing to the users due to construction/upgradation of the infrastructure. A study should also be done to assign costs of building and maintaining roads to different types of vehicles.

The existing policy of fixation of toll rates needs to be reviewed. The policy of reduction in the rate of tolling after the recovery of capital cost for public funded projects or after the expiry of the concession period for private investment projects needs to be reviewed.

The tolling system should be standardized by using RFID based tolling for electronic toll collection and by allowing a single toll card for toll payment across major toll plazas. Electronic Toll collection (ETC) system needs to be progressively introduced.

A "Congestion Pricing" policy may be adopted for levying additional toll, especially for Heavy Goods Vehicles (HGVs), depending upon the number of axles and emission class.

b) Alternate revenue mechanisms: These include: a) advertisement rights, b) Real estate development along the Highway Corridor, c) Way side amenities, and d) fees from Right of Way (ROW) users like optical fiber, mobile towers etc.

c) Capacity Development: Enhance cross-functional understanding of implementation agencies through training and development programs; develop capacity in NHAI to raise resources, vendor management, concessionaire management and project implementation; training policy to focus on training at entry and on job site, and provide periodic refresher courses; encourage engineering and technical institutions to attract students in highway engineering profession.

d) Faster Implementation of Projects can be done by using technological solutions for real-time

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project monitoring, taking timely necessary corrective actions, faster decision making, etc.

e) Advanced Traffic Management System (ATMS) can be introduced progressively, especially on 4-lane National Highways and National Expressways, to enhance safety and comfort of road users.

f) Environmental Aspects: A rational timeline should be prescribed for processing and finalizing the various mandatory clearances. MoEF may consider enhancing the powers of its Regional Offices for granting forest clearance. Conditions for forest clearance should be standardized. Resurfacing, strengthening and widening should be allowed on the existing roads where no diversion is involved. Once approval is granted for doing surveys on an alignment, the proposal should not be rejected subsequently on other grounds.

g) Rehabilitation & Resettlement (R&R) of project affected people: A uniform R&R policy should be evolved for all types of projects, applicable both for the Central Sector and the State Sector. For green-field expressway projects a separate framework is required considering the vast socio-economic implications, land severance issues, land use changes, environmental issues etc. The project-affected people can also be involved as stake holders in such projects.

h) Consolidation and preservation of Road assets by involving the Private Sector is required. "Pavement Preservation Strategy" has to be evolved on priority. "Pavement Management System" (PMS) and "Bridge Management System" (BMS) also need to be developed.

i) Maintenance of database: An integrated Road Information System (RIS) should be established and periodically updated both at the Central and the State levels.

j) A Comprehensive Master Plan should be developed for network development of NH, SH, MDR & ODRs of 20-25 years with a nodal department for development of each component.

Barriers to Road Freight Movement

a) Multiple check points: Truck operators deal with a number of different agencies (including Sales Tax, Regional Transport Officer, and Excise) for either obtaining clearances for carrying goods or paying certain charges. These checks are generally conducted at different points resulting in more than one detention, which contributes to lower average speed and higher fuel consumption. This adversely affects inter-state road transport as compared to freight/cargo transport by the railways, aviation and even inland transport, which do not face such rigorous en route checking. This has also thwarted the formation of single common market in India.

b) Road transport sector is subject to myriad levies/taxes (both Central and State) with no provision of set-offs in many taxes/levies. These levyies/taxes include: (i) taxes on vehicle purchase, (ii) taxes on operation of motor vehicles, fuel taxes, motor parts, tyres and tubes, etc., (iii) Sales tax/VAT, (iv) Registration and Transfer fees, license/permit fees, etc. High incidence of these fees/taxes erodes the competitiveness of domestic manufactures.

Suggested Measures to Overcome Barriers in flow of Road Freight Movement

a) Integrate Tax administration with inter-State road freight and passenger movement through online communication network system at national, regional and local levels. This will help move towards border-less and paper-less movement of freight traffic across borders. Checking / verification work can be done through electronic surveillance and computerization.

b) Adopt the concept of "Green Channel", currently being implemented in Gujarat. Freight with single destination accounts for a large proportion of consignment and this proportion is likely to increase with increasing containerization. Such road cargo could be accorded "Green Channel" treatment provided necessary papers are prepared and sent to the check post in advance. Introduction of smart cards for vehicle registered ("Vahan") and driving license ("Sarathi") will be a pre-requisite. Development of National Registers for vehicles and the traders, who are frequent users of Check Posts, will also be required.

c) Adopt "Single Window Clearance System" for all authorized charges/clearances both at origin and at Check Posts. The Andhra Pradesh approach for computerization of the Inter-State Check Posts (ICPs) may be adopted. Use of a common software has ushered in a Single Window Checking Facility covering 8 major departments at 5 ICPs on National Highways (NHs) bordering adjoining States.

d) Freight agents and brokers are important actors in the trucking industry. They have now been brought under the purview of legislation, Carriage by Road Act, 2007. This provides for registration/accreditation of brokers and freight agents.

e) Abolish requirement of a transit pass.

f) Amend MV Act, removing penalty payment clause and retaining only removal excess load from the trucks. Install WIM (Weigh-in-Motion) to identify violators. The colour of truck number plate of inter-State vehicles should be different from the intra-State vehicles to help segregate goods vehicles and reduce the intermediate checking of inter-State freight movement.

Issues concerning seamless road passenger movement

a) Lack of uniformity in motor vehicle taxation including taxation for various passenger trans-

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port vehicles like tourist taxis, maxi cabs, All-India tourist buses, etc.

b) Problems faced by private service vehicles and educational institutional buses transporting workers and students respectively between neighbouring States.
c) Issue of Inter-State Agreements for Stage Carriage buses.
d) Absence of holistic transport planning including non-availability of benchmarks for bus operations in India, assessment of passenger and goods travelled demand on a regular basis.
e) Absence of inter-modal integration in terms of common ticketing, transfer stations, etc.
f) Problems affecting State Road Transport Undertaking (SRTUs) including recurrent losses resulting from various internal and extraneous factors.

Recommendations/Suggestions for improving the system

a) Rationalization of tax structure in passenger transport: Taxation on different categories of vehicles should be harmonized to achieve uniformity in the taxation rates.
b) Inter-modal integration: For greater efficiency of the transport network, proper integration of different modes such as rail, bus, and other para-transit modes is essential with regard to: (i) transfer station(s), (ii) ticketing (iii) harmonization of arrival/ departure schedule, etc.
c) Guidelines for Inter-State Agreements: Entering into inter-State agreements, as required under Section 88 of the MV Act, is a long-drawn process and hampers smooth movement of passenger buses between States. Government of India could frame basic guidelines in this matter to facilitate speedy finalization of such agreements.
d) Seamless movement of passenger transport vehicles in line with the New National Permit System for goods vehicles: It is essential that All India Tourist Taxi Cabs, Maxi- Cabs, All India Tourist Buses and buses covered by Special Permits under Section 88(8) of MV Act, 1988 should also be subjected to uniform fees for free movement throughout the country.
e) Scientific assessment of passenger and goods travel demand: Traffic studies for major transport corridors can help assess demand for both passengers and goods. This can assist in a making a proper assessment of the requirement of bus fleet, bus frequency, augmentation of routes, and for building infrastructure for goods transport such as parking facilities, rest facilities for operators, weighing bridges, fuel stations, etc..
f) Framework for Competitive Public Bus Passenger Transport Services should be prepared, and should encourage: (a) competition in the market: this occurs where there is no restriction on entry, and (b) competition for the market: where entry is restricted, it is possible to increase competition for the right to service individual routes, for the sole right to provide a whole network or to undertake particular functions as a subcontractor to a monopolist operator.
g) Electronic toll collection (ETC) system can improve throughput at toll centers by 3 to 4 times, thereby significantly reducing waiting times and fuel consumption. Toll operators also benefit from lower personnel requirements and reduced leakages.
h) Para-Transit policy framework should be evolved.
i) Enforcement of higher fuel efficiency norms for vehicles could help address the twin problems of energy security and environmental pollution.
j) Fleet Modernization by replacing older vehicles with newer ones (with better technology and lower emissions) needs serious consideration. This can be done by giving incentives to owners of commercial vehicles older than 15 years to modernize their fleet, encourage owners of private vehicles older than 15 years to replace their vehicles through a suitable tax regime, a vehicle recycling policy, and improvement in the inspection and certification regime.
k) Encourage use of multi axle vehicles (MAV): MAV (gross tonnage including weight of truck of over 16.2 tonnes) are cheaper to operate compared to smaller trucks i.e. medium commercial vehicles and light commercial vehicles, by over 25%. The incremental cost of a MAV can be recovered in less than three years. Measures to promote the use of MAVs could be considered including excise duty reductions for MAVs similar to small and fuel efficient cars, stringent monitoring of overloaded trucks and enforcing pollution and safety norms.
l) Vehicle Safety Standards, Inspection & Certification: Mandatory checks are presently required only for commercial vehicles. Private vehicles are also required to be checked for fitness once in 15 years. All vehicles should be required to be tested for emissions at least once in six months. There should be a regular audit of pollution checking Centres. A Vehicle Inspection & Certification system should be put in place in a phased manner under PPP with strict supervision. Private vehicles also need to be brought into the regular fitness regime. A third party vehicle inspection programme can be considered, and the State Road Transport Authority could monitor and audit the system.
m) Ensuring passenger safety requires strict enforcement of road safety regulations focusing on proper driver selection, training and regulating their driving conditions and hours of work. There is a need to identify unregulated service providers like shared autos and set certain core standards. Smaller vehicles like three-wheelers should ideally serve as a complementary system or render feeder service to the public transport instead of supplementing it.

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B. Railways

Major issues confronting Railways

a) Capacity constraints: Indian Railways has suffered a steady decline in its share in freight and passenger traffic as its network is plagued by infrastructural and carrying-capacity constraints.
b) Investment Planning: Investment in Indian Railways has to be sharply focused and directed towards removing capacity constraints and improving operations. Investment should be focused on total capacity creation including rolling stock, asset renewal, technology induction etc. This should be quantifiable in terms of incremental tonne kms.
c) Project Execution: IR does not have good track record on funding and execution of projects. Available funds are spread thinly on numerous projects which are then left incomplete.
d) Safety & Reliability of Operations: Failure of equipment and disruption to traffic on account of accidents continues to be a problem and affects operational reliability.
e) Social and commercial objectives: For long-term sustainability, IR has to strike a balance between the commercial and the social parts of the business, which have to be kept distinct and separate and managed appropriately.
f) Financial issues (cost, tariff and accounting): In the short run, most of the costs incurred by IR are fixed and therefore, the only option left is to expand volumes on a large scale.
g) Tariffs: Passenger tariff-setting has to be made rational and attuned to business growth requirement. Freight tariff needs to be based on differentiation linked to type and quality of service offered. Setting fares for freight and passenger should consider the competition from other modes, provision of subsidy, and need for generation of surpluses for reinvestment.
h) Accounting System: The present system of accounting does not assist decision making. For example, it gives little information on how to control costs, as accounts are kept on "heads of account" rather than on the basis of activities. There is no satisfactory way to figure out, for example, which are the paying lines and which are not; which trains yield how much; what is the cost of a marshalling operation, or the cost of overhaul of locomotives at each depot.
i) Productivity: The wage costs are high and the productivity of employees as measured in terms of transport output (million of passenger-kms and freight-ton-kms per employee) is relatively low compared to USA, Japan, Russia and China. Similarly, NTKMs per wagon per day and transport output per route kms is low compared to Chinese and Russian Railways.
j) Human Resource: HR functions in Indian Railways have traditionally evolved in the context of its being in the government. There is no mechanism for attuning recruitment and training to the job requirements through rewards and incentives. Multiplicity of departments and services would need to be reviewed.
k) Organization Structure: Railway is organized in terms of several functional departments. The staffing pattern does not match the skills required to build a technologically sophisticated, responsive and customer-focused organization. IR also performs a wide range of activities from manufacturing of coaches/locomotives to running of schools/hospitals. Each one of these activities needs be examined afresh from the perspective of either retention or hiving off based on operational need for integration, and "make or buy" decision. There is also a need to empower heads of Zonal Railways to a higher degree and hold them accountable for not only operational, but also financial results.
l) Research & Development: Indian Railways has not been in the frontier of developing or innovating railway technologies. The gap between the state-of-the-art and technology adopted in construction, maintenance and operation on IR needs to be bridged.

Desirable Plan of Action

a) Investment: Prioritization is needed in many areas viz. dedicated freight corridors, high capacity rolling stock, last mile rail linkages & improved port connectivity. Operationally urgent and quick pay-off projects that can ease capacity constraints the fastest need to be prioritized for full funding and time-bound execution.
b) Development of logistics parks would also need to be taken up on priority to create matching terminal and handling capacity and facilitate integration of rail with other modes.
c) Enhancing Project execution capabilities is critical for speedy capacity creation and improving returns on investments.
d) Capacity constraints: The planning framework needs to change to ensure creation of capacity ahead of demand. In addition to removing bottlenecks that already exist, planning for future must be based on an in-depth analysis of the market trends. Planning should consider the service delivery strategy, prioritization of projects, requirement and mobilization of the resources and strengthening the organizational capacity for project execution.
e) Replacement and renewal of assets: The present ad hoc approach in respect of appropriation to Depreciation Reserve Fund needs to be replaced by a rule-based approach.
f) Safety and Reliability of operations: A comprehensive and holistic approach to planning and operation is needed to attain a state-of-zero accident as stated in Vision 2020.
g) Social and commercial objectives: The commercial and social roles of IR should be kept distinct

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and separate. The commercial part of the business has to be run with a clear set of objectives and judged by commonly accepted financial measures such as revenue, profit, return on capital and productivity of assets. The social part of the business would need to meet different goals and judged by parameters such as improvement in connectivity, service level, and efficiency of delivery/provision of projects/services.

h) Cost structure: Viability in the short run dictates that the volumes expand at viable tariff levels. As larger volumes bring down unit cost of operations, it could lead to a virtuous cycle of even larger volumes. This, however, presupposes that capacity is not a constraint and that the services offered create value for the customers.

i) Accounting System must be revamped to accurately reflect the cost of various activities.

j) Productivity: Increase in axle load, better payload to tare ratio, higher trailing load and improvement in headway etc. could improve productivity relatively quickly.

k) HR: To attract, nurture and retain talent in large numbers for growth in future, IR has to take a close look at its HR policies and practices. Recruitment of highly qualified PhDs from IIMs/IITs and lateral recruitment from market at suitable compensation should be considered.

l) Research & Development: R&D projects need to be identified based on operational needs and potential financial returns. These need to be supported through allocation of the adequate resources along with clear-cut accountability for their completion. An annual performance audit of RDSO and the R&D projects needs to be instituted.

m) Organizational Reforms: IR has to undertake a number of internal organizational reforms to speed up decision-making and bring about result-orientation even while retaining the departmental structure. This includes reorganization on business lines, separation of policy making and operational responsibilities at the Railway Board level, outsourcing/hiving off of certain activities, empowerment of Zonal Railways along with accountability, investment planning, increasing project execution capability, accounting separation on business lines, business process re-engineering, setting up independent tariff–setting and dispute resolution mechanisms for PPPs, etc.

n) Information Technology: Business processes need to be reviewed and reengineered, wherever needed, before adoption of IT tools. Use of existing IT infrastructure needs to be optimized and adoption of relevant emerging technologies like cloud computing and crowd sourcing, systematically planned. There is a need for a comprehensive IT security system and change in management practices to take advantages of the investment in IT.

C. Civil Aviation

Issues for Consideration

a) Route Dispersal Guidelines of 1994 serves a social need, but economically it results in losses for India's domestic airlines, since they must allocate their scarce resource, aircraft, to service routes that experience light passenger traffic. This also adversely impacts the entry of potential carriers, and creates a disincentive to further expand an airline's fleet and service. It skews the market towards large firms.

b) Slot Allocation Policy: The rules of the slot allocation policy create barriers to entry for new entrants, thus limiting the number and range of air carrier service providers. Application of the grandfather rule, freeing-up of underutilized slots only every six months, the same carrier controlling slots that are utilized 80% or more during the following season, and banning trading of slots between carriers aggravate the anti-competitive results of this policy.

c) Fleet and Equity Requirements for Domestic Passenger Air Service: These regulations also raise barriers to entry, limiting both the number and size of new market entrants.

d) Airport Infrastructure: Poor airport facilities stand in the way of the development of the air transport sector and hinder overall economic growth.

e) Anticompetitive Behavior and Pricing: Abnormally low fares are affecting the financial viability of the airlines. While a cartel erects barriers to entry into the market place, predatory pricing itself makes it unprofitable for new entrants and thus limits competition. In either case the long term viability of the industry is harmed to the detriment of consumers.

f) Taxation and Pricing of Air Turbine Fuel (ATF): High fuel costs make it difficult for incumbent Indian airlines to grow and for new airlines to enter the market.

g) Human Resource Development: Indian aviation needs to recruit and train people in large numbers. As other countries are competing for the same talent pool, this presents a problem.

Key Enablers

a) Development of heliports is important to support the growth of general aviation in India, especially in areas that cannot have runways for financial or terrain related challenges. There is a need to develop standardized route operating procedures for helicopters and a PPP policy for the development of heliports.

b) Support infrastructure at airports in Tier 2/3 cities needs to be developed. This includes night-landing facilities, enhancement of passenger amenities and state support in statutory services (like security) to boost the GA industry. GA facilities at metro airports also need an upgrade in terms of separate terminal, parking space, etc.

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c) Upgradation of non-operational air-strips: Non-operational air strips need to be upgraded in places of economic significance such as ports, tourist places and industrial clusters.
d) Regulatory framework for equitable treatment to General Aircraft (GA) operators: With the current traffic load of scheduled flights at metro airports, GA aircrafts, at times, get a lower priority compared to scheduled operators. MoCA and DGCA should hold consultations to review the existing regulatory and operational framework.
e) Training Institutions should be set up for training of airport managers, air traffic controllers, navigation and communication engineers, airport security and fire-fighting personnel and they should be licensed by the Government.
f) Regional airlines that connect areas from big business centres like Central and State capitals to other commercial centres should be promoted.
g) Policy on air connectivity should be formulated. A plan to develop and construct landing strips at various places should be framed and implemented with State or Centre support.
h) Burden of taxes and fees on regional airlines should be kept as low as possible for initial period of operations in order to make their operations financially viable. The possibility of granting tax holiday to new regional airlines should be considered. Central Government should consider launching incentive schemes to attract such airlines.
i) Introduction of seaplanes for achieving air connectivity to remote and inaccessible areas that are suitable for landing of seaplanes should be considered.
j) PPP model for the development/modernization of airports would be a very viable and practical model. Government should however retain an active stake and control, especially in policy matters, to make sure the public interest is not upstaged by commercial considerations.
k) Development of Back-end Capabilities and Technologies: Private industrial manufacturers may be awarded product development programs. New technologies – for e.g. development of aluminum alloy sheets, bar-stock, extrusions, forgings – should be developed.

D. Shipping and Inland Water Transport

Impediments faced by the Ports, Shipping and IWT sector

a) Inspections and Audits by the Navigational Safety in Ports Committee (NSPC) should be completed in a time, preferably within 60 days of port declaring its readiness for such audit.
b) Rail-Road Connectivity for Ports is an important concern. State Highways/ Zilla Parishad roads need to be upgraded to NH standards.
c) Inland Waterway Transport (IWT) sector needs to be encouraged for hinterland cargo movement. Promote coastal shipping to connect entire coastline.
d) Inter port and intra port competition: Inter-port competition is constrained by hinterland economic activity, connectivity & inland transit costs. Intra-port competition can serve to mitigate the pricing power, but it may be constrained if ownership is concentrated.
e) Financing of port infrastructure is a problem due to the long gestation period (15 years) for green field port projects.
f) Land acquisition and environmental clearance involves significant delays.
g) Scale of operations at Indian Ports is quite fragmented and small as compared to China.
h) Draft limitations restrict large vessels accessing Indian ports which results in higher number of ship calls, increasing the congestion and the demand for berthing.

Key Recommendations for the Ports Sector

a) Capacity Creation: It may not always be possible to adhere to the recommended minimum gap of 30% between the installed capacity and the traffic to allow for proper maintenance of berths, equipment etc. A smaller gap does imply a short-term efficiency gain, but it would be better if the ports create capacity in excess of 30% of actual traffic over a period of time.
b) Massive Mechanization: With the kind and size of vessels with higher parcel sizes calling at Indian ports, massive world-class mechanization is the need of the hour. Each berth should be equipped adequately with high capacity versatile Cranes, Conveyer Systems, Silos, Harbour Mobile Cranes, Grab Unloaders and Gantry Cranes.
c) Development of Adequate Storage Areas is important for speedy clearance of cargo from the wharf to/from some other plot. Storage areas near a port allow the cargo to be cleared from the port faster and help achieve lower turnaround time. Provision of warehousing space near ports is also an incentive to attract traffic.
d) Hinterland connectivity: Improvements in logistics network outside the port is important for improving the competitiveness of Indian ports. For example, for European ports, cargo is transported throughout Europe in an uninterrupted and smooth fashion. Indian Ports should have a minimum 4-lane road connectivity as well as double line rail connectivity.
e) Cost Efficiency: Shipping lines charge that port charges at Indian ports are very high as compared to international ports. However, the factual position is that vessel related charges are perhaps higher in India, but cargo related charges are much lower.

Key Recommendations for IWT

a) Integration of waterways with other modes of transportation to form an efficient multimodal

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transport network is the key to achieve sustainable development of IWT sector. This requires detailed mapping of waterways and industrial clusters and analysis of origin and destination of cargo to undertake development of suitable waterways as well as multimodal transport hubs in IWT corridors. b) Public investment in development of waterways could serve as an important economic lifeline for development of North Eastern (NE) region as its water resources are ideal for IWT.

c) Policy support for creation of floating infrastructure i.e. barges/inland vessels is critical to attract private capital for development of IWT sector. An institutional arrangement wherein the risk on investment is shared through a PPP mode could be effective.
d) Extending mandatory intermodal share for cargo movements (currently mandated to all PSUs by PMO) to all public limited companies and creation of a suitable tradable instrument on the lines of Renewable Energy Certificate (REC) can serve as a significant policy support.
e) An institutional framework to appraise critical projects is needed for timely implementation.
f) For effective resolution of policy and administrative issues, setting up State Level Coordination Committees (SLCC) of various State Government agencies and IWAI under the State Chief Secretaries is of critical importance. Every riverine/coastal State should set up an IWT organization and to frame a long-term strategy for the IWT development.
g) Creation of adequate education and training facilities is necessary. IWT training facilities in the country are limited, and need to be expanded. The National Inland Navigation Institute (NINI) can function as the apex level training institute and Regional Crew Training Centers (RCTCs) can be set up at the State level.
h) Private Sector Participation in the development, maintenance and regulation of some stretches of rivers for inland water transport may be looked into. Power utilities should bear cost of construction and O&M of material handling at power plant end, as is the case with the facilities for unloading of railway wagon.
i) Dredging of Rivers would help develop the IWT.
j) Installation of world class mooring buoys is needed to facilitate imports/exports operations on a large scale at the anchorage.
k) Centrally sponsored schemes for the development of infrastructure should be started to promote IWT and for development of minor ports.

E. Urban Transport

Key issues in the Urban Transport sector

a) Vehicular Emission: Metropolitan cities are facing serious environmental problem due to growing air pollution caused by fuels used in vehicles.
b) Congestion: Traffic congestion in cities results in delays and higher pollution levels. High average age and poor maintenance of vehicles compounds the problem.
c) Road Safety Issues: Pedestrians, bicyclists, motorcyclists, and non-motorized vehicle occupants are often the most vulnerable in Indian cities.
d) Parking Problems: Haphazard parking contributes to higher levels of traffic congestion.
e) Inadequate public transport: Public transport systems in India are generally inefficient, due to outdated technology, incompetent management, corruption, overstaffing, and low worker productivity. They also require increasingly large subsidies.

Way Forward

a) Promoting regional economies and compact townships: Regional economies that reduce the need for long-distance travel should be promoted. Similarly, building self-sufficient compact townships would reduce the need for short-distance travel within the cities.
b) Focusing on public transport particularly bus transport: Passenger mobility in urban India relies heavily on roads. Rail based mass transport system should be planned in all cities with population more than 2 million. Urban transport plans should also emphasize setting up a modern and efficient bus transport system.
c) Introducing variety of bus transport services: Segmentation of supply of bus transport system to provide different services for different people is required.
d) Adopting optimal pricing strategies for transport services could effectively be used to encourage the public transport and restrict the use of private vehicles. Today, the operating cost of using the private vehicles is far less than the marginal social costs: this encourages people to use private vehicles. Government policies artificially lower not only the cost of vehicle ownership (through very low one time registration fee, low sales tax, etc.) but also the vehicle usage. Market based instruments such as annual registration fee, parking fee, road tax, fuel tax, congestion charges, etc. could be used to increase the (actual) marginal cost of private vehicle use to equal the marginal social costs of the same. Public transport could be promoted by abolishing annual motor vehicle tax and passenger tax on public vehicles.
e) Enhancing transport coordination: To encourage people to use public transport, the transportation system should be seamlessly integrated across all modes. An authority to coordinate the operations of various modes is required with the objective of improving the efficiency of service delivery and comfort for commuters. A single ticket system, where commuters can buy a transport ticket that is valid throughout the public transport network

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within the coordinating authority's jurisdiction, should also be developed and promoted.

f) Demand side management measures, such as parking fee, fuel tax, congestion pricing, etc., should be implemented in conjunction with other transport planning, supply side management, and transport pricing measures.

g) Supply side management measures, such as one way traffic system, improvement of signals, traffic engineering improvement measures for road network and inter-sections, bus priority lane, etc., could be used as short-term measures to ease traffic congestion. Medium-term measures like new road alignments, hierarchy of roads, provision of service roads, bye passes, ring roads, bus bays, wide medians, intersection improvements, construction and repair of footpaths and roads, removal of encroachments, etc. should be introduced at least in million plus cities. Long-term measures include technology upgradation and introduction of high speed, high capacity public transport system along high-density traffic corridors, etc.

h) Encouraging green modes: Transport policy should encourage the need for developing green modes like bicycles, cycle rickshaws, pedestrians, etc. The safety concerns of cyclists and pedestrians have to be addressed adequately, by having a segregated right of way for bicycles and pedestrians. This will also help in improving traffic flow, increasing the average speed of traffic, and reducing emissions resulting from low vehicle speed.

i) Strengthening urban institutions: The functional responsibilities for urban transport are fragmented among central, state and local level governments. Central government provides sub-urban rail service through Indian Railways in four mega cities. MoRTH is responsible for the national highways, including the stretches within urban areas. State governments control local land use policies, motor vehicle and sales tax rates, bus transport systems, policies for private sector participation, etc. Most of the Urban Local Bodies (ULBs) rely heavily on capital grants from the states for almost all infrastructure projects as their own revenues are barely sufficient for meeting their current expenditures. Therefore, insufficient funds are available for operation and maintenance of existing assets which badly affects the service delivery. ULBs should be empowered to raise funds for developmental projects. They may also be authorized, through legislation, for overall coordination of activities relating to provision of transport infrastructure by various government agencies in urban areas.

j) Innovative financing mechanisms using land as a resource: Alternative methods of financing need to be explored. The Central Government could encourage the levy of dedicated taxes to be credited to an urban transport fund and used exclusively to meet urban transport needs within the State. Such dedicated taxes could be in the form of a supplement to the petrol and diesel taxes, betterment levy on land owners or even an employment tax on employers. Revenues from a betterment levy along new high capacity public transport corridors could be included as a component of the financing plan for such new public transport systems. The commercial utilization of land resources, available with public transport service providers, is also recommended to raise additional resources.

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