

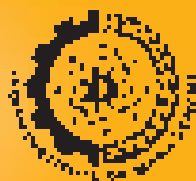
Operational efficiency of freight transportation by road in India

2014-15 | 3RD EDITION

A Joint Study Report by



Transport Corporation of India Limited



Calcutta

OVERVIEW OF THIS DOCUMENT

Road infrastructure development catalyses national progress.

What monetizes the value of this infrastructure is logistics efficiency.

India's logistics infrastructure is inadequate to support projected national growth.

What is required is not just building more roads; what India needs is better logistics management to get the best out of its roads infrastructure.

What the country also needs is enhanced sectoral clarity to address wide-ranging challenges and opportunities.

A clarity that draws on decades of experience, ground-level understanding of realities, perspective of diverse stakeholders and grounded solutions.

A few years, TCI commissioned a collaborative study with the Indian Institute of Management Calcutta (IIMC) to examine how India's road freight logistics efficiency could be strengthened. The study focused on an assessment of the operational efficiency of freight transportation across India's national highways.

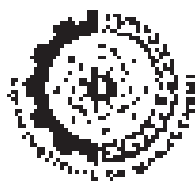
This third edition of the report analyses the prevailing realities of the country's high-volume traffic routes and compares them with global benchmarks, with the objective to enhance the efficiency of the country's roads sector to among the best in the world.

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FOREWORD



The road transport sector is more than a transportation pipeline; it is a key indicator of national development.

India's road freight sector accounts for almost 65 per cent of all the freight moved in the country. This dominant proportion places a premium on logistic efficiency.

A small inefficiency can translate into extensive national under-delivery; a small improvement can achieve the reverse.

Given this criticality, we embarked on a periodic health appraisal of India's road freight transportation sector.

This appraisal appraises diverse issues, identifies blockers and examines how road freight efficiency can be enhanced, and how this can catalyse India's economic growth. The appraisal compares Indian standards with developed countries, explains conclusions through numerical references and creates a basis for why the freight transportation sector needs reform.

Some of the findings have been surprising. For instance, the analysis of data across ten major national routes explains how government investments in road networks have not been able to generate desired benefits.

The study also recommends how transporters and the government can overcome logistics industry challenges and drive national growth.

This Study is the 3rd edition. The earlier editions were launched in 2008 - 09 & 2011 - 2012 by TCI along with IIM - Calcutta.

I am extremely grateful to the IIMC team for its support in creating this forward-looking document.

A handwritten signature in black ink, appearing to read 'DP Agarwal'.

DP Agarwal

Vice Chairman & Managing Director
Transport Corporation of India

About TCI Limited

TCI is India's leading multimodal integrated supply chain solutions provider with a global presence. With an expertise developed over five decades, a customer-centric approach and extensive infrastructure, TCI moves 2.5% of India's GDP by value today.

The Group, with its customer-centric approach, professional management and the best resources and technology

(comprising 1400 offices, 11 million sq. ft. warehouse space, 5000+ workforce and a large fleet of customized vehicles), follows strong corporate governance principles while remaining committed to value-creation for its stake holders and social responsibilities.

An ISO 9001:2008 certified company, TCIL is listed on premier stock exchanges like NSE and BSE.

Vision

TCI group should be a customer oriented, multi-technology, multi-specialist transport system in the Indian and international markets, with a proven commitment to excellence in every facet of activity and pursuit of value based policies to satisfy aspirations of society, customers, vendors, employees, shareholders and the transport industry.

TCI Freight

TCI Freight, the largest division of Group TCI, is India's foremost and Asia's leading surface transport entity. It enjoys strong backing in terms of its extensive and strategically-located branch network and trained work force.

TCI XPS LEADER IN EXPRESS

TCI XPS, an express distribution specialist, offers a single-window door-to-door time-definite solution for customers' express requirements. Equipped with ISO 9001:2008-certified operations, TCI XPS delivers consignments of all sizes and weights to 13,000 locations in India and 200 countries.

TCI Supply Chain Solutions

With a Mission to be 'The most admired service provider of integrated supply chain solutions', TCI Supply Chain Solutions brings deep commitment to client partnerships. Its dedicated verticals for the auto, retail, telecom, electricals, pharmaceuticals, FMCG and cold chain offer specialized services to these critical sectors of the economy.

TCI Global GLOBAL LOGISTICS

TCI Global provides a single-window advantage to customers across all major South East Asian countries through a dedicated network of international offices in the region besides possessing a strategic presence in high-growth emerging markets in Asia, Brazil (Latin America) and Africa. TCI Global offers customers end-to-end services ranging from customs clearance, international inbound and outbound freight handling (air and sea), primary and secondary warehousing/redistribution, third party logistics, multimodal (air, surface and sea) services, ODC movements, mining logistics and project cargo.

TCI Seaways

TCI Seaways owns well-equipped ships that cater to the coastal cargo requirements for transporting container and bulk cargo from ports on the East coast of India to Port Blair in the Andaman and Nicobar Islands and further distribution within the islands.

TCI Foundation

As the group's social arm, TCI Foundation fulfils corporate social responsibility. TCIF has been actively working in the areas of health, education, women's development, disability and disaster relief assistance. It runs charitable hospitals and schools for the under-privileged in rural areas. It has also collaborated with the Bill & Melinda Gates Foundation & National Aids Control Organization to run AIDS management programmes.

TCI Developers Ltd.

Associate Company: The real estate arm of TCI Group was created to address the development of commercial properties of TCI. These properties will be developed into office complexes, residential buildings, etc. depending on the best property use. It is also undertaking the development of large modern warehouses, logistics parks etc.



Joint Ventures: TLCI is a joint venture between TCI and Mitsui & Co Ltd, which is the sole logistics partner for Toyota Kirloskar Motors Ltd. in India. TLCI has been providing complete logistics solutions from inbound transportation from suppliers across India and other countries to outbound transportation of complete built units (CBU) and spares.

TCI CONCOR Multimodal Logistics Solutions

This is a joint venture with CONCOR for bulk multimodal logistics solutions by rail and road.



Transportation is a teething problem in India. It inhibits growth and contributes to a large number of untapped opportunities. With increased globalization, developments in all forms of electronic commerce, increasing number of vehicles on the road and a gross inadequacy in road network capacity, the problem can only worsen with time unless transportation system infrastructure and service delivery mechanisms can be fine-tuned. Understandably, this is a gigantic task and there is no easy solution that can deliver magical results overnight. This context enables great opportunities for related industries, policy formulation, enforcing agencies, and researchers working in this field (in academic institutes of higher learning) to come together and help improve the state of affairs in the transportation sector of the nation.

The TCI-IIMC Study of the Operational Efficiency of Freight Transportation by Road in India was sponsored by the Transport Corporation of India (TCI) and was taken up by Prof. Subrata Mitra of Indian Institute of Management Calcutta. It was a very timely and laudable initiative that has been continuing for a while.

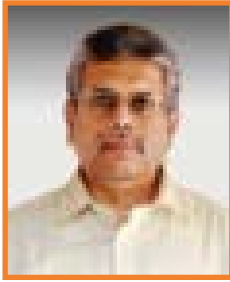
The scope of the study included analysing present route statistics vis-a-vis those that existed a few years ago to help identify any major changes in the road freight transportation sector that might have taken place over this period, as well as changes that are badly needed. The operational efficiency of freight transportation by road and possible recommendations to improve it were also within the scope of the work. The study analysed the problems and prospects of multi-modal transportation and the effect of seasonality on freight transportation by road in India, and made recommendations for the consideration of TCI.

The major recommendations highlighted the need and means for improving the toll collection infrastructure, the need to reduce the inconvenience linked to documentation, check and tax collection at state borders and check posts, the need for improving fuel efficiency by improving road conditions, signalling mechanisms and pushing over-aged vehicles off-road as well as the need to better utilize railway network for freight transportation.

The road transportation system in India is known to have major bottlenecks, including inadequate network spread and capacity, bad road surfaces, breakdowns and poor accident recovery mechanisms, poor quality vehicles leading to more pollution and reduced fuel efficiency and inefficient regulation enforcing mechanisms, to name a few that badly require workable solutions toward improvements. The findings and recommendations of the present study are expected to make positive contributions in this regard.

Professor Uttam K. Sarkar,
Dean (New Initiatives and External Relations)
Indian Institute of Management - Calcutta

AUTHOR PROFILE



Prof. Subrata Mitra is a Professor of Operations Management at IIM Calcutta. He received his B.E. in Electronics and Telecommunications and M.E. in Production Management from Jadavpur University, Kolkata and Fellowship (Ph.D.) from IIM Calcutta. He has four years of industry experience and over 15 years of teaching experience. He has research interests in logistics and supply chain management and has published extensively in national and international journals. He is also actively involved in training programmes and consultancy projects. Prof. Mitra was a recipient of the Fulbright Senior Research Fellowship and the Fulbright-Nehru Visiting Lecturer Fellowship in 2006 and 2011, respectively.

He is also the author of TCI & IIMC's Joint Publications on Operational efficiency of freight transportation by road in India, all the three editions.

ABOUT IIM CALCUTTA

The Indian Institute of Management Calcutta (IIMC) was established as the first national institute for post-graduate studies and research in Management by the Government of India in November 1961 in collaboration with Alfred P. Sloan School of Management (MIT), and with the support of the Government of West Bengal, the Ford Foundation and Indian industry. Over the years, IIMC has developed into a Centre of Excellence in management education with a global reputation. It has played a pioneering role in professionalising Indian management through its post-graduate and doctoral level programmes, executive training programmes, research and consulting activities. IIMC alumni today occupy leadership positions as corporate managers, academicians and successful entrepreneurs worldwide.

The vision of the Institute is to emerge as an international centre of excellence in all aspects of management education. Over the past five decades, IIMC has blossomed into one of Asia's finest business schools. Its strong ties with the business community make it an effective mechanism for the promotion of professional management practices in Indian organizations. Today, IIMC attracts the best talent in India - a melting pot of academia, industry and research. The best and the brightest young men and women pursue its academic programmes.

One of the biggest strengths of the Institute is its world-renowned faculty. The faculty members enjoy distinguished academic achievements in different areas of management and related basic disciplines, while actively involved in teaching, training, research and consulting. They carry out consultancy assignments to keep in touch with real-life management problems in public and private corporations, financial institutions, government agencies and international agencies. This dynamic learning process at IIMC enriches teaching and training activities of the faculty. It also helps in developing case studies and identifying directions for research relevant for business and industry.

IIMC is the only management institute in India to have received 'triple crown' accreditation from AACSB, AMBA and EQUIS.

IIMC is also the only institute of India to be a member of the CEMS Global Alliance.

Executive summary

This study, henceforth referred to as the 2014-15 survey, was commissioned by Transport Corporation of India (TCI) to assess the operational efficiency of freight transportation by road in India. This is a follow-up study of the earlier studies, also commissioned by TCI, in 2008-09 and 2011-12, henceforth referred to as the 2008-09 survey and 2011-12 survey, respectively.



While the 2008-09 survey and 2011-12 survey covered 10 and 17 routes, respectively, the 2014-15 survey covered 28 routes, out of which 10 routes were common across all the surveys, seven routes were common between the 2011-12 and 2014-15 surveys, and 11 routes were new in the 2014-15 survey.

The objective of the 2014-15 survey was to compare the route statistics with those for the 2008-09 and 2011-12 surveys, and identify major changes in the road freight transportation sector that may have taken place over the last few years. The other objective was to make an assessment of the operational efficiency of freight transportation by road, and suggest recommendations. The focus of the 2008-09 survey was on a detailed analysis of the trucking industry and a comparison of roads and railways in terms of freight transportation.

The 2011-12 survey, on the other hand, was more focused on a comprehensive analyses of public-private partnerships (PPP) in road projects, Electronic Toll Collection (ETC), access-controlled expressways and logistics parks/hubs. The 2014-15 survey analyzed the problems and prospects of multi-modal transportation and the effect of seasonality on freight transportation by road in India. To put the 2014-15 survey report in

perspective, the summaries of the 2008-09 and 2011-12 survey reports were included in the Annexure of this report. Primary data for the survey was collected by TCI. Secondary data was collected from various reports and websites. Other survey-related inputs and clarifications were also provided by TCI officials over e-mail communication.

As on March 31, 2013, India's total road length network was 5.23 million km and road density was 1.59 km/sq. km. However, the length of national highways/expressways was a meagre 100,087.08 km, or about 2% of the total road length network, even as they carried 40% of the road traffic. Roads and railways carried about 65% and 30%, respectively, of the country's total freight volume, the rest carried by waterways and airways.

In 2011-12, the contribution of the transport sector to India's GDP was 6.5%, out of which roads and railways accounted for 4.8% and 1%, respectively.

Road freight volumes are expected to increase from 1315 BTKM in 2012-13 to 1553 BTKM in 2014-15. However, the development of new roads has not been able to keep pace with increasing freight volumes and passenger traffic since Independence, creating infrastructural bottlenecks. Therefore, the needs of



A comparison of the survey data for the years 2008-09, 2011-12 and 2014-15 shows that while the average journey time and average vehicle speed have improved over the years, the average mileage of vehicles has remained almost the same.

the hour are to build new roads faster, widen existing roads and improve road conditions through periodic maintenance.

The length of national highways and access-controlled expressways as a percentage of the total road length network needs to be improved. Many toll plazas that are still following the manual system of toll collection need to be equipped with ETC. Delays at check posts and state borders for documentation checks and payment of various fees and taxes need to be minimised by reducing paperwork. Appropriate actions need to be initiated against unnecessary on-road police intervention and harassment.

The Ministry of Road Transport and Highways set a target of building 17.26 km of new roads per day in 2014-15, up from 11.67 km per day in 2013-14. Also, 100% of the toll plazas are targeted to be equipped with ETC in 2014-15. The introduction of a uniform Goods and Services Tax (GST) is expected to reduce paperwork and checkpost delays, potentially saving billions of US dollars in delay costs, additional fuel consumption cost due to slow vehicular speed and idling at check posts. The Government needs to make an all-out effort to mitigate on-road delays and improve vehicular fuel efficiency so that shipping lead times and transportation costs can be significantly minimised.

A comparison of the survey data for the years 2008-09, 2011-12 and 2014-15 shows that while the average journey time and average vehicle speed improved over the years, the average mileage of vehicles remained almost the same. Two major routes surveyed in 2014-15



Road freight volumes are expected to increase from 1315 BTKM in 2012-13 to 1553 BTKM in 2014-15. However, development of new roads has not been able to keep pace with increasing freight volumes and passenger traffic since Independence, creating infrastructural bottlenecks.

2

India's national highways and expressways as a percentage of its road length network





14.7

India's annual additional fuel consumption cost due to delays (in USD billion).



were Delhi-Bangalore and Delhi-Mumbai. The survey found that on the Delhi-Bangalore route, on-road stops, other than for toll collection such as check posts and police intervention, were contributing more to stoppage delays and stoppage expenses than in 2011-12.

Also, since the increase in freight rate was not commensurate with the increase in freight cost, there was a significant drop in contribution margins, even below the 2008-09 level. On the Delhi-Mumbai route, toll delays and toll expenses as percentages of total stoppage delays and stoppage expenses, respectively, remained almost the same as in 2011-12.

Freight rate increased more than freight cost in the last three years with an increase in the contribution margin over the 2011-12 level. Among the remaining 26 routes, one common observation was that for routes covering the eastern and north-eastern parts of the country, average vehicle speeds were lower and average stoppage delays were higher than the corresponding national averages due to poor road conditions, more stops, long queues, delays at border check posts and on-road police intervention.

If the average statistics for the 28 major routes surveyed approximately represent the national average, it may be inferred that while average stoppage delays per km have remained almost the same as in 2011-12, average stoppage expenses per tonne-km worsened during the same period. The average contribution margin improved in 2014-15.

The study also estimated the cost of delay and the cost of additional fuel consumption arising out of delays to the economy. According to the estimates, the cost of delay was USD 6.6 billion per year and the cost of additional fuel consumption due to delay was USD 14.7 billion per year.

In India, the scope of multi-modal transportation remained limited, given that most of the freight was carried by roads and the rest by railways. The share of waterways and airways in carrying domestic freight was almost insignificant. Road transportation was door-to-door, reliable and efficient, with vehicles available almost in real-time. Railways, on the other hand, suffered from inefficiency, poor service, loading delays and the unavailability of rakes.

Since the increase in the freight rate was not commensurate with the increase in freight cost, there was a significant drop in the contribution margin, which was even below the 2008-09 level.



The Government should simplify and standardise the rules and regulations across different modes of transportation to facilitate multi-modal transportation.

Multi-modal transportation in India was mainly limited to the combination of roads and railways, affected by the lack of coordination among different modes, delays during modal shifts, low cargo containerisation, priority accorded by Indian Railways to passenger trains over goods trains, and differences in rules and regulations across different transportation modes.

However, multi-modal transportation, where railways carry freight over a long distance from one end of the country to another, and where the last-mile connectivity is provided by roads, is preferred in many countries because it is not only cost-effective due to economies of scale, but also fuel-efficient, reducing carbon emissions and environmental pollution. A comparison of road and rail (where first 50 km and last 50 km connectivity was provided by roads) freight costs for some selected routes showed that freight costs per tonne were lower for railways than for roads and the same became even lower when rake capacity increased.

Due to higher cargo containerisation, operationalisation of two Dedicated Freight Corridors (DFCs), and setting up of multi-modal logistics parks across the country and along the DFCs, the share of railways in carrying domestic freight could increase, strengthening the prospects of multi-modal transportation in India.

The Government should simplify and standardise the rules and regulations across different transportation modes

to facilitate multi-modal transportation. The Government should remove all infrastructural bottlenecks to boost the movement of domestic freight by inland waterways.

Despite India possessing a vast coastline and a significant inland waterways length, the share of waterways in carrying India's domestic freight is insignificant. Like railways, waterways are also an environment-friendly mode of transportation; sincere effort should be made to increase the share of inland waterways in domestic freight movement.

The effect of seasonality on freight transportation by road was also assessed in this study. While the effect of seasonal demand, demand for and availability of trucks, assurance of return load, time of the year and day of the week on freight rate fluctuations could not be assessed due to data non-availability, the effect of climatic conditions on stoppage delays, freight costs and contribution margins could be assessed from the survey data.

It was observed that stoppage delays and freight costs were higher in the summer and monsoon months than in winter and spring due to poor road conditions, vehicle breakdown, slow vehicle movement, occasional detours owing to road flooding, traffic jams as well as long queues at check posts and toll plazas. The contribution margin, on the other hand, was lower in summer and monsoons than in winter and spring, since the increase in freight rates was not commensurate with the





increase in freight costs. Therefore, truckers planning to ship during the summer and monsoon months had to make do with low contribution margins.

Based on the 2014-15 survey, the following recommendations are made, which should be read along with the recommendations made in the 2008-09 and 2011-12 surveys.

1 Although the average journey time and vehicle speed improved across all the major routes, more needs to be done to reduce stoppage delays. Besides improving the toll collection infrastructure, the number of stops for various other purposes, such as documentation check and tax collection at state borders/check posts and on-road police intervention, should be minimised and the process of document checking and tax collection simplified to facilitate a smooth and seamless flow of goods across the country. There is an urgent need to reduce paperwork so that a single document can allow vehicles to pass through state borders and check posts without an elaborate checking process, saving time and journey tenure. It is expected that the introduction of a uniform Goods and Services Tax (GST) from April 1, 2016 would reduce paperwork, decrease stoppage delays and increase average vehicular speed. The Government should endeavour to resolve issues raised by different stakeholders and introduce the GST Bill as soon as possible in the Parliament for ratification.

2 The fuel efficiency in terms of mileage of vehicles remained almost unchanged. Mileage was affected by slow vehicular speeds due to poor road conditions, traffic jams, multiple on-road stops, long queues and idling at check posts. If road conditions can be improved and the number of stops and stoppage delays minimised, it is expected that vehicles mileage would also improve. Fuel efficiency also depends on the engine and vehicle age. The Government should ensure that truckers replace their old, fuel-inefficient

6.6

India's annual cost due to transportation delays (in USD billion).



vehicles with new-generation fuel-efficient vehicles like multi-axle tractor-trailer units. This could be achieved forcefully by law or by providing financial incentives in terms of subsidies, soft loans, tax benefits, and so on. This is important since fuel efficiency not only reduces costs for truckers, economy and carbon emissions, but also preserves precious foreign exchange through reduced crude oil import.

3 The Government should look into and resolve issues faced by shippers in freight transportation by railways. The problems of loading delays, unavailability of rakes when required, poor service and lack of multi-modal coordination need to be urgently addressed. Railways carry a significant volume of freight in many countries. However, despite a large network, the share of railways in domestic freight movement is less than half of that of roads in India because of the issues mentioned above. Ideally, railways should be the preferred mode for long-distance transportation. Rail transportation not only reduces costs due to economies of scale, but also reduces fossil fuel consumption, mitigating environmental pollution.

4 Two issues that affect the share of Indian Railways in domestic freight movement are the low level of cargo containerisation and preference to passenger trains over goods trains when they share the same track, as per the policy of the Indian Government. Cargo containerisation not only makes freight transportation easier, but also minimise delays during modal shifts. It is expected that in the light of India's increasing international trade and private sector participation in operating container trains, the level of cargo containerisation improve and facilitate rail freight movement. However, the Government should make an all-out effort to create an environment conducive to containerisation growth at par with the level in countries where most of the freight is containerised. The problem of sharing the same track by passenger and goods trains can be partially taken care of when the two DFCs become operational, accommodating speedier, longer and heavier goods trains that could reduce journey time and transportation cost. The Government should remove all hurdles and ensure that these DFCs become operational at the earliest. Following the experience of



The Government should look into and resolve the issues faced by shippers in transportation of freight by railways.



2:1

Ratio between share of freight moved by roadways and railways

these DFCs, the Government may consider building more DFCs parallel to the Golden Quadrilateral and the east-west and north-south corridors.

5 Because of the inefficiencies and issues related to freight transportation by railways, the scope of multi-modal transportation is limited in India. However, multi-modal transportation is preferred all over the world since it is not only efficient and economic, but also fuel-efficient and environment-friendly. The Multi-Modal Transportation of Goods Act, 1993 is applicable to shippers and freight forwarders of international cargo. Its definition does not cover multi-modal transportation of domestic freight. Therefore, for the multi-modal transportation of domestic freight, service providers are governed by policies and regulations of the respective transportation modes, which are not often consistent and do differ across different modes. This makes transportation of freight by multiple modes inefficient. The Government should broaden the scope of the Act and include multi-modal transportation of domestic freight in its definition to standardise the policies and regulations across different

modes for facilitating multi-modal transportation. To counter the lack of coordination among various transportation modes, the Government should create an apex regulatory body such as Multi-Modal Transport Regulatory Authority of India (MMTRAI), in line with NHAI or TRAI, that would coordinate among the various ministries, i.e. Ministry of Road Transport and Highways, Ministry of Railways, Ministry of Shipping and Ministry of Civil Aviation, to facilitate multi-modal transportation.

6 The Government should encourage private participation and assume an active role in building large multi-modal logistics parks as in Nagpur, Vizag and along the DFCs to facilitate multi-modal transportation. Since building large logistics parks requires substantial investments, the Government may provide financial incentives to private parties or invest through the PPP mode.

7 India's vast coastline and significant inland waterways are underutilised in carrying domestic freight. China carries a significant volume of domestic freight through its inland waterways. The Indian

Government should also ensure that infrastructural bottlenecks are removed and the share of inland waterways in carrying domestic freight is increased.

8 The study found that the average stoppage delay per km and the average freight cost per tonne-km was higher while truckers' average contribution margins were lower in summer and monsoons than in winter and spring. One reason was deteriorating road condition due to rain and road flooding, resulting in slow speeds, increased maintenance costs because of frequent breakdowns and occasional detours that increased journey time and cost. Therefore, shipping in the summer and monsoon months proved less lucrative for truckers. Since roads are the lifeline to a country's economy and demand for goods in the summer and monsoon months is no less than in winter and spring, the Government, under various road development programmes, should ensure proper road building and maintenance so that vehicle movement is smooth even during the monsoons and truckers report the same level of monsoon profitability as in winter and spring.

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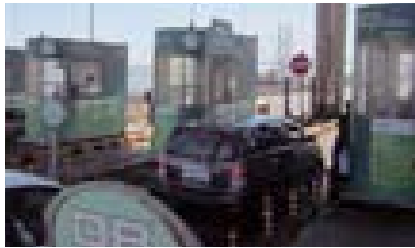
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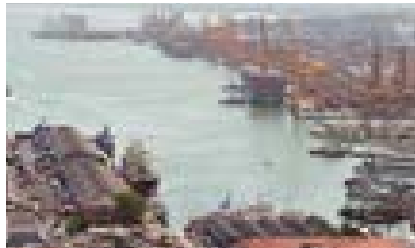
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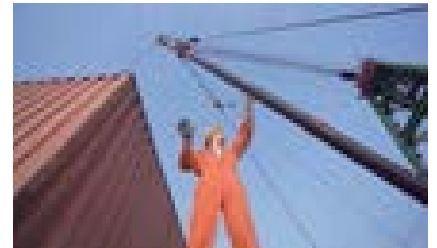
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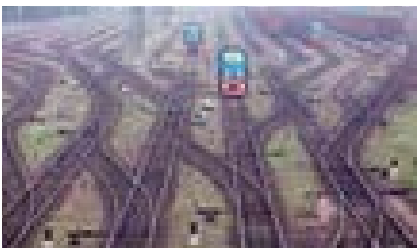
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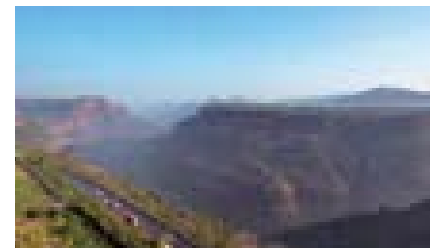
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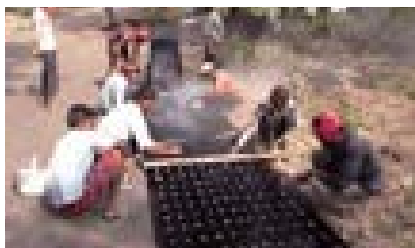
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Introduction 01

As on March 31, 2013, India's total road length network was 5.23 million km, up from 4.24 million km in 2010-11; the road density was 1.59 km/sq. km, more than that of Japan (0.90 km/sq. km), USA (0.67 km/sq. km), China (0.44 km/sq. km), Brazil (0.19 km/sq. km), and Russia (0.08 km/sq. km)¹.

However, the length of India's national highways/expressways was a meagre 100,087.08 km², i.e. approximately 2% of the total road length network, even as they carried 40% of the road traffic. In India, roads and railways carry about 65% and 30%, respectively, of the total freight volume, the rest being carried by waterways and airways.

In 2011-12, the contribution of the transport sector to India's GDP was 6.5%, out of which roads and railways contributed 4.8% and 1% respectively³. Road freight volumes are expected to increase from 1315 BTKM in 2012-13 to 1553, 1688 and 1835 BTKM in 2014-15, 2015-16 and 2016-17 respectively⁴.

¹ Basic Road Statistics of India 2012-13, Ministry of Road Transport and Highways, Available at <http://morth.nic.in/showfile.asp?lid=1762>, Last Accessed on December 21, 2015.

² List of State-Wise National Highways in the Country, Ministry of Road Transport and Highways, Available at <http://morth.nic.in/showfile.asp?lid=1624>, Last Accessed on December 21, 2015.

³ Road Transport Yearbook 2011-12, Ministry of Road Transport and Highways, Available at <http://morth.nic.in/showfile.asp?lid=1131>, Last Accessed on December 21, 2015.

⁴ Report of the Working Group on Road Transport for the Twelfth Five-Year Plan (2012-17), Ministry of Road Transport and Highways, Available at <http://morth.nic.in/writereaddata/linkimages/Exec%20Sum%20WG%20RT12th%20FYP-1711921458.pdf>, Last Accessed on December 21, 2015.



There is an urgent need to develop new roads, increase the widths (two-lane to four-lane, six-lane and so on) of the existing roads, and year-round maintenance of new and existing roads

However, as mentioned in the earlier TCI-IIMC survey reports, the growth in freight volumes and passenger traffic since Independence far outpaced growth in the development of new roads. There is an urgent need to develop new roads, increase road width (two-lane to four-lane, six-lane and so on), and engage in year-round maintenance of new and existing roads so that vehicle movement remains smooth and seamless throughout the year irrespective of the season. Also, the length of national highways and access-controlled expressways as a percentage of the total road length network was miniscule compared to other developed and developing countries.

Although Electronic Toll Collection (ETC) initiatives are being undertaken, many toll plazas still employ a manual system for collecting toll, which leads to long queues and considerable waiting times for vehicles before they can pass through toll gates. Vehicles also have to spend a lot of time at different check posts and state borders for documentation checks and the payment of fees and taxes.

Besides, frequent on-road police intervention delays vehicle movement. The National Highway Authority of India (NHAI), through its various road development programmes such as the National Highway Development Programme (NHDP), is committed to build new roads, widen

existing roads and maintain new and existing roads.

Many new roads are being developed and maintained in the public-private partnership (PPP) mode where the Government provides assistance in different forms, including financial incentives, to attract private investments in the road sector. A new PPP model for road construction envisaged by NHAI is hybrid annuity model where the government will finance 40% of the project cost upfront and the concessionaire will be responsible for financing the rest, designing, building, operating and transferring the project to the government at the end of the concession period, i.e. 15 years. The responsibility for toll collection will rest with the government, which would disburse bi-annual annuity payments to the concessionaire throughout the concession period to cover 60% of the project cost borne by the concessionaire. This new PPP model is expected to mitigate the risk and exposure of the concessionaire and attract private investment in the road sector⁵.

As per the Ministry of Road Transport and Highways website, in 2013-14⁶ the average length of road construction was 11.67 km per day. The corresponding target for 2014-15 is 17.26 km per day.

Also, in 2013-14, less than 10% of the toll plazas were equipped with ETC. In 2014-15, 100% of the toll plazas are targeted to be equipped with ETC.

According to a report⁷, the Ministry of Road Transport and Highways sought Rs. 80,000 crore from the Ministry of Finance for the financial year 2016-17 to drive highway

expansion. Most of the funds will be used in the government's ambitious Bharat Mala project that aims to build roads along the country's border and coastal areas, religious and tourist places, as well as district headquarters. The target is to build 30 km per day and accelerate the pace of road construction. The Ministry plans to expand its highway network to 1.5 lakh km and build 15 more expressways. Although most of the projects will be funded through the engineering, procurement and construction (EPC) route, the Ministry will also seek private participation through PPP including the newly-conceived hybrid annuity model.

The uniform Goods and Services Tax (GST), expected to be introduced from April 1, 2016, is expected to reduce paperwork and check-post delays.

Delays and the corresponding low vehicle mileage cost billions of US dollars (USD) to the Indian exchequer; and every effort should be undertaken to reduce on-road vehicle delays and improve fuel-efficiency so that shipping leadtimes and transportation costs are reduced significantly.

The organisation of this report is as follows. In Section 2, results of the survey of 28 major routes are presented and compared with the 2008-09 and 2011-12 surveys.

Section 3 discusses the current scenario and prospects of multi-modal transportation in India.

Section 4 presents the effect of seasonality on freight transportation by road.

Section 5 presents conclusions and recommendations of this study.

11.67

Average rate of road construction (in kms/day), 2013-14

5 Embarking towards the Horizon of Success and Prosperity, Progressive Year Book May 2015, Ministry of Road Transport and Highways, Available at <http://pib.nic.in/eventsite/ebook/pdf/MinistryofRoadTransportandHighways.pdf>, Last Accessed on February 24, 2016.

6 Efficiency Parameters, Ministry of Road Transport and Highways, Available at <http://morth.nic.in/showfile.asp?lid=1520>, Last Accessed on December 23, 2015.

7 Roads Min Seeks Rs. 80,000 Crore to Expand Highways, The Economic Times, January 14, 2016.





Findings of the survey 02

To estimate the operational costs of a 9-15 tonne truck, a survey was carried out on 28 major routes in 2014-15. *Table 1* shows the routes and the number of trips for each route for which data was collected. It may be noted that a trip can be in either direction. Also, *Table 1* comprised truck capacities and commonality of routes with the 2008-09 and 2011-12 surveys.

Table 1: Routes, number of trips, truck capacities and commonality of routes with 2008-09 and 2011-12 surveys

| Sr. No. | Route between | | No. of trips | Truck capacity (MT) | Commonality with 2011-12 survey | Commonality with 2008-09 survey |
|--------------|---------------|------------|--------------|---------------------|---------------------------------|---------------------------------|
| 1 | Delhi | Bangalore | 30 | 15 | Yes | Yes |
| 2 | Delhi | Mumbai | 30 | 15 | Yes | Yes |
| 3 | Delhi | Chennai | 4 | 15 | Yes | Yes |
| 4 | Delhi | Kolkata | 4 | 15 | Yes | Yes |
| 5 | Mumbai | Chennai | 4 | 15 | Yes | Yes |
| 6 | Mumbai | Kolkata | 4 | 15 | Yes | Yes |
| 7 | Chennai | Kolkata | 4 | 15 | Yes | Yes |
| 8 | Indore | Guwahati | 4 | 15 | Yes | Yes |
| 9 | Pune | Hyderabad | 4 | 15 | Yes | Yes |
| 10 | Ahmedabad | Coimbatore | 4 | 15 | Yes | Yes |
| 11 | Ahmedabad | Bangalore | 4 | 15 | Yes | No |
| 12 | Ahmedabad | Delhi | 4 | 15 | Yes | No |
| 13 | Bangalore | Mumbai | 4 | 15 | Yes | No |
| 14 | Guwahati | Delhi | 4 | 15 | Yes | No |
| 15 | Hyderabad | Delhi | 4 | 15 | Yes | No |
| 16 | Kolkata | Bangalore | 4 | 15 | Yes | No |
| 17 | Nagpur | Delhi | 4 | 15 | Yes | No |
| 18 | Nagpur | Bangalore | 4 | 15 | No | No |
| 19 | Nagpur | Pune | 4 | 9 | No | No |
| 20 | Pune | Delhi | 4 | 15 | No | No |
| 21 | Delhi | Kanpur | 4 | 9 | No | No |
| 22 | Delhi | Chandigarh | 4 | 9 | No | No |
| 23 | Pune | Chennai | 4 | 9 | No | No |
| 24 | Raipur | Delhi | 4 | 15 | No | No |
| 25 | Kolkata | Guwahati | 4 | 15 | No | No |
| 26 | Bangalore | Ernakulam | 4 | 9 | No | No |
| 27 | Ahmedabad | Salem | 4 | 9 | No | No |
| 28 | Indore | Chennai | 4 | 9 | No | No |
| Total | | | 164 | | | |

For each of the Delhi-Bangalore and Delhi-Mumbai routes, data was collected across 30 trips (15 trips from Delhi to Bangalore/Mumbai and 15 trips from Bangalore/Mumbai to Delhi). Similarly, for each of the remaining 26 routes, data was collected on four trips (two trips in each direction).

Since each of the Delhi-Bangalore and Delhi-Mumbai routes constituted 30 trips, they were analyzed and compared. Since the same routes were analyzed

in the 2008-09 and 2011-12 surveys, a longitudinal comparison helped identify significant differences.

For the remaining 26 routes, since the number of observations was small, the survey results for these routes were only indicative and not necessarily generalisable.

The last 11 routes in *Table 1* were new additions in the 2014-15 survey over the 2011-12 survey.

2.1

Findings of the Delhi-Bangalore route survey: Comparison with the 2008-09 and 2011-12 surveys

Table 2 shows the summary statistics for 30 trips on the Delhi-Bangalore route.

Table 2: Summary statistics for the Delhi-Bangalore route

| Parameter | Unit | Minimum | Maximum | Average |
|----------------------------|--------------|---------|---------|---------|
| Distance | Km | 2110 | 2140 | 2130.33 |
| Journey time | Hours | 78 | 96 | 88.4 |
| Average speed | Km/hour | 30.84 | 41.72 | 35.93 |
| Mileage | Km/Lt | 4.03 | 4.03 | 4.03 |
| Loading/documentation time | Hours | 3.5 | 6 | 4.53 |
| No. of stops | -- | 27 | 33 | 31.07 |
| Stoppage delay | Hours | 4 | 10 | 6.88 |
| Stoppage delay per km | Hours/km | 0.0019 | 0.0047 | 0.0032 |
| Stoppage expenses | Rs./tonne-km | 0.31 | 0.36 | 0.35 |
| Trip expenses | Rs./tonne-km | 1.38 | 1.59 | 1.45 |
| Freight rate | Rs./tonne-km | 1.78 | 2.20 | 1.94 |
| Contribution margin | % | 18.65 | 55.21 | 34.54 |

Table 3 compares the 2008-09 and 2011-12 surveys with the 2014-15 survey based on some important statistics.

Table 3: Comparison of the 2008-09, 2011-12 and 2014-15 surveys

| Parameter | Unit | 2008-09 Average | 2011-12 Average | 2014-15 Average |
|-----------------------|--------------|--------------------|--------------------|--------------------|
| Journey time | Hours | 102.18 | 94.47 | 88.4 |
| Average speed | Km/hour | 21.73 | 22.71 | 35.93 |
| Mileage | Km/Lt | 3.6 | 4.06 | 4.03 |
| No. of stops | – | 25.30 | 30.33 | 31.07 |
| No. of toll stops | – | 15.47 | 21.13 | 19 |
| Stoppage delay per km | Hours/km | 0.0024 | 0.0028 | 0.0032 |
| Toll delay per km | Hours/km | 0.0012 | 0.0019 | 0.0010 |
| Stoppage expenses | Rs./tonne-km | 0.15 | 0.15 | 0.35 |
| Toll expenses | Rs./tonne-km | 0.07 | 0.11 | 0.17 |
| Trip expenses | Rs./tonne-km | 0.99 | 1.02 | 1.45 |
| Freight rate | Rs./tonne-km | 1.39 | 1.56 | 1.94 |
| Contribution margin | % | 40.40 | 53.68 | 34.54 |

133

% increase in average
stoppage expenses





It may be observed from *Table 3* that there have been gradual improvements in terms of the average journey time and average vehicle speed over the years.

It may be observed from *Table 3* that there have been gradual improvements in terms of the average journey time and average vehicle speed over the years. On the other hand, vehicle mileage remained more or less the same over three years.

While the average number of stops due to RTO, toll, sales tax, entry tax etc. marginally increased in 2014-15 over 2011-12, the average number of toll stops, marginally decreased over the same period. While the average stoppage delay per km worsened, the average toll delay per km actually improved in 2014-15 over 2011-12.

As far as stoppage expenses were concerned, average stoppage expenses per tonne-km increased by 133.33% in 2014-15 over 2011-12. Average toll expenses per tonne-km, on the other hand, increased by 54.55% during the same period. In other words, average toll expenses per tonne-km as a percentage of average stoppage expenses per tonne-km decreased from 73.33% to 48.57%.

The above observation indicates that while the toll collection infrastructure on this route might have improved over the past three years, on-road delays and expenses, due to reasons other than toll collection, increased so much during this period that even if the average toll delay per km and average toll expenses per tonne-km as a

percentage of average stoppage expenses per tonne-km decreased over the past three years, the average stoppage delay per km and average stoppage expenses per tonne-km worsened during this period.

This is in contrast to the observation made during the 2011-12 survey, when it was found that toll delays and toll expenses were making increasing contributions to stoppage delays and stoppage expenses, respectively, over the years. In the 2014-15 survey, it was found that on-road delays and expenses caused by factors other than toll collection were making increasing contributions to stoppage delays and stoppage expenses, respectively.

It was also observed from *Table 3* that while the average trip expenses per tonne-km increased 42.16% in three years, the average freight rate per tonne-km increased only 24.36% during this period, resulting in a decrease in the average contribution margin from 53.68% to 34.54%, which was even lower than the average contribution margin in 2008-09.

The composition was almost the same as in the 2008-09 and 2011-12 surveys, with fuel cost being the largest (53%) contributor to trip expenses. The contribution of on-road expenses increased from 28% in 2011-12 to 33% in 2014-15.

Figure 1 shows the composition of trip expenses, including fuel cost, on-road stoppage and other expenses, driver's wage/allowance, and maintenance/repair cost.

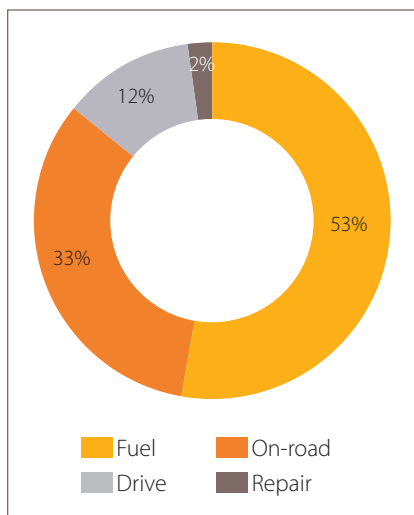


Figure 1: Composition of trip expenses



2.1.1

Allocation of overhead expenses

Based on the data on the annual distance-specific and time-specific overhead expenses for a 15-tonne truck as shown in *Table 4*, the overhead expenses to be allocated to individual trips were determined, which were then added to the variable trip expenses to obtain the actual trip expenses, including overheads.

Table 4: Annual overhead expenses for a 15-tonne truck

| Overhead | Unit | Expense |
|---|--------|---------|
| Distance-specific overhead | | |
| Lubricants | Rs. | 32,400 |
| Spares | Rs./km | 0.50 |
| Tyres | Rs./km | 2.75 |
| Time-specific overhead | | |
| Staff/Administration | Rs. | 336,000 |
| Depreciation (@15%) | Rs. | 292,500 |
| Interest | Rs. | 93,600 |
| Tax/Insurance | Rs. | 77,000 |
| Annual vehicle utilisation and operating hours | | |
| Vehicle utilisation | Km | 108,000 |
| Operating hours | Hours | 6,000 |

The annual cost of lubricants was Rs.32,400, which, divided by the annual vehicle utilisation of 108,000 km, generated the cost of lubricants per km at Rs. 0.30/km.

Similarly, the annual cost of spares was Rs.54,000, which gave Rs. 0.50/km as the cost of spares per km. For a 15-tonne truck, 10 tyres, which ran 60,000 km, cost Rs.165,000, giving Rs. 2.75/km as the cost of tyres per km. Therefore, the distance-specific overhead cost was Rs. 3.55/km, which, divided by the truck capacity of 15 tonnes, gave Rs. 0.24/km as the distance-specific overhead cost per tonne-km.

The annual time-specific overhead cost comprised the annual staff and administrative expenses (salary for driver and maintenance staff), annual depreciation charge (@15% annually, 75% of the value of the vehicle was depreciated in five years), annual interest charge and annual tax and insurance charges for a

vehicle. Therefore, the annual time-specific overhead cost for a 15-tonne truck was Rs.799,100, which, divided by the annual operating hours, gave the time-specific overhead cost per hour of Rs.133.18/hour.

For a particular trip, this figure was multiplied by the journey time, then divided by the distance travelled and the capacity of the truck to obtain the time-specific overhead cost per tonne-km for that trip. To give an example, if the journey time was 85 hours and the distance travelled 2,130 km for a trip, the time-specific overhead cost was Rs. $(133.18 \times 85)/(15 \times 2,130)$ per tonne-km, i.e. Rs. 0.35/tonne-km for that trip.

The average distance- and time-specific overhead cost for 30 trips was Rs. 0.61/tonne-km. Adding the same to the average trip expenses of Rs. 1.45/tonne-km, the average overall trip expenses including overheads became Rs. 2.06/tonne-km,



Figure 2 shows the composition of trip expenses including overheads.

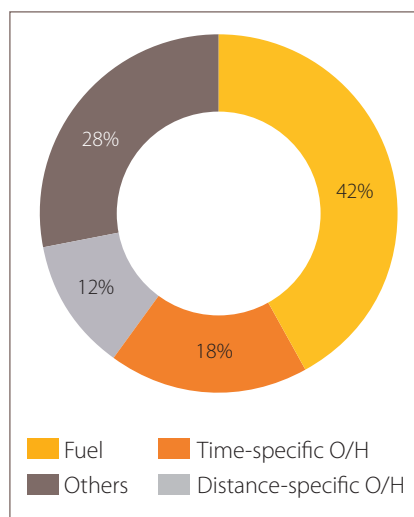


Figure 2: Composition of trip expenses including overheads (O/H)

which was more than the average freight rate of Rs. 1.94/tonne-km, resulting in a 'loss' of 5.8%.

The 'loss' may not be indicative of the general trend in the transport market, and may have been caused by unforeseen and uncontrollable factors. In general, the actual profit/loss margin depended on a host of factors such as the route, commodity, time of year, and the transport markets at the origin and destination. Table 5 shows the summary statistics in terms of trip expenses, including overheads, freight rate and profit margin for 30 trips.

It was observed from the data that 22 out of the 30 trips did actually incur 'losses' when overhead costs were included.

This was in contrast to the observation made during the 2011-12 survey when it was found that only two of the 30 trips incurred 'losses' when overhead costs were included and the average profit margin was 7.49%.

The 'loss' observed in the 2014-15 survey seems to have been caused, as mentioned before, by the disproportionate increase in the average freight rate vis-à-vis the increase in average trip expenses.

This observation was more or less similar to that in the 2008-09 and 2011-12 surveys, i.e. fuel and overheads constituted the major portions of the trip expenses, contributing 42% and 30%, respectively.

Table 5: Trip expenses including overheads, freight rates and profit margins

| Parameter | Unit | Minimum | Maximum | Average |
|-----------------------------------|--------------|---------|---------|---------|
| Trip expenses including overheads | Rs./tonne-km | 1.94 | 2.21 | 2.05 |
| Freight rate | Rs./tonne-km | 1.78 | 2.20 | 1.94 |
| Profit margin | % | -16.54 | 9.14 | -5.14 |

2.1.2

Cost of delay

The cost of additional fuel consumption was taken into consideration by the actual fuel expenses for a trip. However, the other components of the cost of delay were to be ascertained based on the additional data presented in *Table 6*.

The annual profit, interest charges, depreciation, tax and insurance, together amounted to Rs. 646,100, which, divided by the annual operating hours (6,000 hours), gave the cost of delay per hour, i.e. Rs. 107.68/hour. When the driver was to be paid an additional daily allowance due to delay, the same was accounted. *Table 7* shows the summary statistics in respect of trip expenses and contribution margins with the additional delay costs.

The average cost of delay was Rs. 109.53/hour and the average trip expenses, after including the costs of delay, was Rs. 1.47/tonne-km. Trip expenses including the costs of delay were, on an average, only 1.64% more than the trip expenses without accounting for the costs of delay. Also, the average contribution margin reduced slightly from 34.54% to 32.36%. The observations were in line with those from the 2008-09 and 2011-12 surveys.

To include the shipper's inventory-carrying cost due to delay, the value of commodity was multiplied by the cost of capital and

delay time, then added to the aforementioned cost of delay to obtain the per hour cost of delay, inclusive of the additional inventory carrying expenses borne by the shipper.

The average cost of delay, including the shipper's expenses, was Rs. 151.38/hour. The figure may seem insignificant; however, the effect of delay on the economy is not insignificant. For example, the average stoppage delay for a typical goods vehicle on Indian roads was 0.0030 hours/km.

Considering the average annual utilisation of a goods vehicle to be 100,000 km, the average annual stoppage delay for a goods vehicle would be 300 hours. Also, considering the average cost of delay to be Rs. 150/hour, the annual cost of delay for a goods vehicle would be Rs. 45,000.

As per the Road Transport Year Book 2011-12⁶, available on the Ministry of Road Transport and Highways website, there were about 7.6 million goods vehicles as on March 31, 2012, increasing at 8-9% per annum in the last couple of years.

If we consider a conservative 8% growth, the number of goods vehicles as on March 31, 2015 is estimated at about 9.6 million, which means that the annual cost of delay to the Indian economy could be a whopping Rs.432 billion or USD 6.6 billion⁷!

Table 6: Additional data required for estimating delay cost components

| Parameter | Unit | Value |
|-----------------|------------|---------|
| Annual profit | Rs. | 183,000 |
| Cost of capital | Re/Re/Year | 0.10 |

Table 7: Trip expenses and contribution margins including the costs of delay

| Parameter | Unit | Minimum | Maximum | Average |
|---------------------------|--------------|---------|---------|---------|
| Cost of delay | Rs./hour | 107.68 | 136.25 | 109.53 |
| Trip expenses | Rs./tonne-km | 1.40 | 1.62 | 1.47 |
| Increase in trip expenses | % | 0.89 | 2.37 | 1.64 |
| Real contribution margin | % | 16.57 | 51.61 | 32.36 |

6. <http://morth.nic.in/showfile.asp?lid=1131>, Last Accessed on November 3, 2015

7. USD 1 ~ Rs. 65.5 as on November 4, 2015



It was observed from the data that 22 out of the 30 trips did actually incur 'losses' when overhead costs were included.

2.1.3

Cost of additional fuel consumption

Additional fuel is consumed due to poor road conditions, slow vehicular speed and idling at stoppages. If vehicles are more fuel-efficient, road conditions improved and stoppage delays minimised, vehicles would report higher mileage, leading to lower trip expenses and higher contribution margins. A sensitivity analysis was carried out to ascertain the effect of increased mileage on trip expenses and contribution margins.

According to the given data for 30 trips, the average mileage of vehicles was 4.03 kmpl, average trip expenses were Rs. 1.45/tonne-km and contribution margin 34.54%. A sensitivity analysis was carried out for 4.1, 4.3 and 4.5 kmpl, which showed reductions in average trip expenses and

improvements in average contribution margins for higher mileage. *Table 8* shows the effect of mileage on average trip expenses and contribution margins. *Figure 3* shows the effect of mileage on average trip expenses.

If mileage can be improved by increasing fuel efficiency, improving road conditions and reducing stoppage delays, the impact on the economy could be huge. To give an example, if Re. 1/km can be saved due to increased mileage and if the average distance travelled by a goods vehicle in a year is 100,000 km, the annual saving realised by a goods vehicle would be Rs. 100,000. For 9.6 million goods vehicles, the saving to the economy would be Rs. 960 billion or USD 14.7 billion⁸!

Table 8: Effect of mileage on average trip expenses and contribution margins

| Mileage (kmpl) | Average trip expenses (Rs./tonne-km) | Average contribution margin (%) |
|----------------|--------------------------------------|---------------------------------|
| 4.03 | 1.45 | 34.54 |
| 4.1 | 1.43 | 35.93 |
| 4.3 | 1.39 | 39.81 |
| 4.5 | 1.36 | 43.55 |

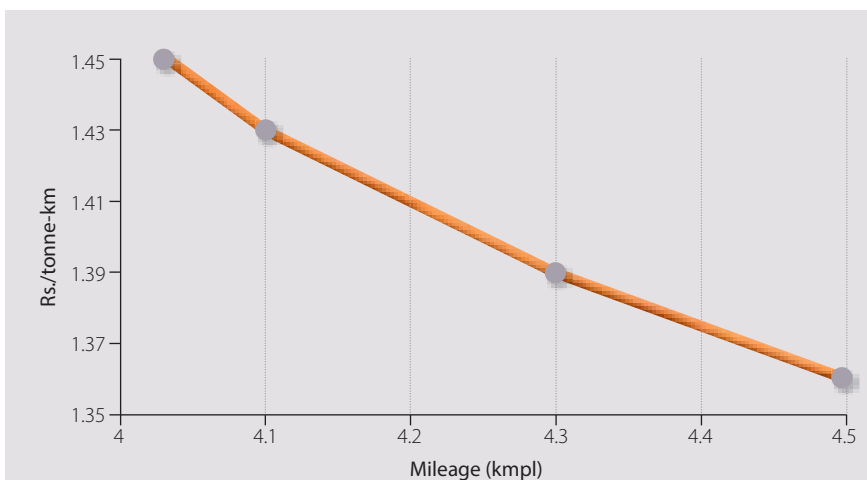


Figure 3: Effect of mileage on average trip expenses

8. USD 1 ~ Rs. 65.5 as on November 4, 2015



14.7

The national economic saving arising out of enhanced fuel efficiency across 9.6 million goods vehicles (USD billion)

2.2

Findings of the Delhi-Mumbai route survey: Comparison with the 2011-12 survey

Table 9 shows the summary statistics for 30 trips on the Delhi-Mumbai route.

Table 9: Summary statistics for the Delhi-Mumbai route

| Parameter | Unit | Minimum | Maximum | Average |
|----------------------------|--------------|---------|---------|---------|
| Distance | Km | 1343 | 1388 | 1359.40 |
| Journey time | Hours | 41 | 58 | 52.07 |
| Average speed | Km/hour | 26.96 | 44 | 33.56 |
| Mileage | Km/Lt | 4.03 | 4.03 | 4.03 |
| Loading/documentation time | Hours | 3.25 | 7.50 | 4.99 |
| Number of stops | -- | 22 | 27 | 24.50 |
| Stoppage delay | Hours | 1.87 | 4 | 2.68 |
| Stoppage delay per km | Hours/km | 0.0014 | 0.0029 | 0.0020 |
| Stoppage expenses | Rs./tonne-km | 0.35 | 0.41 | 0.37 |
| Trip expenses | Rs./tonne-km | 1.36 | 1.56 | 1.42 |
| Freight rate | Rs./tonne-km | 1.67 | 2.31 | 2.01 |
| Contribution margin | % | 15.61 | 68.26 | 41.08 |

Table 10 compares the 2011-12 survey with the 2014-15 survey based on some important statistics.

Table 10: Comparison of the 2011-12 and 2014-15 surveys

| Parameter | Unit | 2011-12 Average | 2014-15 Average |
|-----------------------|--------------|-----------------|-----------------|
| Journey time | Hours | 65.13 | 52.07 |
| Average speed | Km/hour | 21.35 | 33.56 |
| Mileage | Km/Lt | 4.15 | 4.03 |
| Number of stops | -- | 18 | 24.50 |
| Number of toll stops | -- | 16 | 21.13 |
| Stoppage delay per km | Hours/km | 0.0024 | 0.0020 |
| Toll delay per km | Hours/km | 0.0019 | 0.0015 |
| Stoppage expenses | Rs./tonne-km | 0.22 | 0.37 |
| Toll expenses | Rs./tonne-km | 0.19 | 0.32 |
| Trip expenses | Rs./tonne-km | 1.09 | 1.42 |
| Freight rate | Rs./tonne-km | 1.49 | 2.01 |
| Contribution margin | % | 36.95 | 41.08 |



If Re. 1/km can be saved due to increased mileage and if the average distance travelled by a goods vehicle in a year is 100,000 km, the annual saving realised by a goods vehicle would be Rs. 100,000.



The average trip expenses per tonne-km and the average freight rate per tonne-km increased by 30.28% and 34.9%, respectively, in 2014-15 over 2011-12.

It is observed from *Table 10* that the average journey time and average speed improved in 2014-15 over 2011-12 although the average mileage marginally decreased.

Also, the average total number of stops and the average number of toll stops increased, although the average stoppage delay per km and average toll delay per km decreased in 2014-15 over 2011-12.

A noticeable observation: unlike the Delhi-Bangalore route, the average toll delay per km as a percentage of the average stoppage delay per km and the average toll expenses per tonne-km as a percentage of the average stoppage expenses per tonne-km have remained almost the same in 2014-15 as in 2011-12.

Also, the average trip expenses per tonne-km and the average freight rate per tonne-km increased by 30.28% and 34.9%, respectively, in 2014-15 over 2011-12, resulting in an increase in the average contribution margin by 11.18% over the same period.

Table 11 compares the 2014-15 surveys of the Delhi-Mumbai and Delhi-Bangalore routes based on important statistics. When the Delhi-Mumbai route was compared with the Delhi-Bangalore route, the average speed and mileage were almost the same.

However, the average number of toll stops as a percentage of the average total number of stops was higher for the Delhi-Mumbai route (86.24%) than for the Delhi-Bangalore route (61.15%). The average toll delay per km, as a percentage of the average stoppage delay per km, was higher for the Delhi-Mumbai route (75%) than for the Delhi-Bangalore route (31.25%).

Also, average toll expenses as a percentage of average stoppage expenses was higher for the Delhi-Mumbai route (86.49%) than for the Delhi-Bangalore route (48.57%). The above observations were similar to the findings of the 2011-12 survey.

It seems, for the Delhi-Bangalore route, there were more stops, more delays and

Table 11: Comparison of the 2014-15 surveys of the Delhi-Mumbai and Delhi-Bangalore routes

| Parameter | Unit | Delhi-Mumbai Route | Delhi-Bangalore Route |
|-----------------------|--------------|--------------------|-----------------------|
| | | 2014-15 Average | 2014-15 Average |
| Journey time | Hours | 52.07 | 88.4 |
| Average speed | Km/hour | 33.56 | 35.93 |
| Mileage | Km/Lt | 4.03 | 4.03 |
| Number of stops | -- | 24.50 | 31.07 |
| Number of toll stops | -- | 21.13 | 19 |
| Stoppage delay per km | Hours/km | 0.0020 | 0.0032 |
| Toll delay per km | Hours/km | 0.0015 | 0.0010 |
| Stoppage expenses | Rs./tonne-km | 0.37 | 0.35 |
| Toll expenses | Rs./tonne-km | 0.32 | 0.17 |
| Trip expenses | Rs./tonne-km | 1.42 | 1.45 |
| Freight rate | Rs./tonne-km | 2.01 | 1.94 |
| Contribution margin | % | 41.08 | 34.54 |

more expenses incurred due to stops (other than toll stops), such as RTO, check posts, sales tax, entry tax, state borders, police intervention, etc. than for the Delhi-Mumbai route, making the Delhi-Bangalore route less efficient than the Delhi-Mumbai route.

On the other hand, in contrast to the findings of the 2011-12 survey, average trip expenses per tonne-km were higher for the Delhi-Bangalore route than for the Delhi-Mumbai route, whereas average freight rates per tonne-km for the Delhi-Mumbai route were higher than the same for the Delhi-Bangalore route, resulting in a higher average contribution margin for the Delhi-Mumbai route.

Figure 4 shows the composition of trip expenses, including fuel cost, on-road stoppage and other expenses, driver's wage/allowance, and maintenance/repair cost.

It is observed from Figure 4 that fuel cost and on-road stoppage and other expenses were major components of trip expenses, contributing 51% and 39%, respectively. The figures were similar to those for the 2011-12 survey.

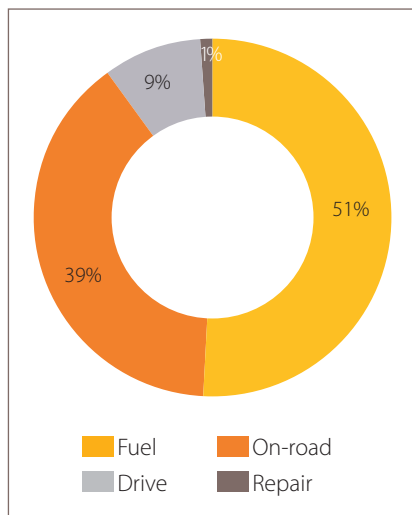


Figure 4: Composition of trip expenses







2.2.1

Allocation of overhead expenses

Based on the data shown in *Table 4*, overhead expenses were computed according to the rationale presented thereafter. The overhead expenses were added to the trip expenses to arrive at the actual trip expenses.

Table 12 shows the summary statistics in terms of the trip expenses including overheads, freight rate and profit margin for the 30 trips.

It may be observed from *Table 12* that even if the average contribution margin was 41.08%, the Delhi-Mumbai route actually incurred a small profit of 0.46% when overheads were included. Out of the 30 trips, 15 actually resulted in 'losses' and all these 15 trips were from Delhi to Mumbai. It was also observed from the data that while the average trip expenses

per tonne-km for these 15 trips from Delhi to Mumbai were the same as the average trip expenses per tonne-km for all the 30 trips, the average freight rate from Delhi to Mumbai of Rs. 1.74/tonne-km, was lower than the overall average of Rs. 2.01/tonne-km, indicating that the Delhi-Mumbai (one-way) route was less profitable than the Mumbai-Delhi (one-way) route.

This validates that freight rates may vary depending on the route, an observation similar to the 2011-12 survey.

It may be observed from Figure 5 that fuel and overhead expenses contributed 44% and 29%, respectively, to the overall trip expenses. The observation is similar to that in the 2011-12 survey.

Figure 5 shows the composition of trip expenses including overheads.

Table 12: Trip expenses including overheads, freight rates and profit margins

| Parameter | Unit | Minimum | Maximum | Average |
|-----------------------------------|--------------|---------|---------|---------|
| Trip expenses including overheads | Rs./tonne-km | 1.89 | 2.08 | 2.00 |
| Freight rate | Rs./tonne-km | 1.67 | 2.31 | 2.01 |
| Profit margin | % | -17.54 | 20.06 | 0.46 |

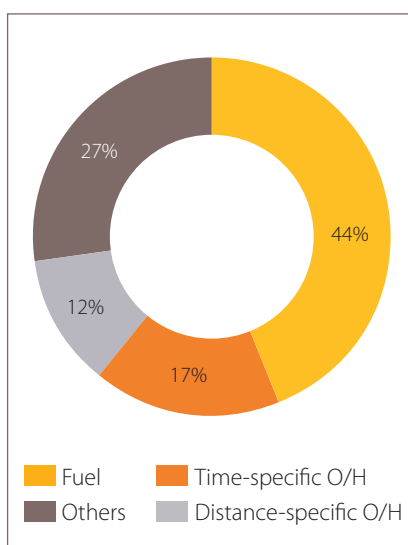


Figure 5: Composition of trip expenses including overheads (O/H)



2.2.2

Cost of delay

Just as for the Delhi-Bangalore route, the cost of delay for the Delhi-Mumbai route was also calculated, and statistics related to trip expenses, including the cost of delay and the real contribution margin, shown in *Table 13*.

The average cost of delay was Rs. 128.66/hour. Average trip expenses increased

by 1.17% to Rs. 1.44/tonne-km and the average contribution margin decreased from 41.08% to 39.42%. If the shipper's inventory carrying cost due to delay was included, the cost of delay became Rs. 166.87/hour. As already estimated before, the cost to the economy due to delay runs into billions of rupees.



If the shipper's inventory carrying cost due to delay was included, the cost of delay became Rs. 166.87/hour.

Table 13: Trip expenses and contribution margins including the costs of delay

| Parameter | Unit | Minimum | Maximum | Average |
|---------------------------|--------------|---------|---------|---------|
| Cost of delay | Rs./hour | 107.68 | 317.47 | 128.66 |
| Trip expenses | Rs./tonne-km | 1.38 | 1.57 | 1.44 |
| Increase in trip expenses | % | 0.68 | 2.65 | 1.17 |
| Real contribution margin | % | 14.83 | 64.74 | 39.42 |



2.2.3

Cost of additional fuel consumption

The average trip expenses and contribution margin were Rs. 1.42/tonne-km and 41.08%, respectively, for an average mileage of 4.03 kmpl. A sensitivity analysis was carried out to check the impact of increasing mileage of 4.1, 4.3 and 4.5 kmpl on the average trip expenses and contribution margin. *Table 14* shows the

effect of mileage on average trip expenses and contribution margins. Figure 6 shows the effect of mileage on average trip expenses.

Improved mileage can save billions of U.S. dollars in foreign exchange expended for the import of crude oil.

Table 14: Effect of mileage on average trip expenses and contribution margins

| Mileage (kmpl) | Average trip expenses (Rs./tonne-km) | Average contribution margin (%) |
|----------------|--------------------------------------|---------------------------------|
| 4.03 | 1.42 | 41.08 |
| 4.1 | 1.41 | 42.58 |
| 4.3 | 1.37 | 46.78 |
| 4.5 | 1.33 | 50.82 |



2.3

Findings of the other 26 routes survey

54.62

% the average contribution margin in 2014-15.

Tables A.1 – A.26 in the Annexure show the summary statistics for the other 26 routes. Out of these 26 routes, the first eight routes were also covered in the 2008-09 and 2011-12 surveys, and the next seven routes were covered in the 2011-12 survey. The last 11 routes were new additions in the 2014-15 survey.

Therefore, for the first eight routes, comparisons of the 2008-09, 2011-12 and 2014-15 survey data were made, and for the next seven routes, comparisons of the 2011-12 and 2014-15 survey data were made. It is observed from the first 15 routes survey that while the average vehicular speed improved and journey time reduced, to a significant extent on most of the routes, the average mileage of vehicles either slightly improved or remained almost at the same level over the years.

The average stoppage delay per km, which showed mixed results, improved across eight routes while on seven routes, it worsened. Average stoppage expenses per tonne-km, on the other hand, increased on most routes.



The variation in average freight rates per tonne-km, on the other hand, could be attributed to fluctuations in the demand for and supply of trucks in the origin and destination markets.

Average trip expenses and freight rates per tonne-km increased for a majority of routes. The average contribution margin improved for 11 routes and deteriorated for the remaining four routes. However, since data for only four trips were available for each of these 15 routes, it was difficult to draw a general conclusion.

Table 15 compares the 28 routes with respect to some key parameters. These 28 routes are high-volume routes representing freight transportation by road in India. Therefore, for each parameter, the average was computed across all 28 routes, which was indicative of the national average for that parameter.

Different routes show different characteristics. However, some of the notable observations are as follows. For the routes spanning the cities in the eastern and north-eastern parts of India, such as Kolkata and Guwahati, the average vehicular speed was almost always on the lower side, lower than the national average, while the average stoppage delay per km is almost always on the higher side, higher than the national average. This indicated poor road conditions, higher stops due to check posts and on-road police intervention, and higher stoppage delays.

Average stoppage expenses per tonne-km varied across routes depending on the number of toll, other types of stops and related expenses. The variation in average trip expenses per tonne-km can be attributed to the variations in fuel and on-road expenses across various routes.

The variation in average freight rates per tonne-km, on the other hand, could be attributed to fluctuations in the demand for and supply of trucks in the origin and destination markets. The average contribution and profit margins (after apportioning overhead costs) were 62.80% and 12.28%, respectively.

However, while the first 22 routes represented carrying freight, the last six routes represent the express service, which is a value-added service whose contribution and profit margins are generally higher than those for freight. Therefore, if we consider freight and XPS separately, the average contribution and profit margins for freight for the first 22 routes turned out to be 54.62% and 7.23%, respectively, while the corresponding figures for XPS for the last six routes were 92.78% and 30.80%.

If we compare the data with that for the 2011-12 survey, we observe that the average vehicular speed improved (from 19.75 kmph to 31.88 kmph), the average stoppage delay per km remained almost the same (0.0032 hours/km vis-à-vis 0.0034 hours/km), and the average stoppage expenses per tonne-km worsened (from Rs. 0.16/tonne-km to Rs. 0.28/tonne-km) in 2014-15.

The average contribution margin, on the other hand, improved from 45.08% in 2011-12 to 54.62% in 2014-15. However, caution should be exercised in drawing any general conclusion since, except for the Delhi-Bangalore and Delhi-Mumbai routes, for each of the other 26 routes, data was available only for four trips.

Table 10: Comparison of 28 major routes

| Parameter Route | Average speed (kmph) | Average mileage (kmpl) | Average delay per km (Hrs/ km) | Average stoppage expenses (Rs./ tonne-km) | Average trip expenses (Rs./tonne- km) | Average freight rate (Rs./tonne- km) | Average contribution per trip (Rs.) |
|--------------------------|----------------------------|------------------------------|---|--|--|---|---|
| Delhi-Bangalore | 35.93 | 4.03 | 0.0032 | 0.35 | 1.45 | 1.94 | 15869.42 |
| Delhi-Mumbai | 33.56 | 4.03 | 0.0020 | 0.37 | 1.42 | 2.01 | 11934.79 |
| Delhi-Chennai | 45 | 4.03 | 0.0029 | 0.29 | 1.37 | 1.62 | 10896.60 |
| Delhi-Kolkata | 21.10 | 3.95 | 0.0046 | 0.33 | 1.46 | 2.11 | 14563.75 |
| Mumbai-Chennai | 26.30 | 4.03 | 0.0023 | 0.25 | 1.36 | 2.28 | 18936.65 |
| Mumbai-Kolkata | 20.79 | 4.03 | 0.0027 | 0.17 | 1.34 | 2.32 | 28490.70 |
| Chennai-Kolkata | 37.10 | 4.03 | 0.0028 | 0.18 | 1.22 | 2.24 | 26227.75 |
| Indore-Guwahati | 20.56 | 4.035 | 0.0059 | 0.24 | 1.48 | 2.26 | 26229.85 |
| Pune-Hyderabad | 23.70 | 4.03 | 0.0016 | 0.16 | 1.38 | 2.43 | 9782.69 |
| Ahmedabad- Coimbatore | 31.20 | 4.03 | 0.0013 | 0.13 | 1.32 | 2.38 | 27249.60 |
| Ahmedabad- Bangalore | 39.28 | 4.03 | 0.0031 | 0.25 | 1.41 | 2.27 | 20126.25 |
| Ahmedabad-Delhi | 34.09 | 4.03 | 0.0031 | 0.31 | 1.48 | 2.67 | 16153.92 |
| Bangalore-Mumbai | 37.15 | 4.04 | 0.0021 | 0.29 | 1.45 | 2.53 | 17114.55 |
| Guwahati-Delhi | 31.15 | 4.03 | 0.0068 | 0.35 | 1.43 | 2.20 | 25499.75 |
| Hyderabad-Delhi | 31.95 | 4.03 | 0.0021 | 0.20 | 1.29 | 1.98 | 17974.15 |
| Kolkata-Bangalore | 27.07 | 4.03 | 0.0038 | 0.26 | 1.47 | 1.82 | 10483.73 |
| Nagpur-Delhi | 29.82 | 4.03 | 0.0011 | 0.20 | 1.29 | 2.07 | 14056.85 |
| Nagpur-Bangalore | 34.93 | 4.03 | 0.0032 | 0.38 | 1.56 | 1.98 | 7268.48 |
| Nagpur-Pune | 37.69 | 4.03 | 0.0020 | 0.10 | 1.91 | 2.65 | 4836.83 |
| Delhi-Pune | 43.09 | 4.03 | 0.0021 | 0.38 | 1.48 | 2.15 | 14262.93 |
| Delhi-Kanpur | 32.48 | 4.03 | 0.0007 | 0.21 | 2.49 | 4.24 | 7598.44 |
| Delhi-Chandigarh | 41.07 | 4.03 | 0.0010 | 0.48 | 2.20 | 2.68 | 1578.51 |
| Pune-Chennai | 41.50 | 4.05 | 0.0016 | 0.24 | 1.84 | 2.49 | 7232.50 |
| Delhi-Raipur | 27.00 | 4.00 | 0.0035 | 0.34 | 1.25 | 2.88 | 36814.50 |
| Kolkata-Guwahati | 11.62 | 4.00 | 0.0169 | 0.18 | 1.27 | 3.38 | 36868.50 |
| Bangalore-Ernakulam | 17.42 | 4.00 | 0.0020 | 0.29 | 2.00 | 4.19 | 12024.25 |
| Ahmedabad-Salem | 40.05 | 4.50 | 0.0020 | 0.35 | 2.05 | 3.10 | 16906.00 |
| Indore-Chennai | 40.00 | 4.50 | 0.0092 | 0.45 | 2.01 | 3.31 | 18961.75 |





Multi-modal transportation 03

Multi-modal or intermodal transportation refers to the shipping of goods from the point of origin to the point of destination using more than one transportation modes such as a combination of rail, road, waterways and airways.

The advantages of multi-modal transportation comprise efficiency, economies of scale, reduced transportation costs, door-to-door delivery, reduced fuel consumption and reduced environmental pollution due to shifting of load from road to other transportation modes. However, there are also some challenges such as coordination among the different transportation modes for seamless delivery, delay during modal shifts, different rules and regulations applicable to diverse transportation modes, single or multiple service providers as points of contact and mismatch between the shipper expectations and experiences.

In this section, we discuss the current scenario of multi-modal transportation and prospects in India.



3.1

Current scenario

As mentioned earlier, in India roads and railways carry about 65% and 30% of the freight, respectively. The rest of the freight is carried by waterways and airways. While coastal shipping and inland waterways are constrained by infrastructural bottlenecks and not receiving due attention, airways are normally used for the shipment of high-value, time-sensitive and perishable goods, such as life-saving drugs.

Also, waterways and airways have limited networks and cannot be relied upon for point-to-point delivery. Therefore, in India, multi-modal transportation is limited to modal shifts between roads and railways.

Historically, roads carry branded, time-sensitive FMCG and durable goods while railways are used for shipping commodities such as coal, cement, steel, iron ore, food grains and petroleum products. Road transportation is more efficient than railways in terms of reliable and timely door-to-door delivery.

Also, vehicles are available for loading almost in real-time depending on their supply and demand in the transport market. Railways, on the other hand, are affected by inefficiency, unreliability, poor

service and a real-time unavailability of rakes for loading and subsequent delivery.

Moreover, as per the policy of the Ministry of Railways, passenger transportation is accorded a higher priority over freight transportation; since passenger trains and goods trains share the same railway tracks, the average speed of goods trains is generally low.

However, the advantages of railways over road transportation comprise a reduction in costs due to economies of scale and a reduced consumption of fossil fuels, thereby saving precious foreign exchange in the import of crude oil and reducing carbon emissions. *Table 16* shows for 15 selected routes, the transit times and costs per tonne for multi-modal transportation involving roads and railways where the first-mile (up to 50 km) and last-mile (up to 50 km) connectivity is provided by roads and railways carry freight for the rest of the distance.

Since transit times and road freight cost data for 11 of these 15 routes are available from the survey, they have also been listed in *Table 16* to compare with multi-modal transportation.



Road transportation is more efficient than railways in terms of reliable and timely door-to-door delivery.



65

The percentage of India's freight transport carried by its roads

Table 16: Comparison of multi-modal (rail + road) and road freight costs for selected routes

| Sr. No. | Route | | Transit time (Hours) | | Multi-modal (Rail + Road) freight cost (Rs.) per tonne for different rake capacities | | | Road freight cost (Rs.) per tonne |
|---------|-----------|-----------|----------------------|-------|--|---------|-------|-----------------------------------|
| | From | To | Rail+Road | Road | 17.5 MT | 23.5 MT | 27 MT | 15 MT |
| 1 | Delhi | Chennai | 144 | 94 | 3760 | 3180 | 2990 | 4900 |
| 2 | Delhi | Hyderabad | 120 | 78.5 | 3210 | 2685 | 2510 | 3800 |
| 3 | Delhi | Bangalore | 144 | 91.07 | 3815 | 3240 | 3050 | 4145 |
| 4 | Delhi | Kolkata | 120 | 84.38 | 3040 | 2540 | 2370 | 2835 |
| 5 | Delhi | Guwahati | 360 | 121 | NA | 4045 | 4175 | 5310 |
| 6 | Chennai | Delhi | 120 | 96 | 3685 | 31358 | 2945 | 4465 |
| 7 | Chennai | Guwahati | 360 | NA | NA | 4875 | 4550 | NA |
| 8 | Chennai | Kolkata | 168 | 53 | 3360 | 2920 | 2720 | 4265 |
| 9 | Bangalore | Delhi | 120 | 85.73 | 3905 | 3325 | 3125 | 4140 |
| 10 | Bangalore | Kolkata | 168 | 106 | 3600 | 3035 | 2850 | 4500 |
| 11 | Bangalore | Guwahati | 360 | NA | 5845 | 4910 | 4555 | NA |
| 12 | Hyderabad | Delhi | 120 | 75.5 | 3305 | 2725 | 2530 | 3045 |
| 13 | Kolkata | Delhi | 144 | 82 | 3320 | 2770 | 2545 | 3435 |



20

Percentage of cargo in India that is containerised

It is observed from *Table 16* that while multi-modal transportation requires a longer transit time than for road transportation, the economies of scale for multi-modal transportation are clearly evident, especially when rake capacity increases. The cost of road transportation is almost always higher than for multi-modal transportation for every route.

It is evident from the data shown in *Table 16* that for scale economies, the share of railways in carrying freight should increase beyond the current level. In the US and China, railways carry 47-48% of the total freight volume. According to a study by McKinsey & Co.⁹, in China, roads, railways and waterways carried 22%, 47% and 30%, respectively, of the total freight volume shipped in 2007.

The ideal modal mix for India, as reported by McKinsey & Co., should be an even balance between roads and railways, each carrying about 46-47% of the total freight volume. A 2012 study by Frost & Sullivan¹⁰ reports that the major industries in India availing multi-modal transportation services are engineering goods, pharmaceuticals, retail, automotive,

auto components, electronics and communication. A majority of these industries use a combination of roads and railways although some of them also use a combination of roads and airways, and roads and waterways, depending on the nature of shipment, network, transit time and cost economies.

Some of the major concerns expressed by the survey respondents regarding multi-modal transportation are the lack of coordination between road transport and railways, loading delay at railway stations, unavailability of rakes, lower frequency of goods train movement on certain routes, incompatible policies and procedures between road and rail transportation, and an inability of service providers to offer efficient, seamless and end-to-end transportation solutions.

Another problem associated with freight transportation by railways is the low level of cargo containerisation in India. While in developed countries, the level of cargo containerisation is 80%, in India the figure is 20%. To increase the share of railways in freight movement, the level of cargo containerisation must be enhanced.



The cost of road transportation is almost always higher than that for multi-modal transportation for every route.

9. *Building India: Transforming the Nation's Logistics Infrastructure*, McKinsey & Company Report, July, 2010.

10. *Transportation Modal Shift in India and its Impact on Rail Logistics*, Frost & Sullivan, April, 2013.

The Frost & Sullivan report forecasts that the share of railways in carrying freight would increase by about 5% and the corresponding share of roads would decrease by about the same percentage by 2017. India's international trade is growing at 10-12% annually with a commensurate increase in cargo containerisation.

Most of India's import and export of goods are through major seaports, which need to be connected with the hinterland and mainland through a mix of transportation modes, increasing the need for multi-modal transportation. With increased cargo containerisation, it will also be easier to shift cargo from one mode of transport to another, facilitating a mix of transportation modes.

Earlier, Container Corporation of India (CONCOR) had a monopoly in running container trains. Once Indian Railways opened container freight operations to private operators, many private service providers commenced container freight trains with their own Inland Container Depots (ICD). The entry of private container train operators will increase cargo containerisation.

Freight transportation by railways will also get a boost when the dedicated freight corridors (DFC) become operational by 2015/2016.

The eastern (Ludhiana to Dankuni) and western (Dadri to JNPT) DFCs will cover almost 3,300 route kms, run longer and heavier trains, accommodate faster speeds up to 100 kmph, guarantee transit time and reduce unit transportation costs.

Many large logistics parks with multi-modal facilities have already been set up or are in the process of being set up by private parties either on their own or through collaborations with Government entities such as CONCOR in the public-private partnership (PPP) mode.

MIHAN (Multi-modal International Hub and Airport at Nagpur) and Vizag International Cargo Terminal are two prominent

examples of multi-modal logistics parks (MMLP).

The Ministry of Railways plans to set up 10 MMLPs along the DFCs within 300 km of each other. These MMLPs, spanning 400-500 hectares and built by Government and private funding, would accommodate railway sidings with sheds, container depots, warehouses, office building and assembly units. Once operational, these MMLPs are expected to bring down operational costs by 20-30%.

In the near future, road transportation will still dominate rail transportation in terms of passenger and freight. However, as already mentioned, because of increased cargo containerisation and the operational commencement of DFCs, the share of railways in carrying freight will increase marginally at the cost of a road share.

Air freight will continue to be used only for high-value, time-sensitive and perishable goods, its share of freight movement likely to be limited to 1-2% as before.

Despite possessing a coastline of about 7,500 km and close to 6,000 km of navigable inland waterways in the form of rivers and canals, India's coastal and inland waterway transportation is extensively underutilised, contributing only 3-4% of domestic freight movement by volume. If infrastructural bottlenecks can be removed, there is an immense potential to increase the share of coastal and inland waterways in domestic freight movement that could not only lead to economies of scale, but also reduce carbon emissions and environmental pollution.

As shippers prefer a single-service provider to provide seamless end-to-end multi-modal transportation solutions, large capital investments may be necessary through the PPP mode.

Also, since coordination among the different transportation modes is critical to quality, an apex body, say Multi-Modal Transport Regulatory Authority of India (MMTRA), in line with the Telecom

Regulatory Authority of India (TRAI), may be set up to coordinate the different ministries, i.e. Ministry of Road Transport and Highways, Ministry of Railways, Ministry of Shipping and Ministry of Civil Aviation to facilitate multi-modal transportation.

Sagar Mala Project

The Sagar Mala Project intends to achieve the broad objectives of enhancing the capacity of major and non-major ports and modernising them to make them efficient. This will enable them to become drivers of port-led economic development, optimising the use of existing and future transport assets, developing new transport lines/linkages (including roads, rail, inland waterways and coastal routes), setting up logistics hubs and establishing industries and manufacturing centres to be served by ports in EXIM and domestic trade.

For coastal shipping to be viable, the multimodal chain as a whole, including the land part, has to be efficient and cost-effective. Road capacity is likely to be in short supply and coastal shipping should fill the gap.



It is imperative to divert freight from road to coastal shipping but this is not happening. The movement of freight by coastal ships and the integration of coastal shipping with the transport network could supplement land-based transport modes and relieve the burden on them. Regrettably, coastal shipping has not grown in India and accounts for only 8% of the total domestic freight. Much of this comprises bulk cargo like coal and POL.

Little general cargo moves on the Indian coast despite containerisation. Some of the issues due to which coastal shipping has not grown in India: high

costs at major ports, shallow drafts at non-major ports, inadequate road and rail connectivity, as well as low coastal shipping awareness among cargo shippers and consignees.

Sagar Mala is being envisioned as an integrated infrastructure cum policy initiative for a three-pronged approach for the development of India's maritime sector focusing on port-development, port-led development and inland/coastal shipping supported by enabling policies, institutional framework and funding mechanism leading to inclusive growth. The Union Cabinet, chaired by Prime Minister Shri Narendra Modi,



India's coastal and inland waterway transportation is heavily underutilised, contributing only 3-4% of domestic freight movement by volume.



gave its 'in-principle' approval in March 2015 for the concept and institutional framework of the Sagar Mala Project.

Key benefits of Sagar Mala

Sagar Mala is an integrated infra cum policy initiative to develop India's maritime sector to contribute to the inclusive growth of the Indian economy. The key preliminary/indicative benefits of Sagar Mala initiative are listed below:

Bharat Mala

The Rs 80,000-crore Bharat Mala project, aimed at improving connectivity in border areas including the coastal boundary, may not take off in the current fiscal as stakeholders, including

various ministries and states, are yet to firm up their views on the proposal.

The 7,000-km project, conceived around April this year by the Ministry of Road Transport and Highways, is designed to cover Gujarat, Rajasthan, Punjab, Jammu & Kashmir, Himachal Pradesh, Uttarakhand, part of Uttar Pradesh, Bihar and West Bengal in the first phase and move to Sikkim, Assam, Arunachal Pradesh, Manipur and Mizoram. The Centre is to prepare the final blueprint of the project in consultation with the states and various ministries, including Finance, Home, Shipping and Niti Aayog.

Benefits of Bharat Mala

- Three to four modern world-class mega ports of 200 MT capacity each.
- Transshipment terminal as a Regional Container Hub.
- Establishing 10 state-specific Coastal Economic Regions to foster economic growth in ports and their hinterlands.
- Better integrated connectivity in an CER and hinterland.
- Fully integrated coastline through inland and mega waterways (national navigation channels).
- Greenfield / brownfield options for river and coastal ports.
- Shift to an optimal modal mix (increase of coastal shipping and inland water transport)
- Seamless dedicated backward linkages with key transport/infra projects e.g. DMIC, AKIC, CBIC, DFC, PCPIR.
- Three or four coastal tourist circuits to position India as a prominent tourist destination.

Economic benefits

- 15x growth in coastal/IWT traffic increase over the next 20 years.
- Capacity augmentation to handle 5x port traffic over the next 20 years.
- Coastal Economic Regions leading to increased GDP/ EXIM.
- Significant employment creation in ports, shipping and ancillary areas/ecosystem.
- Structured urbanisation of coast/river and development of riverine/ coastal communities
- Revenue generation though increased economic activity due to the all-round development of coastal cities and tourism.

Bharat Mala to cover...

- Gujarat • Rajasthan • Punjab
- Jammu & Kashmir • Himachal Pradesh
- Uttarakhand • Uttar Pradesh • Bihar
- West Bengal • Sikkim • Assam
- Arunachal Pradesh • Manipur
- Mizoram

Key components of Sagar Mala

1

Port modernisation

- Transform existing ports into world-class ports through the modernisation of port infrastructure and existing systems.
- Ensure inter-agency coordination for synergistic development at major and minor ports.



2

Efficient evacuation systems

- Develop efficient rail, road and coastal/IWT networks into the hinterland: high-speed rail, road, coastal and inland waterway networks to integrate industrial corridors, economic centers, port-based SEZs and inland cities by:

Providing dedicated roads/lanes for domestic cargo movement.

Facilitating hinterland linkages to avoid unnecessary transaction costs.

These could ensure an optimal modal mix for transporting cargo in and out of ports. To ensure a faster development of such networks and linkages, it would be beneficial to integrate such projects with existing rail/road/IWT/airport development projects such as DFC, NHDP etc.

Promotion of coastal shipping and inland water transport (IWT)

Coastal shipping and IWT facilities could be enhanced through a mix of infrastructure and policy initiatives. Some of such initiatives comprise:

- Provide green channel for coastal cargo and easier ingress/egress from ports.



- Simplify procedures on manning norms, fuel taxes and compliances for coastal/ inland vessels.
- Incentivise commodities to use coastal mode.
- Promote research and manufacturing of equipment and vessels for coastal/ inland use.
- Provide provisions for setting up a coastal shipping promotion fund for the development of coastal shipping.
- Provide provisions for a proportionate reduction in CSR obligation for every unit of lowered carbon emission through coastal shipping and IWT.
- Allocate PSU cargo for coastal shipping and IWT usage.
- Modernise port infrastructure for development of coastal and inland water transport by:

Building segregated facilities for coastal/ inland vessels.

Integrated connectivity of IWT/coastal facilities with rail/road network.

3

Coastal economic development

Encourage coastal economic activity in coastal regions through:

- Development of coastal economic zones (CEZ), port-based SEZs/FTWZs, captive ancillary industries and promotion of coastal tourism.

These three outcomes could be supported by enabling policies, robust institutional structure and appropriate financing and funding mechanisms to ensure inclusive growth.



4

Coastal economic region

The development of a coastal economic region has three components i.e., modernisation of ports and new ports, hinterland connectivity and port led development.

A regional plan would be prepared to study the business potential of the identified MER, infrastructure gaps inhibiting growth and barriers to trade. The objective of the plan would be to integrate the potential of the industrial clusters, Smart Cities and economic centers in the MER with the capacity and modernisation requirements at the ports and align the freight system (road/rail/IWT/coastal) evacuation linkages with these. It will also identify institutional/capacity bottlenecks that impede seamless EXIM/domestic trade.

A CER will comprise the following characteristics:

- Single state-based economic region encompassing major and minor ports within a state.
- Extend along 300 to 500 km of coastline and 10 to 30 km inland/offshore.
- Enable the identification of new ports and industrial/economic clusters within a state, as required.
- Foster the development of a maritime ecosystem and extended supply chain e.g. logistics, shipping agencies, service providers, education & training, etc. through institutional and/or infrastructure mechanisms.
- Enable sustainable growth of rural communities by providing employment opportunities and ensuring regional economic development.







Impact of seasonality 04

Freight transportation by road is impacted worldwide by seasonality. The impact is in two forms – impact in the form of journey time, stoppage delay and average speed, and impact in the form of freight cost, freight rate and contribution margin.

It is evident that due to adverse weather conditions such as heavy rain and snowfall, journey time, stoppage delay and freight cost would increase and average speed decrease. On the other hand, the freight rate will depend on seasonal fluctuations in demand for certain items, demand for and availability of trucks in the origin and destination transport markets, assurance of return load at the destination, quick turnaround from the destination, time of year, day of week, and so on.

In the developed countries, activities, especially factory outputs, peak from autumn (fall) to just before Christmas and then decline in spring through summer.

Therefore, the demand for trucks exceeds their supply during autumn to just before Christmas, increasing the freight rate. During spring and summer, since the demand for trucks is less than their supply, the freight rate is low.

Hence, shippers planning to ship their merchandise during autumn to just before Christmas, need to accommodate a higher freight rate¹². Similarly, the freight rate varies for different days of a week. Normally, the rate is higher during Monday through Friday and lower during the weekend. The rate is also on the lower side during public holidays¹³.

12. How Seasonality Affects Logistics Services, Available at <http://bestshippingservice.co.uk/how-seasonality-affects-logistics-services>, Last Accessed on December 16, 2015.

13. Paul Sutcliffe, Features of Seasonality and its Effects on Road Freight Transport Task, 25th Australasian Transport Research Forum, October 2-4, 2002.

4.1

Findings from the survey data

Due to data non-availability, the effect of seasonal demand for some items, demand for and availability of trucks in transport markets, availability of return load at the destination, time of the year and day of the week on the freight rate could not be assessed.

However, the effect of weather conditions on the stoppage delay, freight cost and contribution margin could be assessed to some extent from the survey data. It is expected that during the monsoons, due to heavy rains and occasional flooding, journey time and stoppage delay would increase because of poor road conditions, frequent vehicular breakdown, slow vehicular speeds, occasional detours due

to road flooding, traffic jams and long queues at different check posts and toll plazas.

Consequently, freight cost also increases during monsoons^{14,15}. In order to assess the effect of weather conditions on stoppage delay, freight cost and contribution margin, we categorised the survey data into two phases:

- (1) April to September, representing the summer and monsoon months, and
- (2) November to March, representing winter and spring.

Table 17 shows the data for some select major routes.

Table 17: Effect of weather conditions on stoppage delay, freight cost and contribution margin

| Route | Months | Average stoppage delay (Hrs/km) | Average freight cost (Rs./tonne-km) | Average freight rate (Rs./tonne-km) |
|-----------|-----------|---------------------------------|-------------------------------------|-------------------------------------|
| Del ↔ Chn | Apr - Sep | 0.0031 | 1.43 | 1.67 |
| | Nov - Mar | 0.0026 | 1.32 | 1.59 |
| Del ↔ Kol | Apr - Sep | 0.0056 | 1.43 | 1.92 |
| | Nov - Mar | 0.0036 | 1.48 | 2.31 |
| Mum ↔ Kol | Apr - Sep | 0.0029 | 1.45 | 2.29 |
| | Nov - Mar | 0.0025 | 1.23 | 2.34 |
| Ind ↔ Ght | Apr - Sep | 0.0108 | 1.58 | 2.14 |
| | Nov - Mar | 0.0012 | 1.39 | 2.39 |
| Ahd ↔ Bng | Apr - Sep | 0.0035 | 1.43 | 2.42 |
| | Nov - Mar | 0.0027 | 1.39 | 2.13 |
| Bng ↔ Mum | Apr - Sep | 0.0025 | 1.53 | 2.62 |
| | Nov - Mar | 0.0017 | 1.37 | 2.44 |
| Hyd ↔ Del | Apr - Sep | 0.0023 | 1.33 | 2.00 |
| | Nov - Mar | 0.0020 | 1.26 | 1.98 |

14. Measuring Road Transport Performance, World Bank Report, Available at http://www.worldbank.org/transport/roads/rdt_docs/annex1.pdf, Last Accessed on December 16, 2015.

15. V.N. Ojeh and C.N. Ojoh (2011), Impact of Climate Variability on Road Transport in Warri Metropolis, International Journal of Environmental Sciences, Vol. 2, No. 27, pp. 988-995, Available at http://www.academia.edu/3848457/Impact_of_climate_variability_on_road_transport_in_Warri_Metropolis, Last Accessed on December 16, 2015.



It may be observed from *Table 17* that the average stoppage delay and average freight cost are higher in the summer and monsoon months than in winter and spring for all major routes.

This substantiates the observations made by other authors, as mentioned before. Also, the average contribution margin is lower during monsoons than in winter and spring, except for one route.

This observation indicates that truckers make lower profits during the monsoon months than in winter and spring. We noted the average freight rates for the summer and monsoon months and during winter and spring for all the major routes.

We observed that the increase in freight cost during summer and monsoons is not always proportionately reflected in the increase in freight rate during those months since, we may recall, freight rates depend on many factors besides freight costs, resulting in lower contribution margins for truckers during the summer and monsoon months.

Although the above observations are in line with those made earlier, a complete statistical significance test could not be performed because of a small sample size. Future studies should take into account a large sample size for significant testing.



It is expected that during the monsoon months, due to heavy rains and occasional flooding, the journey time and stoppage delay would increase.





GST – Goods & Service Tax 05

The proposed GST Bill is seen as a single and largest tax reform to the current, ambiguous Indirect Tax structure in India.

GST will remove multiple layers of taxation such as the Central Sales Tax, the octroi, state-level sales tax, entry tax, stamp duty, telecom license fees, taxes on sales or consumption of power, luxury tax, lottery tax, turnover tax, transportation taxes on goods and services and more to usher a single simpler tax system like Central Goods and Services Tax (CGST) and State Goods and Service Tax (SGST).

Warehouse sector, a crucial element of the supply chain process, is expected to benefit from the proposed implementation of the goods and service tax (GST). A complicated tax regime, coupled with poor infrastructure, has led to high logistics costs in India at around 14% of the total value of goods against 7-8% in developed countries.

GST, when implemented, will free the decisions on warehousing and distribution from tax considerations, which, henceforth, would be based purely upon operational and logistics efficiency.

This will lead to the development of various logistics hubs, large warehouses and improved sectoral efficiency. Demand for warehousing is expected to grow at a CAGR of 18% in the next four years due increased investments in the retail sector and increasing import and export activities in India.

Scientific warehousing with a wider scale of operations and inflow management from multiple supplier locations are soon to be seen across India, warranting personnel with specialised skill sets.

Current indirect tax structure in India and GST model

GST is a tax on goods and services with a comprehensive and continuous chain of set-off benefits from the producer's point and service provider's point up to the retailer level.



GST is expected to be levied only at the destination point, and not at various points (from manufacturing to retail outlets). It is essentially a tax only on value addition at each stage and a supplier at each stage is permitted to set off through a tax credit mechanism, which would eliminate the burden of all cascading effects, including the burden of CENVAT and Service Tax.



Under GST structure, all different stages of production and distribution can be interpreted as a mere tax pass through and the tax essentially would be applicable on final consumption within the taxing jurisdiction.

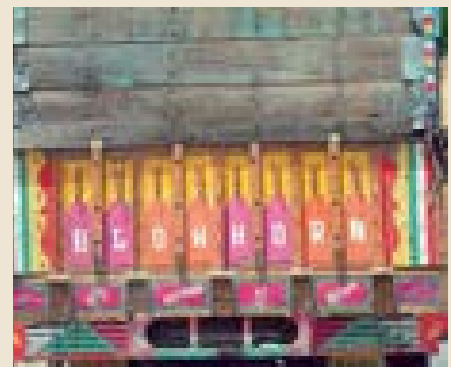
Currently, a manufacturer needs to pay tax when a finished product moves out from the factory, and it is again taxed at the retail outlet when sold. The taxes, levied at the multiple stages such as CENVAT, Central Sales Tax, State Sales Tax, Octroi, etc., will be replaced by GST to be introduced at the Central and State levels.

All goods and services, barring a few exceptions, will be brought into the GST base. There will be no distinction between goods and services.

Under GST, the taxation burden will be divided equitably between manufacturing and services through a lower tax rate by increasing the tax base and minimising exemptions.



However, the basic features of law such as chargeability, definition of taxable event and taxable person, measure of levy including valuation provisions, basis of classification etc. would be uniform across these statutes as far as practicable.



The existing CST will be discontinued. Instead, a new statute known as GST will come into place on the inter-state transfer of goods and services.

By removing the cascading effect of taxes (CST, additional customs duty, surcharges, luxury tax, entertainment tax, etc.), CGST and SGST will be charged on the same price.

More about GST

Benefits of GST

The implementation of GST will help create a common market in India and reduce the cascading effect of tax on the cost of goods and services. It will impact tax structure, tax incidence, tax computation, credit utilisation and reporting, leading to a complete overhaul of the current indirect tax system.



Issues related to GST

GST will not be a cost to registered retailers. Therefore, there will be no hidden taxes and the cost of doing business will decline. This, in turn, will help export become more competitive. In GST system, Central GST and State GST will be charged on manufacturing costs and collected on the point of sale. This will benefit people as prices will decline, which in turn, will help companies as consumption will increase.

Few considerations in GST

Under the Bill, alcoholic liquor for human consumption is exempted from GST. It will be up to the GST Council to decide when GST would be levied on various categories of fuel, including crude oil and petrol. The Centre will levy an additional 1% tax on the supply of goods in the course of inter-State trade, which will go to the States for two years or till when the GST Council decides. The primary reason for the Bill is to pave the way for the Centre to tax sale of goods and the states to tax provision of services. The Bill further proposes that the Central Government will possess the exclusive power to levy GST on imports and inter-state trade.

GST merits

The biggest benefit will be that multiple taxes like octroi, Central Sales Tax, State Sales Tax, Entry Tax, license fees, turnover tax etc. will no longer be present and all that will be brought under the GST. Doing business now will be easier and more comfortable as various hidden taxation will not be present. It will be beneficial for Indian companies as the average tax burden on companies will decline. Reducing production costs will make exporters more competitive and aggressive.







Conclusions and recommendations 06

While comparing the survey data for 2008-09, 2011-12 and 2014-15, we observe that different routes show different characteristics. However, one common observation is that over the years, average journey time has reduced and average vehicular speed has increased.

The average mileage of vehicles remained almost at the same level, sometimes marginally improved or deteriorated on some routes. Two major routes that were more extensively surveyed among the 28 routes were Delhi-Bangalore and Delhi-Mumbai. On the Delhi-Bangalore route, the survey found on-road stops, other than for toll collection such as check posts and police intervention, contributed more to stoppage delays and stoppage expenses than was observed in the 2011-12 survey.

Also, freight rates did not increase commensurately with the freight costs, resulting in a significant drop in the contribution margin compared to the 2011-12 level. On the Delhi-Mumbai route, on the

other hand, toll delays and toll expenses as percentages of total stoppage delays and stoppage expenses, respectively, virtually remained the same as the corresponding 2011-12 level.

The freight rate increased more than the freight cost in the last three years, resulting in a considerable increase in the contribution margin compared to the 2011-12 level. Among the other routes, one observation was that routes covering the eastern and north-eastern parts of the country experienced slower speeds of vehicles and higher stoppage delays than the corresponding national averages due to poor road conditions, a higher number of stops and delays at check posts, and on-road police intervention.

If we take the aggregate data for the 28 routes surveyed as a surrogate for the national average, we observe that while average stoppage delays per km remained almost the same as compared to the 2011-12 levels, average stoppage expenses per tonne-km worsened. The average contribution margin, on the other hand, improved in 2014-15.

As far as transportation modes are concerned, freight movements are heavily tilted towards roads. Railways carry the rest of the freight. The share of airways and waterways, as modes of domestic freight movement, is almost negligible. While in many countries, railways carry a significant volume of freight, in India the share of railways in carrying freight is less than half of roads.

Road transportation is preferred over rail transportation because it is door-to-door, reliable and efficient, with vehicles available almost in real-time. Railways, on the other hand, suffer from inefficiency, unreliability, loading delay and unavailability of rakes in real-time. Multi-modal transportation in India is limited and confined to the combination of roads and railways.

Besides loading delays during modal shifts, multi-modal transportation is affected by the lack of coordination among different modes, priority accorded by Indian Railways to passenger traffic over freight movement, inadequate containerisation of freight and differences in rules and regulations for different modes of transportation.

However, multi-modal transportation holds advantages in terms of reduced cost due to economies of scale, reduced fuel consumption resulting in lower carbon emissions, and point-to-point reach in an extended network where railways can act as the main mode of transportation between two cities located at two extreme ends of the country and last-mile deliveries can be undertaken by roads.

It is expected that due to an increasing cargo containerisation, operationalisation of two DFCs and setting up of multi-modal logistics parks across the country and in the vicinity of DFCs, the share of railways in carrying freight could increase and boost freight movement using multiple transportation modes.

The Government needs to play a key role in simplifying and standardising regulations for carrying freight across different transportation modes to facilitate multi-modal transportation. The Government should also endeavour to remove infrastructural bottlenecks facing inland waterways.

Although India enjoys a vast coastline and significant length of inland waterways, the share of waterways in carrying domestic freight is almost negligible. Serious effort is required to increase the utilisation of waterways for domestic freight movement since waterways, like railways, are also environment-friendly, reducing fuel consumption and greenhouse gas emission.

This study also focused on assessing the effect of seasonality on freight



The freight rate has increased more than the freight cost in the last three years, resulting in a considerable increase in the contribution margin.

transportation by road. While the effect of seasonal demand for certain items, gap between the demand for and supply of trucks in transport markets, availability of return load at the destination, time of the year and day of the week on freight rate variations could not be assessed due to data non-availability, the effect of weather conditions on stoppage delays, freight costs and contribution margins could be assessed to some extent from the survey data.

It was observed that stoppage delays and freight costs were higher in summer and monsoons than in winter and spring due to poor road conditions, frequent vehicular breakdown, slow vehicular speeds, occasional detours owing to road flooding, traffic jams, and long queues at check posts and toll gates.

The contribution margin, on the other hand, was lower in the summer and monsoon months than in winter and spring since the increase in freight costs was not adequately reflected in the increase in freight rates. Therefore, truckers planning to ship during monsoons needed to factor low contribution margins.

Based on the 2014-15 survey, the following recommendations are made, which should be read along with the recommendations made in the 2008-09 and 2011-12 surveys.

- Although the average journey time and vehicle speed improved across all major routes, more is needed to be done to reduce stoppage delays. Besides improving the toll collection infrastructure, the number of stops for various other purposes such as documentation check and tax collection at state borders/check posts and on-road police intervention need to be minimised and the process of document-checking and tax collection simplified to facilitate a smooth and seamless flow of goods across the country. There is an urgent need to reduce paperwork so that a single document allows vehicles to pass

through state borders and check posts without elaborate checking processes, reducing journey time. It is expected that the introduction of a uniform Goods and Services Tax (GST) from April 1, 2016 could reduce paperwork, decrease stoppage delays and increase average vehicular speed. The Government needs to resolve issues raised by different stakeholders and introduce the GST bill as soon as possible to the Parliament for ratification.

- The fuel efficiency in terms of vehicular mileage remained almost the same. Mileage was affected by slow vehicular speeds due to poor road conditions, traffic jams, multiple on-road stops, long queues and idling at check posts. If road conditions can improve and number of stops and stoppage delays minimised, vehicular mileage can improve. The fuel efficiency also depends on the engine and vehicular age. The Government need to ensure that truckers replace their old, fuel-inefficient vehicles with new-generation, fuel-efficient vehicles such as multi-axle tractor-trailer units. This may be achieved forcefully by law or through financial incentives in terms of subsidies, soft loans, tax benefits and so on. This is important since fuel efficiency not only reduces cost to truckers and the economy and but also reduces carbon emission, and preserves precious foreign exchange through a reduced crude oil import bill.

- The Government needs to address issues faced by shippers in rail freight transportation. The problems of loading delays, unavailability of rakes when required, poor service and lack of coordination with other transportation modes need to be urgently addressed. Railways carry a significant volume of freight in many other countries. Despite a large network, the share of railways in domestic freight movement is less than half of roads because of the issues mentioned above. Ideally, railways should be the preferred mode for long-distance



Road transportation is preferred over rail transportation because it is door-to-door, reliable and efficient, and vehicles are available almost on a real-time basis.



transportation. Rail transportation not only reduces costs due to economies of scale, but also reduces fossil fuel consumption, mitigating environmental pollution.

- Two more issues that affect the share of Indian Railways in domestic freight movement are the low level of cargo containerisation and the preference given to passenger trains over goods trains when they share the same track (as per the policy of the Indian Government). Cargo containerisation not only makes freight transportation easier, but also helps minimise delays during modal shifts. It is expected that in the light of India's increasing international trade and private sector participation in operating container trains, the level of cargo containerisation will improve and facilitate rail freight movement. However, the Government needs to make an all-out effort to create an environment conducive to containerisation growth, at par with

the level in countries where most of the freight is containerised. The problem of sharing the same track by passenger and goods trains could be partially taken care of when the two DFCs become operational to accommodate speedier, longer and heavier goods trains, reducing journey time and transportation cost. The Government needs to remove hurdles and ensure that these DFCs become operational at the earliest. Following the experience of these DFCs, the Government may consider building more DFCs parallel to the Golden Quadrilateral as well as the east-west and north-south corridors.

- Because of the inefficiencies and issues related to rail freight transportation, the scope of multi-modal transportation is limited in India. However, multi-modal transportation is preferred the world over since it is not only efficient and economic, but also fuel-efficient and environment-friendly. The Multi-Modal Transportation of

Goods Act, 1993 is applicable to shippers and freight forwarders of international cargo. Its definition does not cover multi-modal transportation of domestic freight. Therefore, for multi-modal transportation of domestic freight, service providers are governed by policies and regulations of the respective transportation modes not often consistent and differing across different modes. This makes freight transportation by multiple modes inefficient. The Government needs to broaden the scope of the said Act and include multi-modal transportation of domestic freight in its definition to standardise policies and regulations across different modes for facilitating multi-modal transportation. To counter the lack of coordination among various transportation modes, the Government needs to create an apex regulatory body such as Multi-Modal Transport Regulatory Authority of India (MMTRAI), in line with NHAI or TRAI, to coordinate among the



various ministries, i.e. Ministry of Road Transport and Highways, Ministry of Railways, Ministry of Shipping and Ministry of Civil Aviation, to facilitate multi-modal transportation.

- The Government needs to encourage private participation, and may itself assume an active role, in building large multi-modal logistics parks as in Nagpur and Vizag and along the DFCs to facilitate multi-modal transportation. Since building large-scale logistics parks requires substantial investments, the Government may provide financial incentives to private parties or may invest through the PPP mode.
- India's vast coastline and a significant inland waterway length, are underutilised in carrying domestic freight. China carries a significant volume of domestic freight through inland waterways. The Indian Government needs to ensure that infrastructural bottlenecks are removed

and the share of inland waterways in carrying domestic freight increases.

- The study finds that the average stoppage delay per km and the average freight cost per tonne-km are higher and truckers' average contribution margins lower in summer and monsoons than in winter and spring. One of the reasons is deteriorating road conditions due to rains and road flooding, resulting in slow vehicle speeds, increased maintenance costs because of frequent breakdowns and occasional detours that increase journey time and cost. Therefore, shipping in the summer and monsoon months is less lucrative for truckers. However, since roads represent the lifeline to a country's economy and demand for goods in the summer and monsoon months is no less than in winter and spring, the Government, under various road development programmes, should ensure proper road building and maintenance so that vehicle

movement is smooth even during the monsoons and truckers experience the same profitability as in winter and spring.



Although the average journey time and vehicle speed improved across all major routes, more is needed to be done to reduce stoppage delays.



Annexure

Summary statistics for 26 major routes

Table A.1: Summary statistics for the Delhi – Chennai route

| Parameter | Unit | Average | | |
|----------------------------|--------------|---------|---------|---------|
| | | 2008-09 | 2011-12 | 2014-15 |
| Distance | Km | 2300 | 2245 | 2883 |
| Journey time | Hours | 109 | 117 | 95 |
| Average speed | Km/hour | 21 | 19 | 45 |
| Mileage | Km/Lt | 3.54 | 3.91 | 4.03 |
| Loading/documentation time | Hours | 6 | 1.06 | 4.50 |
| No. of stops | – | 16 | 16 | 40 |
| Stoppage delay | Hours | 8.54 | 4.67 | 8.24 |
| Stoppage delay per km | Hours/km | 0.0037 | 0.0021 | 0.0029 |
| Stoppage expenses | Rs./tonne-km | 0.11 | 0.08 | 0.29 |
| Trip expenses | Rs./tonne-km | 0.93 | 0.98 | 1.37 |
| Freight rate | Rs./tonne-km | NA | 1.64 | 1.62 |

Table A.2: Summary statistics for the Delhi – Kolkata route

| Parameter | Unit | Average | | |
|----------------------------|--------------|---------|---------|---------|
| | | 2008-09 | 2011-12 | 2014-15 |
| Distance | Km | 1497 | 1467 | 1486 |
| Journey time | Hours | 108 | 115 | 83 |
| Average speed | Km/hour | 27.73 | 25.02 | 21.10 |
| Mileage | Km/Lt | 3.63 | 3.84 | 3.95 |
| Loading/documentation time | Hours | 2.75 | 3 | 8 |
| No. of stops | – | 18 | 26 | 28 |
| Stoppage delay | Hours | 22.38 | 6.27 | 6.82 |
| Stoppage delay per km | Hours/km | 0.0148 | 0.0023 | 0.0046 |
| Stoppage expenses | Rs./tonne-km | 0.11 | 0.19 | 0.33 |
| Trip expenses | Rs./tonne-km | 0.84 | 1.17 | 1.46 |
| Freight rate | Rs./tonne-km | 1.12 | 1.37 | 2.11 |

Table A.3: Summary statistics for the Mumbai – Chennai route

| Parameter | Unit | Average | | |
|----------------------------|--------------|---------|---------|---------|
| | | 2008-09 | 2011-12 | 2014-15 |
| Distance | Km | 1381.67 | 1389.75 | 1376.75 |
| Journey time | Hours | 63.67 | 77.75 | 67.50 |
| Average speed | Km/hour | 21.75 | 17.9 | 26.30 |
| Mileage | Km/Lt | 3.45 | 3.87 | 4.03 |
| Loading/documentation time | Hours | 2.25 | 4.5 | 5.13 |
| No. of stops | – | 23.67 | 22.75 | 14 |
| Stoppage delay | Hours | 3.64 | 2.62 | 3.15 |
| Stoppage delay per km | Hours/km | 0.0026 | 0.0019 | 0.0023 |
| Stoppage expenses | Rs./tonne-km | 0.20 | 0.17 | 0.25 |
| Trip expenses | Rs./tonne-km | 1.05 | 1.19 | 1.36 |
| Freight rate | Rs./tonne-km | 1.54 | 1.69 | 2.28 |

Table A.3: Summary statistics for the Mumbai – Kolkata route

| Parameter | Unit | Average | | |
|----------------------------|--------------|---------|---------|---------|
| | | 2008-09 | 2011-12 | 2014-15 |
| Distance | Km | 2007.5 | 2078.25 | 1933.75 |
| Journey time | Hours | 93.5 | 117.75 | 135.63 |
| Average speed | Km/hour | 21.64 | 17.91 | 20.79 |
| Mileage | Km/Lt | 3.16 | 3.69 | 4.03 |
| Loading/documentation time | Hours | 2.83 | 2.38 | 3.88 |
| No. of stops | – | 27 | 36.75 | 16 |
| Stoppage delay | Hours | 14.13 | 12.47 | 5.17 |
| Stoppage delay per km | Hours/km | 0.0071 | 0.0060 | 0.0027 |
| Stoppage expenses | Rs./tonne-km | 0.20 | 0.43 | 0.17 |
| Trip expenses | Rs./tonne-km | 1.01 | 1.40 | 1.34 |
| Freight rate | Rs./tonne-km | 1.27 | 1.57 | 2.32 |

Table A.3: Summary statistics for the Chennai – Kolkata route

| Parameter | Unit | Average | | |
|----------------------------|--------------|---------|---------|---------|
| | | 2008-09 | 2011-12 | 2014-15 |
| Distance | Km | 1700 | 1763.5 | 1705.75 |
| Journey time | Hours | 96 | 74 | 57 |
| Average speed | Km/hour | 17.75 | 23.84 | 37.10 |
| Mileage | Km/Lt | 4 | 4.54 | 4.03 |
| Loading/documentation time | Hours | 2.5 | 4.25 | 4 |
| No. of stops | – | 28 | 30 | 21 |
| Stoppage delay | Hours | 4.5 | 3.46 | 4.85 |
| Stoppage delay per km | Hours/km | 0.0026 | 0.0020 | 0.0028 |
| Stoppage expenses | Rs./tonne-km | 0.17 | 0.15 | 0.18 |
| Trip expenses | Rs./tonne-km | 1.01 | 1.01 | 1.22 |
| Freight rate | Rs./tonne-km | 0.98 | 1.45 | 2.24 |

Table A.6: Summary statistics for the Indore – Guwahati route

| Parameter | Unit | Average | | |
|----------------------------|--------------|---------|---------|---------|
| | | 2008-09 | 2011-12 | 2014-15 |
| Distance | Km | 2176 | 2214.25 | 2256 |
| Journey time | Hours | 130 | 133.75 | 174 |
| Average speed | Km/hour | 16.75 | 16.57 | 20.56 |
| Mileage | Km/Lt | 3.66 | 3.56 | 4.04 |
| Loading/documentation time | Hours | 3.5 | 1.38 | 7.31 |
| No. of stops | – | 19 | 16 | 24.5 |
| Stoppage delay | Hours | 32.41 | 4.43 | 14.04 |
| Stoppage delay per km | Hours/km | 0.0149 | 0.0020 | 0.0059 |
| Stoppage expenses | Rs./tonne-km | 0.18 | 0.11 | 0.24 |
| Trip expenses | Rs./tonne-km | 1.03 | 1.17 | 1.48 |
| Freight rate | Rs./tonne-km | 1.42 | 1.67 | 2.26 |

Table A.7: Summary statistics for the Pune – Hyderabad route

| Parameter | Unit | Average | | |
|----------------------------|--------------|---------|---------|---------|
| | | 2008-09 | 2011-12 | 2014-15 |
| Distance | Km | 615 | 651.25 | 620 |
| Journey time | Hours | 28.5 | 29.5 | 33.06 |
| Average speed | Km/hour | 21.88 | 22.07 | 23.70 |
| Mileage | Km/Lt | 3.89 | 4.34 | 4.03 |
| Loading/documentation time | Hours | 1.5 | 1.19 | 4.63 |
| No. of stops | – | 9 | 12 | 10 |
| Stoppage delay | Hours | 2.13 | 1.75 | 1 |
| Stoppage delay per km | Hours/km | 0.0034 | 0.0027 | 0.0016 |
| Stoppage expenses | Rs./tonne-km | 0.15 | 0.17 | 0.16 |
| Trip expenses | Rs./tonne-km | 1.00 | 1.38 | 1.38 |
| Freight rate | Rs./tonne-km | 1.77 | 1.77 | 2.43 |

Table A.8: Summary statistics for the Ahmedabad – Coimbatore route

| Parameter | Unit | Average | | |
|----------------------------|--------------|---------|---------|---------|
| | | 2008-09 | 2011-12 | 2014-15 |
| Distance | Km | 1919 | 1947.25 | 1723.75 |
| Journey time | Hours | 63.5 | 109 | 65.5 |
| Average speed | Km/hour | 30.25 | 17.86 | 31.20 |
| Mileage | Km/Lt | 4.03 | 4 | 4.03 |
| Loading/documentation time | Hours | 3.5 | 1.81 | 5.25 |
| No. of stops | – | 15 | 28 | 16 |
| Stoppage delay | Hours | 4 | 9.62 | 2.3 |
| Stoppage delay per km | Hours/km | 0.0021 | 0.0049 | 0.0013 |
| Stoppage expenses | Rs./tonne-km | 0.15 | 0.14 | 0.13 |
| Trip expenses | Rs./tonne-km | 1.02 | 1.06 | 1.32 |
| Freight rate | Rs./tonne-km | 1.42 | 1.58 | 2.38 |

Table A.9: Summary statistics for the Ahmedabad – Bangalore route

| Parameter | Unit | Average | |
|----------------------------|--------------|---------|---------|
| | | 2011-12 | 2014-15 |
| Distance | Km | 1585.25 | 1547 |
| Journey time | Hours | 92.75 | 51 |
| Average speed | Km/hour | 17.09 | 39.28 |
| Mileage | Km/Lt | 4.03 | 4.03 |
| Loading/documentation time | Hours | 3.31 | 3.56 |
| No. of stops | – | 20 | 21 |
| Stoppage delay | Hours | 8.4 | 4.83 |
| Stoppage delay per km | Hours/km | 0.0053 | 0.0031 |
| Stoppage expenses | Rs./tonne-km | 0.11 | 0.25 |
| Trip expenses | Rs./tonne-km | 1.07 | 1.41 |
| Freight rate | Rs./tonne-km | 1.57 | 2.27 |

Table A.10: Summary statistics for the Ahmedabad – Delhi route

| Parameter | Unit | Average | |
|----------------------------|--------------|---------|---------|
| | | 2011-12 | 2014-15 |
| Distance | Km | 939 | 904.75 |
| Journey time | Hours | 47.5 | 34.5 |
| Average speed | Km/hour | 21.05 | 34.09 |
| Mileage | Km/Lt | 4.9 | 4.03 |
| Loading/documentation time | Hours | 2.44 | 5.81 |
| No. of stops | – | 16 | 15 |
| Stoppage delay | Hours | 3.13 | 2.79 |
| Stoppage delay per km | Hours/km | 0.0033 | 0.0031 |
| Stoppage expenses | Rs./tonne-km | 0.13 | 0.31 |
| Trip expenses | Rs./tonne-km | 0.82 | 1.48 |
| Freight rate | Rs./tonne-km | 1.16 | 2.67 |

Table A.11: Summary statistics for the Bangalore – Mumbai route

| Parameter | Unit | Average | |
|----------------------------|--------------|---------|---------|
| | | 2011-12 | 2014-15 |
| Distance | Km | 984.25 | 1050 |
| Journey time | Hours | 41.25 | 38.25 |
| Average speed | Km/hour | 24.57 | 37.15 |
| Mileage | Km/Lt | 3.51 | 4.04 |
| Loading/documentation time | Hours | 2.75 | 3.69 |
| No. of stops | – | 22.5 | 16.75 |
| Stoppage delay | Hours | 3.74 | 2.18 |
| Stoppage delay per km | Hours/km | 0.0038 | 0.0021 |
| Stoppage expenses | Rs./tonne-km | 0.24 | 0.29 |
| Trip expenses | Rs./tonne-km | 1.22 | 1.45 |
| Freight rate | Rs./tonne-km | 2.11 | 2.53 |

Table A.12: Summary statistics for the Guwahati – Delhi route

| Parameter | Unit | Average | |
|----------------------------|--------------|---------|---------|
| | | 2011-12 | 2014-15 |
| Distance | Km | 2137.5 | 2195 |
| Journey time | Hours | 142.5 | 121.5 |
| Average speed | Km/hour | 15.13 | 31.15 |
| Mileage | Km/Lt | 3.92 | 4.03 |
| Loading/documentation time | Hours | 1.69 | 3.63 |
| No. of stops | – | 14 | 33 |
| Stoppage delay | Hours | 6.16 | 14.83 |
| Stoppage delay per km | Hours/km | 0.0029 | 0.0068 |
| Stoppage expenses | Rs./tonne-km | 0.10 | 0.35 |
| Trip expenses | Rs./tonne-km | 0.97 | 1.43 |
| Freight rate | Rs./tonne-km | 1.52 | 2.20 |

Table A.13: Summary statistics for the Hyderabad – Delhi route

| Parameter | Unit | Average | |
|----------------------------|--------------|---------|---------|
| | | 2011-12 | 2014-15 |
| Distance | Km | 1628 | 1725 |
| Journey time | Hours | 97.5 | 77 |
| Average speed | Km/hour | 16.7 | 31.95 |
| Mileage | Km/Lt | 4.04 | 4.03 |
| Loading/documentation time | Hours | 3.75 | 3.5 |
| No. of stops | – | 14.25 | 20 |
| Stoppage delay | Hours | 2.25 | 3.65 |
| Stoppage delay per km | Hours/km | 0.0014 | 0.0021 |
| Stoppage expenses | Rs./tonne-km | 0.13 | 0.20 |
| Trip expenses | Rs./tonne-km | 1.02 | 1.29 |
| Freight rate | Rs./tonne-km | 1.56 | 1.98 |

Table A.14: Summary statistics for the Kolkata – Bangalore route

| Parameter | Unit | Average | |
|----------------------------|--------------|---------|---------|
| | | 2011-12 | 2014-15 |
| Distance | Km | 1961 | 2019 |
| Journey time | Hours | 144.75 | 103.5 |
| Average speed | Km/hour | 13.55 | 27.07 |
| Mileage | Km/Lt | 3.57 | 4.03 |
| Loading/documentation time | Hours | 2.5 | 7.75 |
| No. of stops | – | 34 | 34 |
| Stoppage delay | Hours | 13.13 | 7.70 |
| Stoppage delay per km | Hours/km | 0.0067 | 0.0038 |
| Stoppage expenses | Rs./tonne-km | 0.13 | 0.26 |
| Trip expenses | Rs./tonne-km | 1.13 | 1.47 |
| Freight rate | Rs./tonne-km | 1.60 | 1.82 |

Table A.15: Summary statistics for the Nagpur – Delhi route

| Parameter | Unit | Average | |
|----------------------------|--------------|---------|---------|
| | | 2011-12 | 2014-15 |
| Distance | Km | 1166 | 1201.75 |
| Journey time | Hours | 50 | 52 |
| Average speed | Km/hour | 23.38 | 29.82 |
| Mileage | Km/Lt | 3.44 | 4.03 |
| Loading/documentation time | Hours | 4.19 | 5.94 |
| No. of stops | – | 12 | 13.75 |
| Stoppage delay | Hours | 2.14 | 1.3 |
| Stoppage delay per km | Hours/km | 0.0018 | 0.0011 |
| Stoppage expenses | Rs./tonne-km | 0.10 | 0.20 |
| Trip expenses | Rs./tonne-km | 1.05 | 1.29 |
| Freight rate | Rs./tonne-km | 1.67 | 2.07 |

Table A.16: Summary statistics for the Nagpur – Bangalore route

| Parameter | Unit | Average |
|----------------------------|--------------|---------|
| Distance | Km | 1149.25 |
| Journey time | Hours | 52.63 |
| Average speed | Km/hour | 34.93 |
| Mileage | Km/Lt | 4.03 |
| Loading/documentation time | Hours | 4.25 |
| No. of stops | – | 21.5 |
| Stoppage delay | Hours | 3.66 |
| Stoppage delay per km | Hours/km | 0.0032 |
| Stoppage expenses | Rs./tonne-km | 0.38 |
| Trip expenses | Rs./tonne-km | 1.56 |
| Freight rate | Rs./tonne-km | 1.98 |

Table A.17: Summary statistics for the Nagpur – Pune route

| Parameter | Unit | Average |
|----------------------------|--------------|---------|
| Distance | Km | 723.25 |
| Journey time | Hours | 25.5 |
| Average speed | Km/hour | 37.69 |
| Mileage | Km/Lt | 4.03 |
| Loading/documentation time | Hours | 2.5 |
| No. of stops | – | 8 |
| Stoppage delay | Hours | 1.45 |
| Stoppage delay per km | Hours/km | 0.0020 |
| Stoppage expenses | Rs./tonne-km | 0.10 |
| Trip expenses | Rs./tonne-km | 1.91 |
| Freight rate | Rs./tonne-km | 2.65 |

Table A.18: Summary statistics for the Pune – Delhi route

| Parameter | Unit | Average |
|----------------------------|--------------|---------|
| Distance | Km | 1410.5 |
| Journey time | Hours | 45.25 |
| Average speed | Km/hour | 43.09 |
| Mileage | Km/Lt | 4.03 |
| Loading/documentation time | Hours | 3.88 |
| No. of stops | – | 26.5 |
| Stoppage delay | Hours | 2.98 |
| Stoppage delay per km | Hours/km | 0.0021 |
| Stoppage expenses | Rs./tonne-km | 0.38 |
| Trip expenses | Rs./tonne-km | 1.48 |
| Freight rate | Rs./tonne-km | 2.15 |

Table A.19: Summary statistics for the Delhi – Kanpur route

| Parameter | Unit | Average |
|----------------------------|--------------|---------|
| Distance | Km | 489 |
| Journey time | Hours | 27.25 |
| Average speed | Km/hour | 32.48 |
| Mileage | Km/Lt | 4.03 |
| Loading/documentation time | Hours | 4.75 |
| No. of stops | – | 5.5 |
| Stoppage delay | Hours | 0.33 |
| Stoppage delay per km | Hours/km | 0.0007 |
| Stoppage expenses | Rs./tonne-km | 0.21 |
| Trip expenses | Rs./tonne-km | 2.49 |
| Freight rate | Rs./tonne-km | 4.24 |

Table A.20: Summary statistics for the Delhi – Chandigarh route

| Parameter | Unit | Average |
|----------------------------|--------------|---------|
| Distance | Km | 367 |
| Journey time | Hours | 14.5 |
| Average speed | Km/hour | 41.07 |
| Mileage | Km/Lt | 4.03 |
| Loading/documentation time | Hours | 6.63 |
| No. of stops | – | 7 |
| Stoppage delay | Hours | 0.37 |
| Stoppage delay per km | Hours/km | 0.0010 |
| Stoppage expenses | Rs./tonne-km | 0.48 |
| Trip expenses | Rs./tonne-km | 2.20 |
| Freight rate | Rs./tonne-km | 2.68 |

Table A.21: Summary statistics for the Pune – Chennai route

| Parameter | Unit | Average |
|----------------------------|--------------|---------|
| Distance | Km | 1251 |
| Journey time | Hours | 36.75 |
| Average speed | Km/hour | 41.5 |
| Mileage | Km/Lt | 4.05 |
| Loading/documentation time | Hours | 4.31 |
| No. of stops | – | 26 |
| Stoppage delay | Hours | 1.97 |
| Stoppage delay per km | Hours/km | 0.0016 |
| Stoppage expenses | Rs./tonne-km | 0.24 |
| Trip expenses | Rs./tonne-km | 1.84 |
| Freight rate | Rs./tonne-km | 2.49 |

Table A.22: Summary statistics for the Raipur – Delhi route

| Parameter | Unit | Average |
|----------------------------|--------------|---------|
| Distance | Km | 1506 |
| Journey time | Hours | 55.75 |
| Average speed | Km/hour | 27 |
| Mileage | Km/Lt | 4 |
| Loading/documentation time | Hours | 1.25 |
| No. of stops | – | 22 |
| Stoppage delay | Hours | 5.2 |
| Stoppage delay per km | Hours/km | 0.0035 |
| Stoppage expenses | Rs./tonne-km | 0.34 |
| Trip expenses | Rs./tonne-km | 1.25 |
| Freight rate | Rs./tonne-km | 2.88 |

Table A.23: Summary statistics for the Kolkata – Guwahati route

| Parameter | Unit | Average |
|----------------------------|--------------|---------|
| Distance | Km | 1165 |
| Journey time | Hours | 100.25 |
| Average speed | Km/hour | 11.62 |
| Mileage | Km/Lt | 4 |
| Loading/documentation time | Hours | NA |
| No. of stops | – | 13 |
| Stoppage delay | Hours | 19.65 |
| Stoppage delay per km | Hours/km | 0.0169 |
| Stoppage expenses | Rs./tonne-km | 0.18 |
| Trip expenses | Rs./tonne-km | 1.27 |
| Freight rate | Rs./tonne-km | 3.38 |

Table A.24: Summary statistics for the Bangalore – Ernakulam route

| Parameter | Unit | Average |
|----------------------------|--------------|---------|
| Distance | Km | 610 |
| Journey time | Hours | 34.75 |
| Average speed | Km/hour | 17.42 |
| Mileage | Km/Lt | 4 |
| Loading/documentation time | Hours | 0.5 |
| No. of stops | -- | 10.5 |
| Stoppage delay | Hours | 1.2 |
| Stoppage delay per km | Hours/km | 0.0020 |
| Stoppage expenses | Rs./tonne-km | 0.29 |
| Trip expenses | Rs./tonne-km | 2.00 |
| Freight rate | Rs./tonne-km | 4.19 |

Table A.25: Summary statistics for the Ahmedabad – Salem route

| Parameter | Unit | Average |
|----------------------------|--------------|---------|
| Distance | Km | 1793 |
| Journey time | Hours | 63.5 |
| Average speed | Km/hour | 40.05 |
| Mileage | Km/Lt | 4.5 |
| Loading/documentation time | Hours | 1.63 |
| No. of stops | -- | 26 |
| Stoppage delay | Hours | 3.55 |
| Stoppage delay per km | Hours/km | 0.0020 |
| Stoppage expenses | Rs./tonne-km | 0.35 |
| Trip expenses | Rs./tonne-km | 2.05 |
| Freight rate | Rs./tonne-km | 3.10 |

Table A.26: Summary statistics for the Indore – Chennai route

| Parameter | Unit | Average |
|----------------------------|--------------|---------|
| Distance | Km | 1630 |
| Journey time | Hours | 61.63 |
| Average speed | Km/hour | 40 |
| Mileage | Km/Lt | 4.5 |
| Loading/documentation time | Hours | 1.69 |
| No. of stops | -- | 22.5 |
| Stoppage delay | Hours | 14.92 |
| Stoppage delay per km | Hours/km | 0.0092 |
| Stoppage expenses | Rs./tonne-km | 0.45 |
| Trip expenses | Rs./tonne-km | 2.01 |
| Freight rate | Rs./tonne-km | 3.31 |

Summary of the 2008-09 survey

This project was commissioned by the Transport Corporation of India (TCI) to assess the impact of governmental investments in national highways on the operational efficiency of freight transportation by road in India.

The objectives of the project were to:

- (a) analyse data for 10 major routes to assess the operational efficiency of freight transportation
- (b) compare and benchmark with key freight transportation statistics of other countries
- (c) suggest recommendations for transporters and the Government as to how to overcome the problems faced by the industry.

Data for the 10 routes was collected by TCI throughout the year 2008, and the complete dataset was made available for analysis in early January, 2009. Primary data was complemented by secondary information derived from published reports and various websites. Discussions with senior officials of TCI in Delhi and Kolkata also provided significant inputs for the project.

1 The Indian trucking sector contributes about 4.5-5% (USD 55-60 billion) of the GDP. However, the sector is plagued with problems.

2 The foremost problem faced by the sector is the paucity of quality highways and expressways. While road freight volumes increased at a compounded annual growth rate (CAGR) of 9.06% and the number of vehicles (all types) increased at a CAGR of 10.13% during the period between 1950-51 and 2007-08, the GDP at market prices grew at a CAGR of only 7.35% during the same period, indicating that road freight volumes and the number of vehicles (all types) grew faster than the GDP during this period. The total length of roads, on the other hand, increased at a CAGR of only 3.77% during the period between 1950-51 and 2007-08 implying that the development of roads has not been able to keep pace with the growths in road freight volumes and the number of vehicles during the same period. Today, national highways constitute only 2% of the total road network, but carry 40% of all road traffic. Highways are also not access-controlled, allowing humans, animals and all

types of vehicles simultaneously, resulting in slow vehicular speeds, uncertain journey time and accidents. Poor road maintenance also leads to similar problems, as well as equipment breakdowns.

3 The second major problem faced by the sector comprises interstate and intrastate checkpost delays. Since different states have different documentation requirements for sales tax compliance, a considerable amount of time is wasted at interstate checkposts for completing sales tax-related formalities. Besides, required form-filling by various governmental departments, checking of documents, physical checking of the vehicle, driver and consignment by RTO and traffic police, and collecting highway toll and taxes contributes to the delay experienced at checkposts and on the road. On top of this, there is police harassment and corruption (soliciting unofficial payments from drivers). Survey data shows on-road stoppage expenses (toll/RTO/ST/octroi) and unofficial payments made to governmental officials and traffic police amount to, on an average, 15% of total trip expenses.

6.5

The contribution of India's transport sector to GDP (%)



Poor road conditions, checkpost delays and old vehicles result in a daily coverage of maximum 250-400 km by a truck, compared to 700-800 km in developed countries.



4 The sector is fragmented with 80% of it being accounted for by the unorganised sector. On the one hand, there are diseconomies of scale due to the small size of operators. On the other hand, these small operators, colluding with corrupt officials and police, flout all rules and regulations, evade taxes, overload vehicles and indulge in unethical practices. Since organised players have to directly compete with small operators, there is an immense downward pressure on pricing. Also, because India has one of the lowest freight rates in the world, transporters make little margins or even incur losses. Reports indicate that unorganised players secure 4-5% while organised players secure 10-15% margins. As a result, transporters have few options to invest in assets and technologies. Vehicles that ply on Indian

roads are old, fuel-inefficient, and need immediate replacement. There is inadequate investment in information technology for tracking shipments in real-time, resulting in poor service. Problems are compounded by the fact that the sector is yet to receive industry status, which makes it difficult for transporters to raise capital and debt through organised banking and financial channels. Lack of skilled manpower is another concern.

5 Poor road conditions, checkpost delays and old vehicle fleets result in a daily coverage of a maximum of 250-400 km by a truck, as compared to 700-800 km in developed countries. While a truck on Indian roads can cover only 60,000-100,000 km in a year, in the U.S. a truck can travel up to 400,000 km in a year. The average speed of trucks in India is merely 20 km per hour,

which was confirmed by the present survey. The survey found that stoppage delay as a percentage of journey time varied between 5% and 25%, and was dependent on route characteristics. Costs of delay were also estimated and found not to affect margins by significant amounts. However, a conservative estimate showed that the annual cost of delay to the economy was of the order of Rs. 30 billion (USD 600 million). Another estimate was made on additional fuel consumption due to stoppages and slow vehicular speed, indicating that the annual savings to the economy would have been around Rs. 240 billion (USD 4.8 billion) if vehicular mileage been at desired levels.

6 The study recommends that the Government needs to invest heavily in extending, widening and upgrading the



15

Percentage of total trip expenses, comprising on-road stoppage expenses including unofficial payments to governmental officials and traffic police

highway network, build more quality arterial roads, implement access-control mechanisms and allocate adequate funds for road maintenance. Private participation may be actively sought in road development and maintenance through public-private partnerships (PPP). The Government could expedite the introduction of uniform Value-Added Tax (VAT) across all states to reduce paperwork and checkpost delays.

7 A system similar to the TIR Carnet system in the European Union (EU) that requires no checking of consignments, sealed at the origin, at interstate checkposts, may be adopted to facilitate the smooth flow of high-value, perishable and time-sensitive items.

8 Electronic tolling systems could be introduced and investments by transporters may be subsidised by the Government. Rules and regulations have to be strictly enforced by governmental officials to avoid tax evasion, overloading and other unethical practices. Offenders should be handed exemplary punishment.

9 The Government could accord industry status to road transportation so that transporters can avail benefits. Construction of more transportation hubs and logistics SEZs need to be initiated to create more shared facilities for transporters. Multi-modal transportation involving rail and road that not only reduces transportation costs through economies of scale, but also saves precious fuel, may be encouraged where the last mile connectivity is provided by road.

10 Transporters may be encouraged to replace old vehicles with multi-axle tractor-trailer units that reduce fuel consumption, save transportation costs, create less road damage and emit less pollutants to the environment. Transporters may be provided with tax breaks and/or reduced toll rates to facilitate the purchase of relatively expensive tractor-trailer units. Driver training institutes may be set up and periodic driver training in vehicle maintenance, road safety, hygiene standards and health hazards could be made mandatory for driving on highways. To deal with the shortage of skilled manpower, the Government could organise workshops, seminars and conferences in collaboration with academics and industry associations.

Summary of the 2011-12 survey

This project, henceforth referred to as the 2011-12 survey, was commissioned by Transport Corporation of India (TCI) to assess the operational efficiency of freight transportation by road in India.

The project is a sequel to an earlier project, henceforth referred to as the 2008-09 survey, also commissioned by TCI in 2008 to analyze data for 10 major routes to assess the operational efficiency of freight transportation. In the 2011-12 survey, data for an additional seven routes were collected by TCI besides the 10 routes for which data was collected in the 2008-09 survey. The objectives of the 2011-12 survey were to compare the route statistics with the 2008-09 survey to identify major changes, if any, make an assessment of efficiency of freight transportation by road, and suggest improvements in the operational efficiency of freight transportation.

To put into perspective, a summary of the 2008-09 survey immediately follows this section. While the focus of the 2008-09 survey was on a detailed analysis of the trucking industry and comparison of roads with railways in terms of freight transportation, the 2011-12 survey was more focused on comprehensive analyses of public-private partnerships (PPP) in road projects, electronic toll collection (ETC), access-controlled expressways and logistics parks/hubs.

As mentioned before, primary data was collected by TCI. Secondary data was collected from various reports and websites. Telephonic discussions with TCI

officials in Gurgaon were conducted for inputs and clarifications.

India has the second largest road network in the world with a road length of 4.24 million km. India's road density is among the highest in the world with 1.29 km of roads per sq. km of area. However, India's national highways and expressways constitute only 1.67% of the road length, and the percentage of paved roads is only 49.3%, lagging the U.S. and China. While India's road freight volumes are increasing at a compounded annual growth rate (CAGR) of 9.08% and the population of vehicles (all types) is increasing at a CAGR of 10.76%, the road length is increasing at a CAGR of only 4.01%, indicating paucity. Moreover, India's roads are poor, lacking maintenance; pedestrians and animals have uncontrolled access to roads, resulting in slow vehicular speed, break-downs and accidents.

It is imperative that new roads be built, and existing roads be widened and maintained. However, these projects require massive investments, which are beyond budgetary provisions and borrowings from banks and financial institutions. Therefore, private investments in the form of PPP must be sought for road development and maintenance. However, there are some concerns regarding project viability such as uncertain traffic volume, traffic diversion,



The 2014-15 survey analyzed the problems and prospects of multi-modal transportation and the effect of seasonality on freight transportation by road in India.

projected demand and revenue realisation, toll structure and toll collection, and return on investments. The Government should adequately address these concerns, and offer incentives such as Viability Gap Funding (VGF), land acquisition, waiver of taxes and duties etc. It is expected that in the 11th Five-Year Plan (2007-12), more than 50% of the investments in roads will be contributed by the private sector. Besides, all National Highways Development Projects (NHDP) will be implemented in the PPP mode.

Toll collection is an alternative way of financing road development and maintenance. The majority of Indian toll plazas employ manual tolling systems. Manual toll collection is a slow process, leading to congestions and long queues of vehicles at toll plazas. A CRISIL study estimates that a vehicle has to wait 5-10 minutes in the queue before it can pay the toll and leave. The data available for Delhi-Mumbai route in the 2011-12 survey also confirmed that the average waiting time at a toll plaza was about 10 minutes. Moreover, the data for the Delhi-Bangalore and Delhi-Mumbai routes showed that toll delays and toll expenses as percentages of total stoppage delays and total stoppage expenses, respectively, had increased in 2011-12 over 2008-09, indicating the requirement of a thorough analysis of the toll collection process and toll structure. To expedite the toll collection process, India should gradually move towards electronic toll collection (ETC), to not only reduce congestion and queues at toll plazas, but also reduce operating costs for toll operators and plug revenue leakages. However, concerns comprise cost implications for users and toll operators, inter-operability of different ETC systems and so on, which need to be addressed before ETC can be implemented. The Committee, set



A CRISIL study estimates that a vehicle has to wait for about 5-10 minutes in the queue before it can pay the toll and leave the toll plaza.

4.01
% of the road length in India is increasing at a compounded annual growth rate (CAGR)





18,637

Length of roads (in kms) that need to be built by the end of the 13th Five Year Plan



India's roads and highways are easily accessible for slow-moving vehicles, pedestrians and animals, resulting in a low average vehicular speed and a high number of accidents.

up by the Government and chaired by Mr. Nandan Nilekani, recommended the use of the passive Radio Frequency Identification (RFID) technology, which is not only fast becoming the popular global standard, but also less expensive and complex to implement. The Committee recommended that the existing manual toll plazas be gradually converted to ETC plazas and new toll plazas be built with ETC capabilities. The Government accepted the recommendations of the Committee for ETC implementation in India.

India's roads and highways are easily accessible to slow-moving vehicles, pedestrians and animals, resulting in a low average vehicular speed and a high number of accidents. India has a meagre 600-700 km of access-controlled expressways compared to 74,000 km of expressways in China. India needs to build more quality, access-controlled expressways for faster connectivity between cities and towns. The expressways should be equipped with Intelligent Transportation Systems (ITS) including round-the-clock CCTV surveillance for monitoring real-time traffic data and ensuring safety and security of users.

A recent study recommends that 18,637 km of expressways need be built by the end of the 13th Five-Year Plan period, i.e. 2022. However, the massive investment required for the expressway projects is estimated at Rs. 450,000 crore. The Government, under NHDP-VI, has already approved the construction of four expressways of more than 1,000 km length at a financial outlay of Rs. 16,680 crore. It is suggested that private participation in expressway projects in the form of PPP should be encouraged. There are, of course, concerns regarding projected traffic volumes, revenue realisation and project profitability. Besides adequately addressing these concerns, the Government needs to facilitate land acquisition, provide basic infrastructure, facilitate quick approvals, and offer economic incentives such as a waiver of taxes and duties. Revenues may be realised through toll collection and property

development in the vicinity of expressways. For reference, brief descriptions of three major expressways, namely Mumbai-Pune, Ahmedabad-Vadodara and Delhi-Gurgaon are included in the section on access-controlled expressways.

The report also highlights the importance of logistics parks and hubs. Logistics parks differ from ordinary warehouses through value-added services shared by multiple users. Benefits to users include cost savings to the extent of 50% through economies of scale and scope, efficient use of multi-modal transportation, and availability of value-added services under one roof. According to an estimate, strategic locations of logistics parks may save India USD 13-16 billion in logistics costs. The scale of Indian logistics parks is small (only 3-4% of the warehouses may qualify as multi-modal logistics parks) compared to the same in China and other Asian countries. India needs to scale its logistics parks and differentiate them from ordinary warehouses if it intends to compete with logistics parks in Hong Kong, Shanghai, Singapore and Dubai and capture a reasonable share of international cargo. There are some existing and promising hubs, which have already been identified based on their locations, proximity to economic and industrial activities, and connectivity by rail, road etc. The Ministry of Railways has proposed to set up a number of multi-modal logistics parks along the dedicated freight corridor. However, there are some concerns such as the low level of cargo containerisation in India and the required investment for setting up logistics parks. For logistics parks to be successful, the scale of cargo containerisation has to increase. While in developed countries, 80% of the cargo is containerised, in India, the figure is only 20%. Out of the 560 million containers handled across the world in 2010, India handled only 9.4 million containers while China, Singapore and Hong Kong handled 150 million, 28 million and 24 million containers, respectively. While India has 130 Container Freight Stations (CFS) and 61 Inland Container

Depots (ICD), there are 3,000 CFS and ICD in China. Therefore, the Government needs to play an active role in setting up more CFS and ICD to promote the cargo containerisation. To build and operate logistics parks, investments from the private sector would have to be sought in the PPP mode with appropriate economic incentives. For reference, brief descriptions of some logistics parks set up by the private sector have been included.

Finally, the potential of Nagpur as an emerging air cargo and logistics hub has been discussed. Nagpur already boasts of a number of logistics parks because of its location and connectivity through rail, road and air. The proposed logistics hub spread over 4,354 hectares, expected to be completed by 2035 at an estimated cost of Rs. 2,581 crore, will also include an integrated township and a Special Economic Zone (SEZ). Once completed, the project is expected to serve 14 million passengers, handle 0.87 million tonnes of cargo and generate revenues worth Rs. 5,280 crore annually. If developed properly, Nagpur has the potential to emerge as a logistics hub not only for India but also for South-East Asia.

As far as the route surveys are concerned, no appreciable differences in parameters related to the operational efficiency of freight transportation by road have been

observed in 2011-12 compared to 2008-09. Although it seems that the mileage of vehicles marginally improved, the average vehicular speed, stoppage delay per km and stoppage expenses per tonne-km remained at the same level. Average trip expenses and freight rates per tonne-km, increased due to inflation. Average contribution and profit margins, on the other hand, showed no specific trend and were dependent on the route under consideration. One observation, specific to the Delhi-Bangalore and Delhi-Mumbai routes, which were surveyed in detail, was of importance. On these routes, it was found that the number of toll stops as a percentage of the total number of stops, toll delay as a percentage of the total stoppage delay and toll expenses as a percentage of the total stoppage expenses were higher in 2011-12 than in 2008-09. This observation indicates the growing contribution of toll delays and toll expenses to total stoppage delays and total stoppage expenses, respectively. Although, costs of delay were not significant for individual trips, an estimate indicated that the annual cost of delay to the Indian economy was around Rs. 270 billion or USD 5.5 billion. Another estimate showed that the impact of additional fuel consumption and slow vehicular speed on the Indian economy was around Rs. 600 billion or USD 12 billion per annum.



13-16

The quantum (Rs./bn) of savings in logistics costs through the strategic locations of logistics parks

Based on the findings of the survey, the following recommendations are made, which need to be read along with the recommendations made in the 2008-09 survey.

1 The study shows that freight volumes and vehicles are growing more rapidly than the growth of road lengths over the years, putting a greater pressure on the existing roads, and seriously affecting their quality and maintenance. Therefore, the Government needs to pay immediate attention to the development of new roads, while widening and maintenance of the existing roads. However, these require massive financial outlays for which the Government must seek private investments through the PPP

mode. To attract investments from the private sector, the Government, apart from offering economic incentives, should adequately address the concerns of the private sector in terms of uncertain traffic volumes, demand and revenue realisation, toll structures and toll collection, political interference, and investment returns.

2 Now, the National Highways Authority of India (NHAI) acts as the regulator for roads and highways. In the context of private investments, an independent regulatory authority like the

Telecom Regulatory Authority of India (TRAI) should be set up to assess costs, benefits, service levels, safety measures and tariff structures.

3 The study shows that on two major routes, toll delays and toll expenses made higher contributions to stoppage delays and stoppage expenses in 2011-12 than in 2008-09, necessitating a detailed examination of the toll collection activities at toll plazas. There is an urgent need for reducing toll delays and rationalising the toll structure to divert more traffic to toll roads. The solution to the problem of toll delays is to gradually move towards electronic toll collection (ETC) systems. The majority of Indian toll plazas employ manual toll collection and only a handful of them are equipped with ETC. There are some concerns regarding the deployment of ETC, such as cost implications for users and toll operators, inter-operability of different ETC systems etc., which need to be taken care of. The recommendations of the Committee chaired by Mr. Nandan Nilekani have been accepted by the Government for implementation of ETC in India. Implementation of ETC will not only reduce toll delays, but also reduce fuel consumption and environmental pollution. To address the issue of rationalising the toll structure, an independent regulatory authority needs to be set up, as already mentioned before.

4 India needs to build a large access-controlled expressway network with ITS capabilities for improved road safety and security. The proposed expressway projects may be taken up with private participation in the PPP mode. The Government should facilitate this by acquiring the land, providing the basic infrastructure and giving quick approvals besides extending economic incentives such as exemptions from taxes and duties. Revenues may be realised through toll collection and property development in the vicinity of the expressways. Also, a National Expressway Authority of India

(NEAI), in line with NHA, should be set up for construction, operation and maintenance of the expressways.

5 India needs to build large-scale logistics parks and scale existing parks to compete with the logistics parks in Hong Kong, Shanghai, Singapore and Dubai. New logistics parks should be built in the PPP mode with economic incentives such as tax exemption and opportunities for the private sector. Logistics parks not only lead to economic development and generate employment, but also promote multi-modal transportation including the use of railways to increase efficiency and reduce pollution. Nagpur, on the other hand, should be developed as an international air cargo hub since Nagpur has the potential to emerge as the logistics hub not only for India but also for the entire South-East Asian region.

6 Presently, in India, freight transportation is tilted towards roads, which carry about 60% of the total freight volumes, whereas railways carry about 35% of the total freight volumes. The trend is different in the U.S. and China where railways carry about 47-48% of the total freight volumes. According to a report by McKinsey & Company, the ideal modal mix for India should be balanced between roads and railways, each carrying about 46-47% of the total freight volumes. Multi-modal transportation should be encouraged where long-distance transportation services may be provided by railways and the last-mile connectivity by roads. Increased use of railways, as mentioned before, is environment-friendly. However, multi-modal transportation needs coordination among different ministries, i.e. Ministry of Road Transport and Highways, Ministry of Railways, Ministry of Shipping and Ministry of Civil Aviation. Ideally, an apex body should be set up with representations from different ministries to coordinate and facilitate the use of multi-modal transportation.



Presently, in India, freight transportation is heavily tilted towards roads, which carry about 60% of the total freight volumes whereas railways carry about 35% of the total freight volumes. The trend is different in the U.S. and China where railways carry about 47-48% of the total freight volumes.

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2016 Edition

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Published By:

Transport Corporation of India Ltd

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Gurgaon-122001, Haryana, India

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