Operational Efficiency of National Highways for Freight Transportation in India

A Joint Study Report by

TCI
LEADERS IN LOGISTICS

INDIAN INSTITUTE OF MANAGEMENT
CALCUTTA

Disclaimer

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Foreword

The road transport sector is a key indicator of the development process of an economy. The Road Freight sector has been growing consistently and estimates show that it has a market share of almost 70%. Given this emerging significant role, many issues have been raised in the context of road freight movements, and these are related to efficiency of operations, competitiveness of market, etc. Lack of adequate infrastructure is also an obstacle to faster economic growth besides stringent documentation process.

This research report was commissioned by Transport Corporation of India (TCI) to assess the impact of government investments in national highways on the operational efficiency of freight transportation by road in India. Analysis of data related to ten major routes in India shows that government investments in road networks have not been able to produce significant benefits for freight transportation. The study also suggests recommendations for transporters and the Government to overcome the problems faced by the logistics industry. We believe that these recommendations would help in providing the much needed impetus to the sector.I am extremely grateful to the IIMC team for their support in bringing out this report.

D.P Agarwal - Vice Chairman & Managing Director
Transport Corporation of India

The Indian economy was growing at more than 9% per annum, second only to China in terms of growth rates, untill last year before the global recession set in and cast its shadow on almost all countries of the world. Even in this global economic turmoil, India achieved a growth rate close to 6% in the last financial year 2008-09 when most of the developed countries experienced negative growths. In the current financial year 2009-10 and during the 11th five year plan period 2007-12, the Indian Government has massive investment plans in infrastructure with an aim to achieve 9-10% growth rates per annum. High growths will induce higher volumes of freight movement by road and in order to sustain high growth rates, the operational efficiency of national highways, state highways and other major district roads need to be improved significantly. Presently, national highways are faced with the problems of inadequate stretch, poor road conditions, poor maintenance, multiple checkpost stops and complex documentation formalities, leading to delays, breakdowns and accidents. Besides improving road conditions and facilitating smooth passage of freight, the Government also needs to address the issues faced by the transportation sector such as fragmentation, diseconomics of scale, undercapitalization, old and fuel-inefficient vehicle fleets, corruption and police harassment. In this context, the TCI-IIMC joint study on the operational efficiency of national highways for freight transportation is a timely one that highlights the problems faced by the transportation sector and suggests recommendations for transporters and the Government as to how to mitigate the problems and contribute to the economic growth of India.

Saibal Chattopadhyay

Dr. Saibal Chattopadhay - Dean : Programme Initiatives
Indian Institute of Management Calcutta

Transport Corporation of India Ltd.

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.

Profile

Incorporated in 1958, TCI is a leading integrated supply chain and logistics solutions provider and a pioneer in the sphere of cargo transportation in India. Leveraging on its extensive infrastructure, TCI offers seamless multi-modal logistics solutions. An ISO 9001:2000 company, TCI is listed with premier stock exchanges like the National Stock Exchange and Bombay Stock Exchange.

Starting as a 'One Man, One Truck, One Office' company, today TCI moves 2.5 per cent of India's GDP by value of cargo. Today, TCI draws its strength from an extensive network of over 1,200 company owned offices, a workforce of over 6,500, customised fleet of 7,000 trucks, six cargo ships and warehousing space of 7.8 million sqft.

Business Divisions and Service

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TCI Freight is India's leading surface transport service provider. It offers multimodal cargo transportation such as full truck load, less than truck load, small and overdimensional cargo through road and rail. Over the years, it has invested in a strategically dispersed branch network, trained workforce, specialised fleet, cutting-edge technology and supporting infrastructure.

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EXPRESS DISTRIBUTION SPECIALISTS
Air | Courier | Surface

TCI XPS is an Express Distribution Specialist offering time-sensitive and door-to-door service for both documents and non-documents through its vast surface transport network, air cargo and courier service.

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TCI Seaways has modern well-equipped fleet and caters to coastal cargo requirements, transporting container and bulk cargo from islands and ports to various neighbouring countries.

TCI Global
GLOBAL LOGISTICS

TCI Global established TCI as a global SCM organisation that provides logistics services comprising global freight forwarding (sea and air), custom clearance, express and courier, warehousing, transportation and supply chain consultancy.

The Indian Institute of Management 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 professionalizing 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 have distinguished academic achievements in different areas of management and the related basic disciplines, and are 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 of research relevant for business and industry.

Author Profile

Subrata Mitra is Professor of Operations Management at the Indian Institute of Management Calcutta (IIMC), with over twelve years of experience in industry and academics. He has research interests in inventory control, third-party logistics and closed-loop supply chains, and has published his report works in international journals such as European Journal of Operational Research, Omega, Journal of the Operational Research Society, Asia Pacific Journal of Operational Research and Supply Chain Forum: An International Journal. Prof. Mitra is a past Fulbright Senior Research Fellow, and he serves on the Editorial Review Board of the Journal of Supply Chain Management.

Executive Summary

This project was commissioned by Transport Corporation of India (TCI) to assess the impact of government 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, and (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 data set was made available for analysis in early January, 2009. Primary data was complemented by secondary information available in published reports and various websites. Discussions with senior officials of TCI in Delhi and Kolkata also provided significant inputs for the project.

The Indian trucking sector contributes about 4.5-5 per cent (USD 55-60 billion) of the GDP. However, the sector is plagued with many problems. The first and foremost problem faced by the sector is the paucity of good-quality highways and expressways. While road freight volumes increased at a compounded annual growth rate (CAGR) of 9.06 per cent and the number of vehicles (all types) on Indian roads increased at a CAGR of 10.13 per cent during the period 1950-1951/2007-2008, the GDP at market price grew at a CAGR of only 7.35 per cent during the same period, indicating that road freight volumes and the number of vehicles (all types) grew at faster rates compared to the GDP during this period. The total length of roads, on the other hand, increased at a CAGR of only 3.77 per cent during the period 1950-1951/2007-2008, implying thereby that the growth in roads has not been able to keep pace with the growths in road freight volumes and the number of vehicles (all types) on Indian roads during the same period.

Today, national highways constitute only two per cent of the total road network, but carry 40 per cent of the road traffic. Highways are also not access-controlled allowing humans, animals and all types of vehicles simultaneously, which results in slow speed of vehicles, uncertain journey time and accidents. Poor maintenance of roads also leads to slow speed, equipment breakdown and accidents.The second major problem faced by the sector is interstate and intrastate check-post delays. Since different states have different documentation requirements for sales tax compliance, a considerable amount of time is wasted at interstate check-posts for completing sales tax-related formalities.

Besides, delay is experienced at check-posts and on-road for filling in forms required by various government departments, checking of documents and physical checking of the vehicle, driver and consignment by RTO and traffic police, and collecting highway toll and taxes. On top of this, there are police harassment and corruption soliciting unofficial payments from drivers. Survey data shows on-road stoppage expenses (Toll/RTO/ST/Octroi, etc.) including unofficial payments made to government officials and traffic police amount to, on an average, 15 per cent of total trip expenses.

The sector has its own share of problems. It is highly fragmented with 80 per cent of it being accounted for, by the unorganised sector. On one hand, there are diseconomies of scale due to small size of operators. On the other hand, these small operators collude with corrupt officials and police, and flout all rules and regulations, evade taxes, resort to overloading of vehicles and indulge in other unethical practices. Since organised players have to directly compete with small operators, there is immense downward pressure on pricing. Also, because India has one of the lowest freight rates in the world, transporters make little margins or even losses.

Reports indicate, unorganised players make about four to five per cent and organised players make about 10-15 per cent margin. With this little margin, transporters have few options to invest in assets and technologies. Vehicles that ply on Indian roads are old and fuel-inefficient, and need immediate replacement. There is inadequate adoption of information technology for tracking shipments on a real-time basis, leading to poor service quality. 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 for transporters.

Poor road conditions, check-post delays and old vehicle fleets result in a daily coverage of maximum 250-400 km by a truck 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 US 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 also confirmed by the present survey.

The survey found that stoppage delay as percentage of journey time varied between five per cent and 25 per cent, and was very much dependent on the characteristics of routes. 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). Similarly, another estimate was made on additional fuel consumption due to stoppages and slow speed of vehicles, which indicated that had the mileage of vehicles been at desired levels, the annual savings to the economy would have been of the order of Rs. 240 billion (USD 4.8 billion).

The study recommends that the government should invest heavily in extending, widening and upgrading the highway network, build more high-quality arterial roads, implement access-control mechanisms and allocate adequate funds for road maintenance. Private participation may be actively sought in for road development and maintenance through Public-Private Partnerships (PPP). The government may expedite the introduction of uniform Value-Added Tax (VAT) across all states that would reduce paperwork and check-post delays significantly.

Also, a system similar to the TIR Carnet system prevailing in the European Union (EU) that requires no checking of consignments, sealed at the origin, at interstate check-posts may be adopted to facilitate smooth flow of high-value, perishable and time-sensitive items. Electronic tolling systems may be introduced and investments that are required to be made by transporters may be subsidised by the government. Rules and regulations have to be strictly enforced by the government officials and traffic police to avoid evasion of tax, overloading and other unethical practices by drivers. Offenders should be handed out exemplary punishments.

The government may consider according to the industry status for road transportation so that transporters can avail the benefits of being part of an industry. Construction of more transportation hubs and logistics SEZs should be initiated to create more common, shared facilities for transporters. Multi-modal transportation involving rail and road that not only reduce transportation costs through economies of scale, but that also saves precious fuel may be encouraged, where the last mile connectivity would be provided by road.

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

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1. Road Infrastructure

Roads are essential for a country's economic growth. India has the second largest road network in the world. The total length of roads has increased over eight-fold in 57 years from 0.4 million km in 1950-1951 to 3.3 million km in 2007-2008. While, the US tops the list with 6.4 million km of road network, China has only 1.8 million km of roads. As far as the density of roads is concerned, India is far ahead with 1.03 km of roads for every square km of land compared to the US (0.77), Brazil (0.20) and China (0.16).

Indian roads can be broadly classified into four categories: (a) National highways, (b) State highways, (c) Major district roads and (d) Rural roads. While national highways connect important cities and towns of different states across the country, state highways and major district roads connect cities, towns and rural roads within a state with the national highway network. Table 1 shows the lengths of different categories of highways/roads and the corresponding percentages of the total road network.

Table 1: Lengths and Percentages of Different Categories of Highways/Roads

Category of Highway/Road	Length (km)	Per cent of Total Road Network
National Highways	66,754	2.01
State Highways	128,000	3.86
State Highways	470,000	14.18
Rural Roads	2,650,000	79.95
Total Road Network	3,314,754	100

Despite having the second largest road network in the world, Indian roads pose many problems. National highways constitute only 2 per cent of the total road network, but carry 40 per cent of the road traffic. National and state highways taken together constitute about 6 per cent of the total road network; however, they account for almost 80 per cent of the road traffic. Of 66,754 km of national highways, 18,350 km (27 per cent) is still single-lane and 39,079 km (59 per cent) is double-lane. The length of four/six/eight-lane national highways is a meager 9,325 km (14 per cent) causing excessive congestion and delay with buses and trucks hitting a maximum speed of only 30-40 km per hour on highways.

Most of the roads are also of very poor quality and not properly maintained leading to accidents, frequent breakdown of roads and vehicles, and high transportation costs for users. The conditions of rural roads are even poorer. 40 per cent of Indian villages do not have access to all-weather roads and are cut off during the monsoons. The problem is more acute for the north-eastern states, which are poorly linked with the rest of the country. Urban road networks, on the other hand, are inadequate creating congestion during peak hours and limiting vehicular speeds to 10-15 km per hour in central business districts during rush hours.

2. Freight Transportation by Road

Roads are lifelines to a country's economy, transporting goods from one point to another on a 24/7 basis. In India, roads account for 65 per cent of the freight traffic while the railways serve the remaining 35 per cent. The contribution of road transportation to GDP is 4.5-5 per cent and considering India's GDP of USD 1,232.7 billion in 2008, the share of road transportation in GDP is USD 55-60 billion. Also, road transportation accounts for approximately 70 per cent of the contribution made by the transportation sector to GDP. Road freight volumes increased from six Billion Tonne Km (BTKM), about 14 per cent of total freight volumes, in 1950-1951 to 840 BTKM, about 65 per cent of total freight volumes, in 2007-2008 registering a compounded annual growth rate (CAGR) of 9.06 per cent.

During the same period, India's GDP at market prices grew from USD 20 billion to USD 1,142 billion registering a CAGR of 7.35 per cent. Therefore, it is observed that the growth of road freight volumes has exceeded the growth of GDP during the period 1950-1951/2007-2008, which highlights the fact that growth in all transportation modes including roads is an integral part of a country's economic growth.

The vehicle (all types) population also grew from 306,000 in 1950-1951 to about 75 million in 2007-2008 at a CAGR of 10.13 per cent. The population of goods vehicles increased from 82,000 to 3.75 million during the same period at a CAGR of 6.94 per cent. The share of goods vehicles in all types of vehicles decreased from 26.8 per cent to five per cent indicating higher growths of other vehicles such as two-wheelers and cars. However, during the period 1950-1951/2007-2008, the total length of roads, as mentioned before, has increased from 0.4 million km to 3.3 million km registering a CAGR of only 3.77 per cent, and hence has not been able to match the growth rates in road freight volumes and vehicle traffic. Table 2 shows the growths in GDP, road freight volumes, vehicles and road lengths during the period 1950-1951/2007-2008.

Table 2: Growths in GDP, Road Freight Volumes, Vehicles and Road Lengths during 1950-1951/2007-2008

GDP/Freight/Vehicle/Road	Unit	1950-1951	2007-2008	CAGR (%)
GDP	USD	20 Billion	1,142 Billion	7.35
Road Freight Volumes	BTKM	6	840	9.06
Road Freight Volumes	Million	0.306	75	10.13
Vehicles (Goods)	Million	0.082	3.75	6.94
Road Lengths	Million km	0.4	3.3	3.77

Though India has one of the highest road densities in the world, growth in road lengths has not been commensurate with the growths in freight and vehicle traffic, resulting in congestion, long delays and substantial costs to the environment and the economy.

3. Investments and Road Development Programmes

The road freight volume is projected to grow to 1,200 BTKM and the requirement of goods vehicles is six million in 2011-2012. In order to sustain this growth, more roads have to be constructed, existing roads have to be widened and fund allocation for road maintenance has to be increased. The Department of Road Transport and Highways under the Ministry of Shipping and Road Transport and Highways of the Government of India is responsible for highways development, maintenance, regulations and safety. It has been estimated that approximately Rs. 225,000 crore (USD 45 billion) would be required as financial outlays for developing and maintaining national and state highways during the 11th Five Year Plan (2007-2012).

Massive highway development projects under the National Highways Development Project (NHDP) of the National Highways Authority of India (NHAI) have been undertaken that would oversee the completion and widening of the 5,846 km long Golden Quadrilateral (GQ) connecting the four major metros, Kolkata, Delhi, Mumbai and Chennai, and the 7,142 km long north-south, east-west corridors connecting Srinagar with Kanyakumari and Silchar with Porbandar at an estimated cost of Rs. 65,000 crore (USD 13 billion) at 2004 prices. Other projects undertaken by NHDP are upgradation and four/six/eight laning of national highways, construction of ring roads and bypasses in major towns and construction of flyovers, elevated roads, tunnels, underpasses, etc.Funding for road development and maintenance comes from budgetary support (including borrowings) and various forms of taxes such as tax collected on vehicle purchase, vehicle registration fees, road tax, road permit fees, tax collected at state border check-posts and by local authorities, highway tolls, cess on fuel, etc. The Central Government has created a Central Road Fund (CRF) with Rs. 2 (USD 0.04) per litre collection of cess on petrol and high speed diesel oil for development, maintenance and safety of national highways, state roads, rural roads and railway over/under bridges.

Presently, Rs. 8,106.39 crore (USD 1.62 billion) has been provided from the CRF of which Rs. 6,541.07 crore (USD 1.31 billion) and Rs. 1,565.32 crore (USD 310 million) have been allocated to national highways and state highways, respectively. In the interim budget for the year 2009-2010, Rs. 99.9 billion (USD 2 billion) and Rs. 40 billion (USD 800 million) have been allocated for development of national highways and rural roads, respectively. India Infrastructure Finance Company Ltd. (IIFCL) has been authorised to raise Rs. 100 billion (USD 2 billion) via tax-free bonds by March, 2009 with approval to raise an additional Rs. 300 billion (USD 6 billion).

However, budgetary support including borrowings, taxes and surcharges, and fees collected against services rendered are not adequate for funding the massive investments required for roads. Hence, the government is actively pursuing private investments in the Public-Private Partnership (PPP) mode for development and maintenance of roads, bridges, flyovers and tunnels. Tax concessions and duty exemptions on imported equipment are provided to encourage private investments. Of the estimated Rs. 225,000 crore (USD 45 billion) financial outlays for national and state highways in the 11th Five Year Plan, Rs. 120,000 crore (USD 24 billion), i.e. 53 per cent, is expected to be invested by the private sector. In the last four years (2005-2008), 194 contracts totaling 9,013 km of roads have been awarded to the private sector at a cost of Rs. 59,915 crore (USD 12 billion). In the interim budget, 2009-2010, IIFCL has been authorised to refinance 60 per cent of commercial bank loans for PPP projects involving an investment of Rs. 100,000 crore over the next 18 months, which will improve the credit availability for road projects undertaken by the private sector.It may be observed that the government has launched massive projects for highways development. The 11th Five Year Plan document has recommended earmarking a fixed proportion, say one third, of the national highways share of road cess for maintenance.

Also, the Sundar Committee on Road Safety and Traffic Management has suggested earmarking of at least one per cent of total proceeds of cess on diesel and petrol for Road Safety Fund. Initiatives should be taken to develop bypasses, ring roads and feeder roads for taking off some of the load of highways.

4. Road v/s Rail Transportation of Freight

In 1950-1951, railways were the main mode of transportation accounting for 86 per cent of freight transportation and carrying 37.6 BTKM worth of freight. Today, railways account for 35 per cent of freight transportation and in 2007-2008 carried 452 BTKM worth of freight. The growth of rail freight volumes was moderate compared to the phenomenal growth rate of road freight volumes during the period 1950-1951/2007-2008. While the road freight volume grew at a CAGR of 9.06 per cent during this period, the volume of rail freight grew at a CAGR of only 4.46 per cent during the same period, much less than the 7.35 per cent CAGR of GDP during the period. Freight transportation by rail accounts for about 1.1 per cent of GDP, i.e., USD 13-14 billion in 2008.

Railways mainly carry commodities such as food grains, fertilizers, coal, cement, steel, metals and petroleum products. For carrying high-value and time-sensitive goods, railways are not the preferred mode of transportation, since railway networks are not point-to-point, transactions are pretty slow, service quality is poor and there is lack of responsiveness to changing market conditions.

On the other hand, road transportation is door-to-door (Laying railway lines in difficult terrains such as hilly areas is not only expensive but also uneconomical), shipping of small quantities of freight is possible, vehicles are available on demand and ready to depart as soon as loading is complete, and also just-in-time deliveries are possible at the right place, making road transportation the prime mode of transportation of freight in India. Therefore, although rail freight rates are generally cheaper than road freight rates **(Annexure 2 presents a comparison of road and rail freight rates on different routes in different years)**. The inability of railway networks to make door-to-door deliveries and the delay in transactions makes the overall cost of transportation much higher.

However, one can think of multi-modal transportation involving roads and railways where the last mile connectivity can be provided by dedicated trucks. Multi-modal transportation enables to save on fuel, is environment-friendly, offers flexibility in loading, brings in economies of scale and saves overall costs to the extent of 4-6 per cent. Railways themselves can think of forward and backward integration by acquiring or partnering with transporters/truckers to provide multi-modal transportation. Railways have also started construction work of the eastern (Ludhiana to Dankuni) and western (Dadri to JNPT) dedicated freight corridors that will cover approximately 3,300 route km.

Once completed, these dedicated freight corridors will ensure faster speeds of goods trains up to 100 kmph (Now goods trains and passenger trains share the same railway tracks where passenger trains get priority over goods trains, resulting in slow speeds of goods trains), run longer and heavier trains, ensure guaranteed transit time and reduce the unit cost of transportation.

5. Indian Trucking Industry and Problems in Road Transportation

5.1 Structure of the Industry

The Indian trucking industry is deregulated, and is highly fragmented as in many countries such as the US, the UK and Japan, with more than 80 per cent of the industry being accounted for by the unorganised sector consisting of small truck operators having five or less vehicles. The industry is primarily composed of (a) transporters, (b) truck operators and (c) brokers/agents.

Transporters are the primary interface with shippers. They take all the responsibilities of shipment of consignments including loss of cargo and damage claims. Transporters may have their own fleets of trucks and use them for shipping. However, since requirements always exceed availabilities, they have to rely on small truck operators for supply of trucks. The role of brokers or agents, who come in between transporters and truck operators, is to match demand and supply, i.e. they receive requirements from transporters and try to match them with trucks available in the market.

Transporters may enter into annual, half-yearly, quarterly or even daily rate contracts with shippers depending on the volatility of freight rates associated with different classes of commodities.

For example, for pharmaceuticals, transporters and shippers may agree on annual contracts while for construction materials, shippers insist on daily rates since the volatility of freight rates for the latter is much higher than that for the former. Truckers or drivers, on the other hand, are paid either a fixed wage depending on the distance or a percentage of the revenue. In addition, drivers are paid daily allowances. Finally, brokers or agents charge a fixed brokerage per load.

The trucking industry is extremely competitive, and there is always undercutting of prices leading to thin profit margins or even losses. The industry is dominated by unorganised operators with five or fewer trucks that results in inefficiencies and diseconomies of scale. Unorganised truck operators may go directly to shippers bypassing transporters and can thus pose serious competitive threats to transporters.

Truck operators and transporters are not at a level playing field. Since large transporters or trucking companies such as TCI, DRS, VRL, etc. are all organised players, they have to pay various forms of taxes and abide by the rules and regulations stipulated in the Motor Vehicles Act, 1988 regarding weight and volume restrictions, quality of the driver and vehicle, etc. However, small truck operators often get away without paying taxes and conforming to norms of the Motor Vehicles Act. Overloading of vehicles to the extent of 100 per cent is something not unheard of. This puts the organised players in a disadvantaged position vis-à-vis the unorganised players.

5.2 Characteristics of Vehicles

Vehicles used in the Indian trucking industry are another source of diseconomies of scale. The industry deploys mainly two and three-axle rigid trucks with a low cubic capacity freight box. About 75 per cent trucks on Indian roads are two-axle with nine tonne capacity. Because of the low cubic capacity, freight rates may not be as low for the light load as for the heavy load, being effectively 50-100 per cent higher than full-load freight rates.

As far as the vehicle age is concerned, 40 per cent of the vehicles are less than six years old while 34 per cent are more than 10 years old. The useful life of a vehicle is about 20 years after which it is scrapped. A vehicle which is less than six years old can make about 8,000 km per month while a vehicle which is more than 10 years old can make only about 2,000-4,000 km per month.

The Indian trucking industry needs to increase the share of multi-axle vehicles and tractor-trailer combinations with

larger hauling capacities to reduce unit transportation costs, and bring in efficiencies and economies of scale. A 10 per cent increase in the market share of tractor-trailer units is estimated to reduce the annual transportation costs by Rs. 5 billion – Rs. 8 billion (USD 100-160 million). Introduction of tractor-trailer units not only reduces transportation costs, but also causes less damage to roads requiring less maintenance and saves fuel reducing the emission of pollutants.

5.3 Freight Rates and Profitability

Indian freight rates are among the lowest in the world. Freight rates depend on type of commodity, weight/ volume, source-destination pair, time of year, and demand and supply of trucks. Freight rates are very much seasonal in nature, vary with the gap between requirements and availabilities of trucks, and also depend on the possibility of a quick turnaround with return load from the point destination.destination.

Table 3 shows the average freight rates for a 15-tonne truck between each pair of four metros, Delhi, Mumbai, Chennai and Kolkata, based on data provided by TCI.

Table 3: Comparison of Freight Rates Between Four Metros for a 15-tonne Truck

From	To	Distance (km)	Freight Rate (Rs.)	Freight Rate/ km (Rs./km)	Freight Rate Per Tonne-km (Rs./Tonne-km)
Delhi	Mumbai	1,385	23,250	16.79	1.12
Delhi	Chennai	2,300	48,000	20.87	1.39
Delhi	Kolkata	1,471	33,000	22.43	1.50
Mumbai	Chennai	1,382	32,250	23.34	1.56
Mumbai	Kolkata	1,990	45,000	22.61 1.51	
Chennai	Kolkata	1,700	33,000	19.41	1.29
			Average	20.91	1.39

The average freight rate per tonne-km, i.e. Rs. 1.39 (USD 0.028) is one of the lowest in the whole world. Table 4 compares among freight rates in different countries prevailing in 2002.

Table 4: Comparison of Freight Rates in Different Countries in 2002

Country	Freight Rate (USD per tonne-km)
Pakistan	0.015 – 0.021
India	0.019 – 0.027
Brazil	0.025 – 0.048
US	0.025 – 0.050
Central Asian Republics	0.035 – 0.085
Australia	0.036
China	0.040 – 0.060

Seven years have passed by since 2002. Freight rates have presumably increased in other countries as well. However, without even considering an increase in freight rates in other countries, it may be observed from Table 4 that the average freight rate per tonne-km (USD 0.026) between four Indian metros in 2008 is still well below the freight rates per tonne-km in most of the other countries in 2002. Also, the routes between four Indian metros are major busy routes with higher-than-average freight rates. Had freight rates on all Indian routes been considered, the average freight rate would probably have been much lower than USD 0.026 per tonne-km.

Because of low freight revenue realisations and high costs of operations, the Indian trucking industry is making marginal profits or even losses. Reported profit margins are of the order of 4-5 per cent for unorganised players and 10-15 per cent for organised players.

5.4 Problems Faced by the Industry

Since the transport sector has not been accorded the industry status as yet, under-capitalised small truck operators find it difficult to raise funds through organised banking or financial channels. Therefore, it is virtually impossible for them to invest in modern equipment and technology to increase efficiency and reduce the cost of transportation.

Information on various transport markets as regards the availability of trucks and going rates is not available to truckers on a real-time basis forcing them to rely on brokers for loading their trucks. Shippers also end up paying higher-than-market freight rates, if return loads are not assured.

If market information were available to shippers and truckers on a real-time basis, shippers would have paid actual market rates. Also, very few transporters have real-time tracking facilities (GPS). Once a vehicle departs from the source, there is no way to track the movement of the vehicle on a real-time basis until it reaches the destination.

This may induce drivers to indulge in unethical practices such as pilferage, rerouting, overloading and converting LTL to FTL shipments. Shippers may pay for LTL shipments, the rate being higher than that for FTL shipments; however, since there is no visibility once the vehicle leaves the loading point, truckers can still convert LTL to FTL shipments somewhere on the way and shippers end up paying LTL rates for FTL shipments. Had shippers been provided with online tracking facilities, some of these problems would not have occurred at all.

Lack of quality of drivers and staff is also a major concern for transporters in adapting to modern technologies and management practices. The industry culture and profitability cannot ensure employment of good-quality people. In order to upgrade themselves from ordinary truckers to value-added service providers, transporters need to invest in human resources in terms of recruiting, training, motivating and retaining management graduates, office staff, drivers and helpers.

Indian truckers also face problems due to poor road conditions and check-post delays. The average speed of trucks on Indian roads is about 20 km per hour, including all stoppages. A truck on Indian roads travels, on an average, for 20 days a month compared to 25 days in developing countries.

In India, a truck can cover only 250-400 km per day compared to 700-800 km in developed countries. In a whole year, a truck on Indian roads can cover 60,000-100,000 km while in the US a truck can travel up to 400,000 km a year.

Slow speeds of trucks result in poor service quality in terms of reliability and on-time delivery. While low rates-poor quality is acceptable for low-value commodity-like items, for high-value, perishable and time-sensitive items poor service quality is definitely a cause of concern.

Poor conditions of Indian roads can be attributed to low axle-load bearing capacity and lack of maintenance. These coupled with frequent overloading to the extent of 100 per cent result in road damage, increase in maintenance costs, equipment breakdown, loss of utilisation time and accidents.

An investment of Rs. 200-300 billion (USD 4-6 billion) is immediately required to modernise roads and related infrastructure such as flyovers, weigh bridges, etc. to increase the load bearing capacity and account for axle-load control. Random checks for axle-load control should be deployed on highways and offenders must be forced to pay substantial penalties and offload additional cargo at their own risk.

A lot of time is also lost on the way due to check-post delays. There are two types of check-posts – interstate (border) and intrastate. Interstate check-posts are primarily for checking Sales Tax (ST) documentation related to the consignment and route permit and collection of entry tax, if applicable.

Intrastate check-posts, on the other hand, are for checking documents related to the driver (license) and the vehicle (registration, insurance, fitness, road tax, road permit, weight of cargo, etc.), and collection of highway toll and octroi, if applicable.

Since there are several windows at a check-post and various forms need to be filled up to be produced for clearance at these windows, the illiterate or semi-illiterate drivers have no choice but to rely on the agents for filling up these forms and completing the formalities in return of a service charge.

It is expected that a certain portion of this service charge collected by the agents go to the government officials sitting at these windows. Moreover, there are frequent police harassment on roads and rampant corruption.

There is an unholy nexus between truckers and police/government officials, who allow trucks without proper documents and being overloaded in exchange of payments. Unofficial payments may vary from Rs. 0.13 (USD 0.0026) to Re 1 (USD 0.02) per km. One sample data on the Delhi – Chennai route shows that delays constituted 10.43 per cent of the transit time and unofficial payments made en-route, amounted to 19.4 per cent of the total expenses on road.

Another survey done by TCI on the Kolkata – Mumbai route shows that the vehicle took eight days to reach Mumbai with 32 hours or 16.67 per cent of the transit time wasted at various check-posts and the average speed of the vehicle was merely 11 km per hour.

It is estimated that check-post delays cause Rs. 9-23 billion (USD 180-460 million) loss (not taking into account fuel expenses due to slow speed and idling) in a year and unofficial payments amount to Rs. 9-72 billion (USD 180 million-1.44 billion) in a year. According to another estimate, fuel worth Rs. 100-150 billion (USD 2-3 billion) is wasted on highways and check-posts annually.

A vehicle that costs Rs. 1.2 million (USD 24,000) pays Rs. 300,000 (USD 6,000) per annum in the form of various taxes, which include the excise duty on fuel. This is why freight cost is a major component of the cost of a product in India.

Average speed of trucks on Indian roads is about 20 km per hour
On Indian roads, a truck travels for 20 days a month v/s 25 days in developing countries
In India, truck covers 250-400 km per day while 700-800 km in developed countries
Annualy, a truck on Indian roads can cover 60,000-100,000 km while in the US a truck can travel up to 400,000 km
Immediate investment in roads and related infrastructure of Rs. 200-300 billion is required
Fuel worth Rs. 100-150 billion is wasted on highways and check-posts annually

6. Comparison with China and Other Countries

As mentioned before, India has the second largest road network (after the US) and the highest road density in terms of road length per square km of land in the world. However, Indian road conditions are very poor compared to developed countries and even China and Pakistan. A truck on Indian roads can average 250-400 km per day compared to 700-800 km in developed countries. In India, a truck can travel 60,000-100,000 km in a year compared to 400,000 km in the US. Though, China has only 1.8 million km of roads compared to 3.3 million km in India and the road density in China is only 0.16 km per square km of land compared to India's 1.03 km per square km of land, China has over 125,000 km of national highways (Seven per cent of the road network) compared to 66,754 km of national highways (Two per cent of the road network) in India.

While 50 per cent of China's road network is paved, 80 per cent of the Indian road network is constituted by rural roads. In early 1990's, road conditions in China and India were similar – poor quality, poor maintenance, uncontrolled mixing of pedestrians, animals and other slow moving traffic contributing to slow travel speeds, uncertain journey time and high accident rates.

Since then, China's GDP has been growing at more than nine per cent and has now touched USD 4.42 trillion in 2008, about 3.6 times India's GDP in 2008. China's growth has been mainly driven by manufacturing/industry, while India's growth has been fuelled by the service sector.

The contributions of industry and services to China's GDP are 48 per cent and 40 per cent respectively, while the corresponding figures for India are 29 per cent and 53 per cent, respectively. This highlights the fact that the Chinese economy is much more dependent on freight transportation than India's economy. China moved almost five trillion tonne-km worth of freight compared to 900 billion tonne-km for India in 2002, a multiple of 5.55. Unlike in India, inland water transportation has the highest share of freight transportation among all modes of transport in China, accounting for 55.17 per cent of freight transportation in 2002. Table 5 shows the volumes and shares of freight moved by different transportation modes in China in 2002.

Table 5: Volumes and Shares of Freight Moved by Different Transportation Modes in China in 2002

Mode of Transport	Volume of Freight Moved (BTKM)	Share of Freight Moved (%)
Rail	1,551.6	31.11
Road	6,78.3	13.60
Inland water	2,751.1	55.17
Air	5.2	0.12
Total	4,986.2	100

Considering only surface transportation modes, freight transportations by rail and road accounted for 70 per cent and 30 per cent respectively, for China in 2002, while the corresponding figures for India were 40 per cent and 60 per cent in 2002.

To sustain its GDP growth, China embarked upon massive investments in highways development spending USD 30 billion or more per annum, since late 1990's. India's investments in roads in the corresponding period were merely between USD 1 billion and USD 3 billion.

While China focused more on building arterial roads and highways, India concentrated more on building feeder roads connecting highways to villages and remote areas. China has successfully implemented access control mechanisms in several segments of its highways, while in India the same could not be implemented due to various reasons including political compulsions resulting in the thoroughfare of humans, animals and all types of vehicles on its highways and hence slow movement of vehicles and accidents.

In China, so far, a major portion of the road development and maintenance fund has been contributed by the government through budgetary allocations and borrowings. However, since the fund requirements increase substantially day by day, China is gradually leaning towards private investments in infrastructure through Public-Private Partnerships (PPP). India, on the other hand, has already taken the initiative to attract private investments in road development and maintenance through PPP, and as mentioned before, in the 11th Five Year Plan period more than 50 per cent of investments in roads are expected to come from the private sector.

As in India, the trucking industry in China is also fragmented. In 2008, the number of trucks in China was about 11-12 million, growing at a rate of six per cent per annum. Focus has been to increase the share of multi-axle tractor-trailer combinations for fuel efficiency and reduced transportation costs. In the US and other developed countries, tractor-trailer units have a significant share of freight carrying vehicles that also increases the uptime of the power unit (tractor). As far as freight rates are concerned, China's freight rates are double the Indian freight rates (Refer to Table 4).

However, costs are also high reducing its profitability. According to estimates, China's logistics costs account for 20 per cent of its GDP compared to nine per cent and 13-14 per cent for the US and India, respectively.

Also, in China logistics contribute 16 per cent of product costs compared to four per cent in many developed countries, affecting both imports and domestic products such as soybeans. Profit margins are expected to be generally low for fragmented transport markets.

For organised markets such as the US, 15 per cent margin is considered to be just fine, given the almost complete absence of cargo loss exposure (Indian transporters have to bear the cost of cargo claims), faster collections and almost complete lack of credit losses (In India, the average credit period is 60 days and more often than not transporters have to bear the cost of bad debts), and the fact that transporters do not have to guarantee freight rates (Indian transporters are generally required to enter into fixed annual rate contracts with shippers that may lead to losses in case market freight rates and/or costs rise).

In developed countries and also in China, there are no check-posts on highways except for toll collection. Vehicles move freely across state/provincial borders. Commercial taxes are collected either at the origin or at the destination, and not en-route. Only traffic police, and no other department, have the authority to intercept vehicles on highways. Fines for any offence have to be imposed and collected jointly by traffic police and road transport authorities.

India can possibly adopt a system similar to the TIR Carnet System used in the European Union (EU) to facilitate cross-border movement of goods. Under this system, vehicles normally carry high-value, perishable and time-sensitive goods, which are sealed at the source and opened only after reaching the destination.

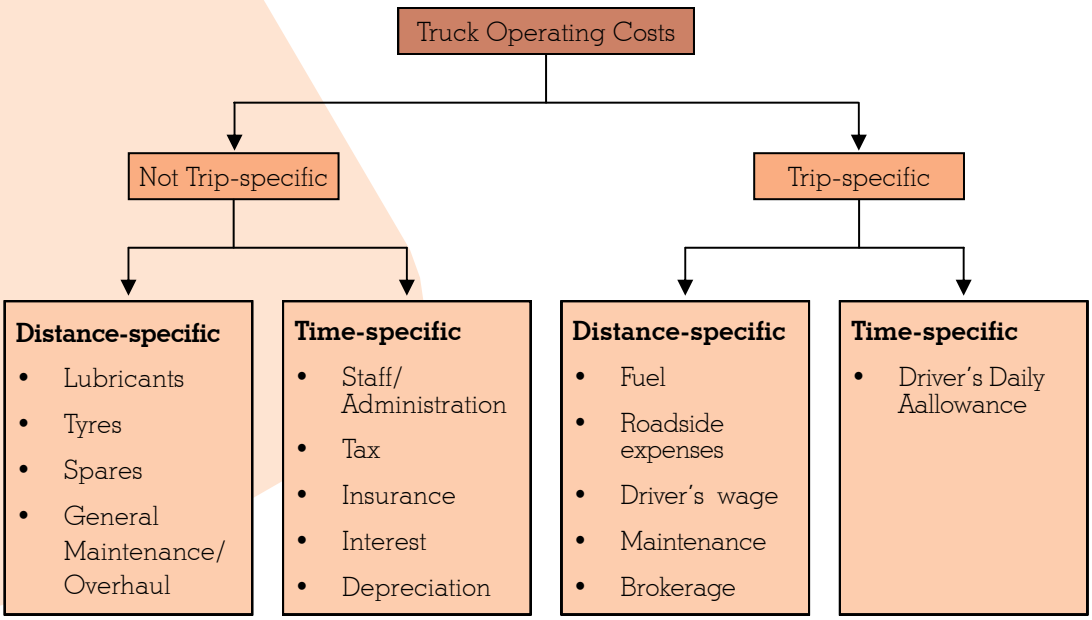
Drivers carry consignment documents, the formats of which have been agreed upon by all the member countries of EU, which serve as a passport for the consignment without being inspected at international borders. This saves a lot of time for passage of high-value items. The same system can be implemented at interstate borders in India doing away with check-posts and saving all that delay time for time-sensitive shipments.

7. Tangible and Intangible Costs of Transportation

7.1 Costs of Operations

Truck operating costs (tangible) can be broadly classified into two categories – (a) Trip-specific and (b) Not trip-specific. Each category can be further classified into two sub-categories – (i) Distance-specific and (ii) Time-specific. Figure 1

Figure 1: Components of Truck Operating Costs



shows the classification and components of operating costs, followed by discussions.

Costs specified under 'Not Trip-specific' are basically overhead costs, not related to individual trips. Costs under this category either depend on the distance travelled by the truck (e.g. lubricants, tyres, spares, etc.) or are distance-independent and generally fixed over a time period, say one year (e.g. administration, road tax, road permit, interest, insurance, depreciation, etc.). On the other hand, costs mentioned under 'Trip-specific' are variable costs associated with individual trips. Costs under this category depend either on the distance and route between the source and destination (e.g. fuel, driver's wage, maintenance/repair, brokerage and roadside expenses such as toll, RTO, ST, octroi, police, etc.) or on the journey time (e.g. driver's daily allowance, which is over and above the fixed wage).

Past data shows that 'Not Trip-specific' (overhead) costs and fuel costs account for 39 per cent and 43 per cent, respectively, of annual operating costs for a 15 tonne truck. To compute the overall cost for a particular trip, distance-specific and time-specific overhead costs have to be apportioned based on the distance (km) travelled for the trip/annual utilisation (km) of the truck and journey time (hours) for the trip/annual operating hours of the truck, respectively.

7.2 Costs of Delay

The operating costs mentioned above are tangible costs. However, as trucks are delayed due to poor road conditions and check-posts, there are intangible costs of delay. As mentioned before, the cost of truck delays (excluding additional fuel cost due to slow speed and idling) to the Indian economy is estimated to be Rs. 9-23 billion (USD 180-460 million) per annum. The possible components of the delay cost are as follows:

(a) Costs to the Transporter

(i) Cost of fuel due to slow speed and idling

Trucks burn more fuel when they run below the optimal speed. Poor road conditions and multiple check-posts force trucks to move at slow speeds. Also, many a time when trucks have to wait in queues at check-posts, drivers do not switch off the engine. Idling of engines also leads to wastage of fuel. It is observed that the mileage (kmpl) of trucks is below the optimal level. Additional fuel consumption not only increases the transportation cost, but also contributes to environmental pollution and puts pressure on crude oil import bills and foreign exchange reserves.

(ii) Loss of profit due to delay

As trucks are unable to make up for the delay, the loss of profit, or opportunity cost, due to the lost time has to be accounted for.

(iii) Interest, tax, insurance

Interest payments on a pro-rata basis need to be considered, since transporters have to pay interests irrespective of whether trucks are running or waiting at check-posts. While waiting at check-posts, trucks incur interest expenses but generate no revenues. On the other hand, more trucks would be required to meet demand. Following the same argument, other overheads such as tax and insurance also have to be considered on a pro-rata basis.

(iv) Depreciation

There is confusion whether depreciation should be considered as a delay time-cost, since depreciation also contributes to tax savings. However, the argument is, trucks are being depreciated (devalued) when they are subjected to wait at check-posts and are not utilised. Since there is no erosion of value when trucks are not operational, depreciation expenses, on a pro-rata basis, have been accounted for in the present analysis.

(v) Driver's daily allowance

As mentioned before, drivers receive daily allowances besides the fixed wage. Transit delay means drivers may have to be paid additional daily allowances.

(b) Cost to the Shipper

(i) Inventory holding cost

The shipper will receive payments after the consignment reaches the consignee/market. However, if the consignment is delayed, payments will be realised only after the delay period during which the shipper will have its capital blocked in the inventory. Hence, the cost of capital for inventory blocked over the delay period needs to be accounted for.

The costs mentioned above are direct costs of delay. However, there are also many indirect costs of delay, which may be difficult to quantify but have significant impacts on the economy.

8. Survey Findings

To estimate the operating cost and cost of delay for a 15-tonne truck, a survey was carried out on 10 major routes in 2008. Table 6 shows the routes and the number of trips for each route on which necessary data were collected by surveyors. It is to be kept in mind that a trip can be considered either way. The underlying assumption is that the characteristics of a route would remain the same both ways.

Table 6: Routes and Number of Trips

Route Between		Number of Trips
Delhi	Bangalore	30
Delhi	Mumbai	3
Delhi	Chennai	2
Delhi	Kolkata	2
Mumbai	Chennai	3
Mumbai	Kolkata	2
Chennai	Kolkata	2
Indore	Guwahati	2
Pune	Hyderabad	2
Ahmedabad	Coimbatore	2
	Total	50

Since different routes may have different characteristics, a holistic analysis taking into account all the 50 data sets together may not be appropriate. Therefore, the focus has been on the Delhi – Bangalore route for a comprehensive analysis since the route accounts for 30 data sets, which is an acceptable number for statistical significance of findings. Data sets for other nine routes have also been analysed; however, since the number of observations for each of these nine routes is either two or three, one should exercise caution and judgement while interpreting the findings.

8.1 Findings of the Delhi-Bangalore Route Survey

The summary statistics based on data collected on the 30 trips are shown in Table 7.

Table 7: Summary Statistics for the Delhi-Bangalore Route

Parameter	Unit	Minimum	Maximum	Average
Distance	Km	2,060	2,322	2,155.83
Journey time	Hours	80	166	102.18
Average speed	Km/hour	12.98	29.03	21.73
Mileage	Km/Lt	3	4.11	3.6
Loading/documentation time	Hours	1	5.5	3.06
No. of stops	--	18	38	25.30
Stoppage delay	Hours	2.75	8.78	5.16
Stoppage delay per km	Hours/km	0.0013	0.0042	0.0024

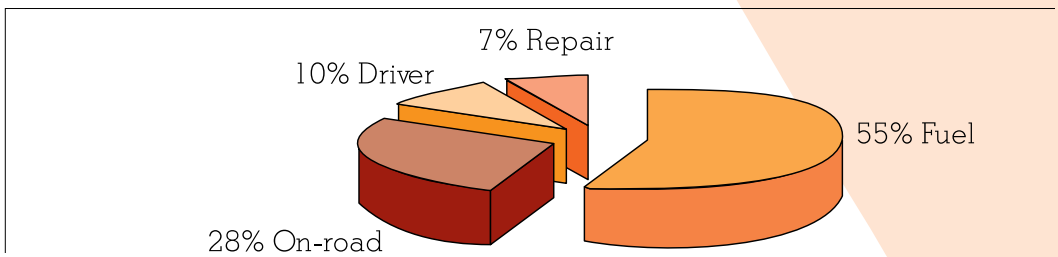
Stoppage expenses	Rs./tonne-km	0.09	0.25	0.15
Trip expenses	Rs./tonne-km	0.86	1.15	0.99
Freight rate	Rs./tonne-km	1.18	1.60	1.39
Contribution margin	%	20.11	67.38	40.40

It may be observed from Table 7 that the average vehicle speed is around 20-21 km per hour as already noted before. Mileage is also below the desired mileage of 3.75 kmpl for a 15-tonne truck. There are, on an average, 25 stops (15 for toll collection) on the way and the average stoppage delay is five hours, about five per cent of the journey time (though delay amounting to 15-25 per cent of the journey time is also not uncommon). Toll stoppages account for almost 50 per cent of the stoppage delay, on an average. The stoppage delay per km is within the corresponding range of 0.0012-0.0060 hours/km reported by an earlier World Bank study.

It may be noted that stoppage expenses (Toll/RTO/ST/Octroi/Police, etc.), on an average, contribute 15 per cent of trip expenses. Toll expenses account for nearly 47 per cent of stoppage expenses, on an average. The freight rate per tonne-km, Rs. 1.39 (USD 0.028) more or less conforms to the range of freight rates listed in Table 4. Also, the contribution margin turns out to be 40 per cent.

As shown in Figure 1, trip expenses include fuel cost, on-road stoppage and other expenses,driver's wage/allowance and maintenance/repair cost.Figure 2 shows the compositions of trip expenses.

Figure 2: Compositions of Trip Expenses



It may be observed from Figure 2 that fuel cost is the largest component of trip expenses, contributing, on an average, 55 per cent of trip expenses.

8.1.1 Allocation of Overhead Expenses

Next, based on the data on annual overhead expenses obtained and as shown in Table 8, distance-specific and time-specific overhead expenses are allocated to individual trips to arrive at the estimates of actual trip expenses. The basis of allocation is explained after Table 8.

Table 8: Annual Overhead Expenses for a 15-Tonne Truck

Overhead	Unit	Expense
Distance-specific overhead		
Lubricants	Rs.	11,000
Spares	Rs./km	1
Tyres	Rs./km	0.22
Time-specific overhead		
Staff/Admin	Rs.	22400
Depreciation	Rs.	243,750
Interest	Rs.	90,000
Tax/Insurance	Rs.	26,500
Annual vehicle utilisation and operating hours		
Vehicle utilisation	Km	100,000
Operating hours	Hours	5,000

The lubricants expenses per km can be obtained by dividing the annual lubricants expenses by the annual vehicle utilisation, and the figure is Rs. 0.11/km. Therefore, the distance-specific overhead expenses are Rs. 1.33/km. If this is divided by the truck capacity, i.e. 15 tonnes, the distance-specific overhead expenses become Rs. 0.09/tonne-km.

Annual staff/administrative expenses for a fleet of 15 trucks of 15 tonnes each are about Rs. 336,000. Hence, the same for one 15-tonne truck would be Rs. 336,000/15, i.e. Rs. 22,400. Depreciation and interest are charged@16.25 per cent and six per cent, respectively, of the purchase price of a 15-tonne truck, i.e. Rs. 15 lakh. The annual time-specific overhead expenses are Rs. 382,650, which divided by the annual operating hours gives the time-specific overhead expenses per operating hour, i.e. Rs. 76.53/hour. For a particular trip, when this figure is multiplied by the journey time, and then divided by the truck capacity and distance travelled, the time-specific overhead expenses per tonne-km are obtained.

To give an example, if the journey time is 86 hours and distance travelled is 2,077 km for a trip, the time-specific overhead expenses are Rs. (76.53·86)/(15·2077) per tonne-km, i.e. Rs. 0.21/tonne-km for that trip.

The average overhead (distance-specific and time-specific) expenses per trip come to Rs. 0.33/tonne-km. Combining this with the average trip expenses of Rs. 0.99/tonne-km as shown in Table 7, one would get the actual trip expenses including overheads as Rs. 1.32/tonne-km. Considering the average freight rate of Rs. 1.39/tonne-km as again shown in Table 7, the profit margin becomes 5.3 per cent (or five per cent revenue margin), which is of the order of margins achieved by Indian transporters. However, one should keep in mind that margins widely vary depending on routes, commodities, time periods and availabilities of trucks.

Hence, the reported margin should not be taken as the all-India average. Table 9 shows the minimum, maximum and average, all-inclusive trip expenses, freight rates and profit margins for the 30 trips.

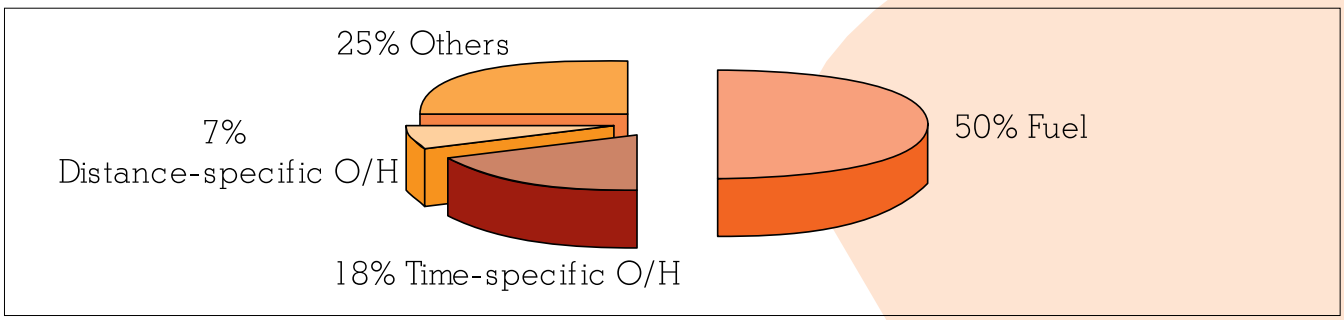
Table 9: Trip Expenses Including Overheads, Freight Rates and Profit Margins

Parametre	Unit	Minimum	Maximum	Average
Trip expenses including overheads	Rs./tonne-km	1.21	1.52	1.32
Freight rate	Rs./tonne-km	1.18	1.60	1.39
Profit margin	Rs./tonne-km	-12.32	21.03	5.20

It may be observed from Table 9 that after allocating overhead expenses to individual trips, nine out of 30, i.e. 30 per cent of the trips have actually incurred 'losses', although overall there has been a marginal profit.

Figure 3 shows the compositions of trip expenses including overheads.

Figure 3: Compositions of Trip Expenses Including Overheads (O/H)



It may be seen from Figure 3 that the major cost components are fuel and overheads, accounting for 50 per cent and 25 per cent, respectively, of total trip expenses.

8.1.2 Cost of Delay

To determine the total cost of delay, individual cost components of delay, as already mentioned before, have to be estimated. It is to be noted that additional fuel consumption due to delay has already been reflected in the declared fuel cost for a trip. Hence, it is already built-in and there is no need to separately estimate the cost of fuel due to delay. However, other cost components have to be estimated. Additional data that is required to estimate these cost components is presented in Table 10.

Table 10: Additional Data Required for Estimating Delay Cost Components

Parametre	Unit	Value
Annual profit	Rs.	250,000
Cost of capital	Re/Year	0.10

The annual profit, interest charges, depreciation, tax and insurance together amount to Rs. 610,250, which divided by the annual operating hours (5,000 hours) gives the cost of delay per hour, i.e. Rs. 122.05. This multiplied by the delay time gives the cost of delay for a trip. If the driver has to be paid additional daily allowances for this delay, then that amount also has to be added to the preceding figure to arrive at the total cost of delay to the transporter. Table 11 shows relevant figures after incorporating delay costs.

Table 11: Effects of Incorporating Costs of Delay

Parametre	Unit	Minimum	Maximum	Average
Cost of delay	Rs./hour	122.05	153.63	124.18
Trip expenses	Rs./tonne-km	0.87	1.18	1.01
Increase in trip expenses	%	1.04	3.79	2.01
Real contribution margin	%	17.18	64.41	37.66

It may be observed from Table 11 that the average cost of delay is Rs. 124.18 per hour of delay. The average trip expenses after incorporating delay costs increase by merely Rs. 0.02/tonne-km (Refer to Table 7), or two per cent, and the contribution margin slightly reduces from 40.40 per cent to 37.66 per cent.To account for the shipper's inventory carrying cost due to delay, the value of commodity is multiplied by the cost of capital and delay time for each trip. After incorporating the shipper's inventory holding cost, the average cost per hour of delay becomes Rs. 148.88. This may seem insignificant, but the annual cost of delay to the economy may be substantial.

Suppose, a vehicle on Indian road clocks, on an average, 2,000 hours per annum of which only five per cent, i.e. 100 hours (a conservative estimate), is contributed by delay. If the average cost per hour of delay is Rs. 100 (again a conservative estimate), the annual cost of delay for a vehicle is Rs. 10,000. Assuming three million vehicles, the annual cost to the economy due to delay becomes a whopping Rs. 30 billion (USD 600 million)!

8.1.3 Cost of Additional Fuel Consumption

As mentioned before, cost of additional fuel consumption due to delay has already been factored in the fuel expenses for individual trips. However, an estimate is made as to how increased fuel efficiency, or mileage of the vehicle, impacts the operational expenses and hence contribution margins. The saving in fuel expenses due to increased mileage is calculated as follows: Let p and d represent the average fuel price and distance, respectively, and xa and xd (xd > xa) denote the actual and desired mileage, respectively.

Then the saving in fuel expenses if the desired mileage, xd, can be achieved is given by $p \cdot (d/xa - d/xd)$. Data for 30 trips shows that the maximum mileage that could be achieved is 4.11 kmpl. If all trips could achieve this mileage, the average trip expenses would have come down from Rs. 0.99/tonne-km to Rs. 0.91/tonne-km and the contribution margin would have risen from 40.40 per cent to 53.34 per cent. Similar exercises have been carried out for 4.5 and five kmpl mileages. Table 12 and Figures 4 and 5 show the impact of increased mileage on trip expenses and contribution margins.

Table 12: Effect of Mileage on Trip Expenses and Contribution Margins

Mileage (kmpl)	Trip Expenses (Rs./tonne-km)	Contribution Margin (%)
3.6	0.99	40.40
4.11	0.91	53.34
4.5	0.86	62.15
5	0.81	72.61

Figure 4: Impact of Mileage on Trip Expenses

Figure 5: Impact of Mileage on Contribution Margins

Hence, if the mileage of a vehicle can be increased by making it more fuel efficient, improving road conditions and reducing delays, substantial improvements in operational expenses and contribution margins can be realised. To give an example, if Re 1/km can be saved by using fuel-efficient vehicles and a vehicle travels, on an average, 80,000 km in a year, there will be savings of the order of Rs. 80,000 per vehicle per year on account of fuel efficiency. Assuming three million vehicles, the annual savings to the economy would be Rs. 240 billion (USD 4.8 billion)!

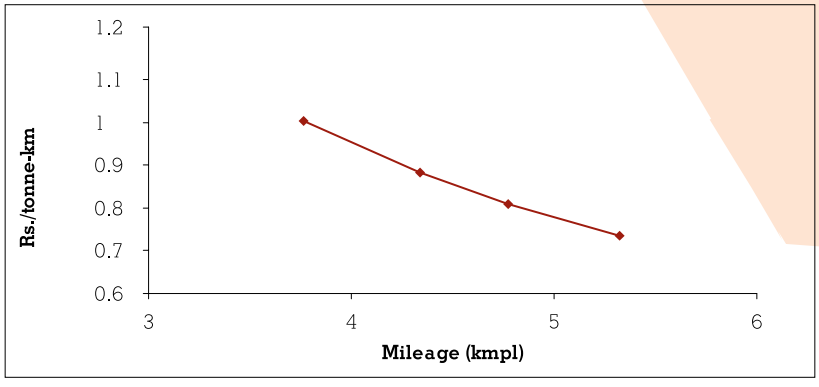
8.2 Findings of the Other Nine Routes Survey

Tables 2.1-2.9 in Annexure 3 show summary statistics for nine other routes.

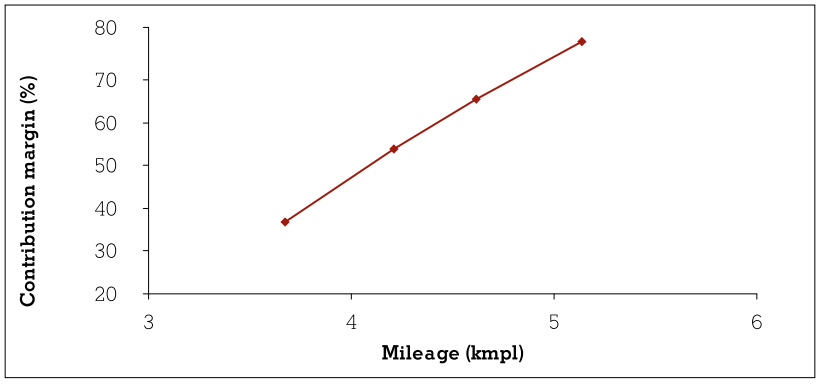
Table 13 compares among the 10 routes with respect to some key parametres.

It may be observed from Table 13 that all the 10 routes show more or less similar characteristics with respect to the above-mentioned parametres except for shipments to/from the eastern region (Kolkata and Guwahati) where the average delay and on-road stoppage expenses are on the higher side and average profitability is on the lower side. One, of course, has to keep in mind that except the Delhi-Bangalore route, data for all other nine routes is based on either two or three observations. Therefore, the inferences are not generalisable.

Table 13: Comparison Among 10 Major Routes



a whopping Rs. 30 billion (USD 600 million)!



Parametre / Route	Average Delay as % of Journey Time	Average Delay per km (Hrs/ km)	Average Delay Cost per hour (Rs./ hour)	Average Stoppage Expenses (Rs./ tonne-km)	Average Trip Expenses (Rs./ tonne-km)	Average Freight Rate (Rs./ tonne-km)	Average Contribution Margin (%)
Delhi-Banglore	5.05	0.0024	124.18	0.15	0.99	1.39	40.40
Delhi-Mumbai	5.05	0.0041	122.05	0.17	1.01	1.67	62.76
Delhi-Chennai	7.83	0.0037	122.05	0.11	0.93	NA	NA
Delhi-Kolkata	20.72	0.0148	124.36	0.11	0.84	1.12	35.95
Mumbai-Chennai	5.72	0.0026	122.05	0.20	1.05	1.54	47.71
Mumbai-Kolkata	15.11	0.0071	132.10	0.20	1.01	1.27	7.29
Chennai-Kolkata	4.69	0.0026	122.05	0.17	1.01	0.98	-3.28
Indore-Guwahti	24.93	0.0149	126.68	0.18	1.03	1.42	37.56
Pune-Hyderabad	7.47	0.0034	164.91	0.15	1.00	1.77	79.26
Ahmedabad-Coimbatore	6.30	0.0021	122.05	0.15	1.02	1.42	39.33

9. Conclusions and Recommendations

It is apparent from preceding discussions that government investments in road networks have not been able to produce significant benefits for freight transportation. General road conditions are still very poor and maintenance is not on par with the desired levels, resulting in slow speed of vehicles, frequent damage of roads, higher maintenance costs, equipment breakdown and accidents.

Check-post delays are also a major cause of concern for transporters. Because of the interstate sales tax-related issues and varying documentation requirements of different states, a lot of time is wasted at the border check-posts in complying with the formalities.

Besides, there are many intrastate check-posts for checking documents, collection of toll/tax, etc. and also on-road police harassment and corruption that cause significant delays and expenses for high-value and time-sensitive shipments. Lack of enforcement of rules and regulations and collusion with officials of government departments and traffic police make it easy for drivers to evade taxes, resort to other unethical practices and overload vehicles causing substantial losses to the government exchequer and extensive damage to roads. The study shows that delays cost billions of rupees to the economy in a year.

The Indian trucking industry has its own share of problems. The industry is very much fragmented. Costs of operations are high because of diseconomies of scale. On the other hand, there is stiff competition putting immense pressure on pricing, making the industry barely profitable or even run into losses.

Also, organised players, who have overheads, pay taxes and strictly follow labour laws, other rules and regulations, and norms of the Motor Vehicles Act, are in direct competition with unorganised players, who flout all rules and norms, and can get away without paying taxes. Vehicles that ply on Indian roads are also very old and fuel-inefficient.

There is an urgent need to replace these vehicles with modern high-capacity, fuel-efficient vehicles that will not only reduce the cost of transportation, but also save scarce foreign exchange and the environment.

The following suggestions/recommendations are being made.

- A unified tax system such as GST will enable the creation of a common market thus permitting free and unimpeded movement of goods and services across the country. Such harmonisation will significantly reduce the vertical imbalance between the Centre and the States by enhancing the tax base of the states. This will replace the cascading effect [tax on tax] created by existing indirect taxes.

  Introduction of a singular GST will also significantly reduce the number of warehouses that manufacturers are required to maintain in different states, thereby resulting in a substantial increase in demand for integrated logistics solutions.

- The government should invest heavily in extending the national highway network and widening/upgrading the existing highways. Efforts should be put in to build high-quality arterial roads. Highways should be access-controlled for humans, animals and slow-moving vehicles.

  The government, of course, has huge investment plans of the order of USD 45 billion in roads and highways in the 11th Five Year Plan (2007-2012), more than half of which would come from the private sector through Public-Private Partnerships (PPP).

- More funds should be allocated for road maintenance. Due to lack of funds, roads remain poorly maintained causing equipment breakdown and accidents.

- The government can do away with varying sales tax documentation requirements of different states by expediting the introduction of uniform Value Added Tax (VAT). VAT, once introduced, would reduce check-post delays by a significant amount.

  Also, with the introduction of VAT, evasion of taxes would be more difficult supplementing the government exchequer and reducing corruption levels.

- As mentioned before, the government can introduce a system similar to the TIR Carnet System prevailing in the European Union (EU) where consignments sealed at the origin need not be checked at interstate check-posts and should only be opened at the destination. This would save a lot of time especially for high-value, perishable and time-sensitive items.

- Electronic tolling systems may be introduced where vehicles need only to slow down rather than completely stop and wait in the queue for collection of toll at toll gates.

- Documentation has to be computerised and made easier so that less number of simple forms need to be filled in at check-posts/offices that will also do away with agents and unauthorised payments to government officials.

- Rules and regulations have to be strictly enforced by government officials and traffic police to avoid evasion of tax, overloading and other unethical practices by drivers. Surprise checks must be carried out on highways for documents and overloading, and offenders should be punished by imposing hefty fines and forcing them to offload any extra weight at their own cost and risk.

- The government can think of according industry status to road transportation. This will facilitate raising capital and debt by transporters through organised banking and financial markets.

- Construction of more transportation hubs and logistics SEZs should be initiated that will create common, shared facilities for transporters and reduce their fixed costs.

- Rail transportation is generally cheaper than road transportation. However, rail transportation is not preferred, except for commodities, because it is not point-to-point, service quality is poor, movement of goods trains is very slow and it is not ideal for small shipments.

  However, multi-modal transportation via rail and road where the last mile connectivity is provided by road may be encouraged because it will not only save transportation costs through economies of scale, but also reduce fuel consumption.

- The government can encourage transporters to incorporate more multi-axle tractor-trailer units in their fleets that will not only save transportation costs and fuel consumption, but also create less damage to pavements requiring less maintenance and emit less pollution to the environment.

  To facilitate purchase of relatively expensive tractor-trailer units, tax breaks and reduced toll rates may be offered.

- In order to install electronic tolling systems and GPS-enabled vehicles, transporters are required to make huge upfront investments, which the government may subsidise and also encourage by providing tax breaks and concessions on toll rates.

- Driver training institutes may be set up to periodically train and update drivers on vehicle maintenance, road safety, hygiene standards and health hazards. Unless certified on a periodic basis, drivers may not be allowed to drive on highways.

- There is an acute shortage of skilled manpower in the trucking sector.The government may generate awareness by organising workshops/seminars/conferences and collaborating with academia and industry associations for sector-specific projects and tailor-made training programmes.

Annexure 1: Access controlled express highways in India- their current status and how developing more of these would help the sector and economy

Overview

A network of access controlled high standard expressways, with navigational aids based on the communication technology with excellent value added amenities on the wayside is the symbol of an advanced economy. The study conducted by the Ministry of Road Transport and Highways on Expressway need in the country, highlighted that a total length of 15,766 km of expressway network is needed by the year 2020. The vision 2021 on Road Development Plan brought out by the Ministry has also stressed the need for having Expressways of about 10,000 km length in the next 20 years.

Current Status

The National Highways Authority of India proposed an access-controlled expressway between Chennai and Bangalore in November 2008. To be taken up under the National Highways Development Programme Phase VI, it will come up on a new alignment over a distance of about 335 km in Tamil Nadu and Karnataka.
Alignment has been frozen for the 66 km long expressway connecting Delhi and Meerut and the 400 km expressway between Vadodara and Mumbai.
Similarly, alignment studies are also being undertaken for the 334 km expressway expected to connect Bangalore to Chennai and 277 km stretch linking Kolkata with Dhanbad.
All these expressways are expected to be fully access controlled with regular points of entry and exit ensuring no major interruptions and easy flow of traffic at all times.
Access controlled expressways will allow for rapid unhindered and safe movement of fast moving vehicles which will help the logistics companies save money and time.
Access controlled expressways are less accident prone due to limited access and uninterrupted traffic flow. This consequently helps avoid unnecessary hassles and delays.
Due to non-contiguous development of expressways, truck traffic has to frequently move from the expressway on to old national highways and vice-versa, which is inconvenient for the truck traffic. Construction of more access controlled express ways will help avoid such problems.

Annexure 2: Comparison of Road and Rail Freight Rates on Different Routes in Different Years

Freight Rates on Road-Rail Mode on Different Routes in Different Years							
					Commodity Wise Rates per tonne		
Route		Period	Mode	KMs	Cement/ Coal (140)	Steel/Iron (180)	Food Grain/ Fertiliser(120)
DLH	MBY	2006-2007	Road	1,419	1,800	1,800	1,800
			Rail Rake	1,535			
			Rail Container				
		2007-2008	Road	1,419	1,700	1,700	1,700
			Rail Rake	1,535	1,415	1,807	1,219
			Rail Container		950	950	1,219
MBY	MDS	2006-2007	Road	1,290			
			Rail Rake	1,274			
			Rail Container				
		2007-2008	Road	1,290	2,325	2,325	2,325
			Rail Rake	1,274	1,183	1,509	1,019
			Rail Container		1,060	1,060	1,060
MDS	CAL	2006-2007	Road	1,684	2,800	2,800	2,800
			Rail Rake	1,662			
			Rail Container				
		2007-2008	Road	1,684	2,900	2,900	2,900
			Rail Rake	1,662	1,512	1,932	1,302
			Rail Container		1,350	1,350	1,350
CAL	DLH	2006-2007	Road	1,453	2,050	2,050	2,050
			Rail Rake	1,444			
			Rail Container				
		2006-2007	Road	1,453	2,200	2,200	2,200
			Rail Rake	1,444	1,333	1,702	1,148
			Rail Container		1,150	1,150	1,150
CAL	MBY	2006-2007	Road	1,987	2,700	2,700	2,700
			Rail Rake	1,969			
			Rail Container				
		2006-2007	Road	1,987	2,825	2,825	2,825
			Rail Rake	1,969	1,702	2,176	1,464
			Rail Container		1,375	1,375	1,375
MDS	DLH	2006-2007	Road	2,432	3,200	3,200	3,200
			Rail Rake	2,184			
			Rail Container				
		2006-2007	Road	2,432	3,300	3,300	3,300
			Rail Rake	2,184	1,809	2,314	1,557
			Rail Container		1,635	1,635	1,635

Annexure 3: Summary Statistics for Nine Major Routes

Table 3.1: Summary Statistics for the Delhi-Mumbai Route

Parameter	Unit	Average
Distance	Km	1,385
Journey time	Hours	111
Average speed	Km/hour	13.08
Mileage	Km/Lt	3.76
Loading/documentation time	Hours	2.75
No. of stops	--	19.67
Stoppage delay	Hours	5.61
Stoppage delay per km	Hours/km	0.0041
Stoppage expenses	Rs./tonne-km	0.17
Trip expenses	Rs./tonne-km	1.01
Freight rate	Rs./tonne-km	1.67
Contribution margin	%	62.76
Cost of delay to transporter	Rs./hour	122.05

Table 3.2: Summary Statistics for the Delhi-Chennai Route

Parameter	Unit	Average
Distance	Km	2,300
Journey time	Hours	109
Average speed	Km/hour	21
Mileage	Km/Lt	3.54
Loading/documentation time	Hours	6
No. of stops	--	16
Stoppage delay	Hours	8.54
Stoppage delay per km	Hours/km	0.0037
Stoppage expenses	Rs./tonne-km	0.11
Trip expenses	Rs./tonne-km	0.93
Freight rate	Rs./tonne-km	NA
Contribution margin	%	NA
Cost of delay to transporter	Rs./hour	122.05

Table 3.3: Summary Statistics for the Delhi-Kolkata Route

Parameter	Unit	Average
Distance	Km	1,497
Journey time	Hours	108
Average speed	Km/hour	27.73
Mileage	Km/Lt	3.63
Loading/documentation time	Hours	2.75
No. of stops	--	18
Stoppage delay	Hours	22.38
Stoppage delay per km	Hours/km	0.0148
Stoppage expenses	Rs./tonne-km	0.11
Trip expenses	Rs./tonne-km	0.84
Freight rate	Rs./tonne-km	1.12
Contribution margin	%	35.95
Cost of delay to transporter	Rs./hour	124.36

Table 3.4: Summary Statistics for the Mumbai-Chennai Route

Parameter	Unit	Average
Distance	Km	1381.67
Journey time	Hours	63.67
Average speed	Km/hour	21.75
Mileage	Km/Lt	3.45
Loading/documentation time	Hours	2.25
No. of stops	--	23.67
Stoppage delay	Hours	3.64
Stoppage delay per km	Hours/km	0.0026
Stoppage expenses	Rs./tonne-km	0.20
Trip expenses	Rs./tonne-km	1.05
Freight rate	Rs./tonne-km	1.54
Contribution margin	%	47.71
Cost of delay to transporter	Rs./hour	122.05

Table 3.5: Summary Statistics for the Mumbai-Kolkata Route

Parameter	Unit	Average
Distance	Km	2,007.5
Journey time	Hours	93.5
Average speed	Km/hour	21.64
Mileage	Km/Lt	3.16
Loading/documentation time	Hours	12.83
No. of stops	--	27
Stoppage delay	Hours	14.13
Stoppage delay per km	Hours/km	0.0071
Stoppage expenses	Rs./tonne-km	0.20
Trip expenses	Rs./tonne-km	1.01
Freight rate	Rs./tonne-km	1.27
Contribution margin	%	7.29
Cost of delay to transporter	Rs./hour	132.10

Table 3.6: Summary Statistics for the Chennai-Kolkata Route

Parameter	Unit	Average
Distance	Km	1,700
Journey time	Hours	96
Average speed	Km/hour	17.75
Mileage	Km/Lt	4
Loading/documentation time	Hours	2.5
No. of stops	--	28
Stoppage delay	Hours	4.5
Stoppage delay per km	Hours/km	0.0026
Stoppage expenses	Rs./tonne-km	0.17
Trip expenses	Rs./tonne-km	1.01
Freight rate	Rs./tonne-km	0.98
Contribution margin	%	-3.28
Cost of delay to transporter	Rs./hour	122.05

Table 3.7: Summary Statistics for the Indore-Guwahati Route

Parameter	Unit	Average
Distance	Km	2,176
Journey time	Hours	130
Average speed	Km/hour	16.75
Mileage	Km/Lt	3.66
Loading/documentation time	Hours	3.5
No. of stops	--	19
Stoppage delay	Hours	32.41
Stoppage delay per km	Hours/km	0.0149
Stoppage expenses	Rs./tonne-km	0.18
Trip expenses	Rs./tonne-km	1.03
Freight rate	Rs./tonne-km	1.42
Contribution margin	%	37.56
Cost of delay to transporter	Rs./hour	126.68

Table 3.8: Summary Statistics for the Pune-Hyderabad Route

Parameter	Unit	Average
Distance	Km	615
Journey time	Hours	28.5
Average speed	Km/hour	21.88
Mileage	Km/Lt	3.89
Loading/documentation time	Hours	1.5
No. of stops	--	9
Stoppage delay	Hours	2.13
Stoppage delay per km	Hours/km	0.0034
Stoppage expenses	Rs./tonne-km	0.15
Trip expenses	Rs./tonne-km	1.00
Freight rate	Rs./tonne-km	1.77
Contribution margin	%	79.26
Cost of delay to transporter	Rs./hour	164.91

Table 3.9: Summary Statistics for the Ahmedabad-Coimbatore Route

Parameter	Unit	Average
Distance	Km	1,919
Journey time	Hours	63.5
Average speed	Km/hour	30.25
Mileage	Km/Lt	4.03
Loading/documentation time	Hours	3.5
No. of stops	--	15
Stoppage delay	Hours	4
Stoppage delay per km	Hours/km	0.0021
Stoppage expenses	Rs./tonne-km	0.15
Trip expenses	Rs./tonne-km	1.02
Freight rate	Rs./tonne-km	1.42
Contribution margin	%	39.33
Cost of delay to transporter	Rs./hour	122.05

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