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IMPROVING RAIL EFFICIENCY & SHARE IN INDIA'S FREIGHT TRANSPORT

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CONTENTS

Abbreviation	Detail
3PL	Third Party Logistics
AAR	Association of American Railroads
ADB	Asian Development Bank
AFTO	Auto Freight Traffic Operator
CAGR	Compound Annual Growth Rate
CFS	Container Freight Stations
CMA	Cement Manufacturing Association
CO_2	Carbon dioxide
CONCOR	Container Corporation
CTO	Container Train Operator
DFC	Dedicated Freight Corridor
DFCCIL	Dedicated Freight Corridor Corporation of India
EDFC	The Eastern Dedicated Freight Corridor
EXIM	Export-Import
FCI	Food Corporation of India
FIEO	The Federation of Indian Export Organisations
FMCG	Fast Moving Customer Goods
FY	Financial Year
GDP	Gross Domestic Product
GVA	Gross Value Added
ICD	Inland Container Depot
INR	Indian Rupees
IT	Information Technology
JNPT	Jawaharlal Nehru Port Trust
Kgs	Kilograms
Km	Kilometre
KMPH	Kilometre Per hour
LTTC	Long Term Tariff Contract

MMLPs	Multi-Modal Logistics Parks
MT	Metric Tonnes
NHAI	National Highways Authority of India
NHs	National Highways
NMG	New Modified Goods
NSSO	National Sample Survey Office
NTKM	Net Tonne Kilometre
OCR	Optical Character Recognition
OECD	The Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
Pol	Mineral Oil
RDSO	Research Designs and Standards Organisation
RFID	Radio Frequency Identification
RO-RO	Roll-on, Roll-off
RTT	Round Trip Traffic
SIAM	Society of Indian Automobile Manufacturers
SUV	Sports Utility Vehicle
TEUs	Twenty Feet Equivalent Units
USD	US Dollar

Executive Summary

An efficient supply chain management requires a coordinated and integrated logistics system. The increased adoption of railways as a mode for cargo movement is crucial for improving India's logistics services. Currently, the modal mix in terms of freight movement is considerably skewed towards road transport. The effect is an increased burden on roads, and therefore, significant congestion, increased pollution, and resultant logistics cost escalations. At this juncture, it is important to strengthen the railways for the cost-effective and clean movement of a broad commodity base. This report comprehensively covers the current performance of the railways, the various initiatives taken to increase freight, global scenario, challenges faced/gaps to be bridged, perceptions of stakeholders, and recommendations to assist the policy establishment in the process of exercising necessary reforms.

In the context of increasing the share of rail in domestic freight movement and improving rail efficiency, this project was envisaged to be undertaken in four stages – situational assessment, engagements, analysis, and delivery. The analysis is based on primary surveys using the Delphi technique. Detailed discussions with relevant departments and key stakeholders – policy establishments, government bodies, business chambers/ associations, logistics players, importers/ exporters, etc. have been conducted for this report. The report gathers incisive insights on the current status of rail infrastructure and operations, reasons for below-par adoption of railways as a mode for freight transport, bottlenecks faced in cargo movement through rail due to sub-optimal infrastructure, operational inefficiency, issues faced in first and last-mile connectivity, the role of private players, issues faced in multi-modal transport, etc. Indian Railways has been taking several initiatives to address the challenges and boost the rail share, such as the special parcel trains for transportation of perishable goods and essentials commodities.

Considerable thrust of the research has been placed on global railway systems, world-class stations, fully integrated rail network connecting remote areas, and improved safety standards, focusing on increasing the share of railways in the modal mix to meet international benchmarks. The report delves deep into global best practices and gathers stakeholder views on the possible measures to be undertaken. In several countries, Public-Private Partnership (PPP) model is widely adopted, wherein various segments of the railway operations and infrastructure are outsourced to the private players. For instance, the private business rents some specific physical assets, such as rolling stock, which saves the railway from financing those assets itself. In 2003, Russia began allowing the private sector to rent freight wagons to the railway, making it profitable through

a change in tariff rules. The new policy created a vibrant market where the private sector provided USD 50 billion toward replacing the railway's extensive stock of old wagons. As a result, 85 percent of Russia's freight wagons are owned by the private sector. Besides, the private sector can sell services to the railway, such as track maintenance. In such cases, the investor deploys its equipment and facilities, finances the working capital involved, and provides the labour to the railways.

The report focuses on the product mix of Indian Railways, which has been skewed towards the movement of bulk commodities such as coal, cement, iron ore, steel, petroleum, foodgrains, and fertilizers. In 2018-19, coal constituted 50 percent of the total freight movement of 1,221 million tonnes, followed by Iron Ore (11%), Cement (10%), Mineral Oil (4%), Fertilizers (4%), Iron & Steel (4%), Foodgrains (3%), Limestone and Dolomite (2%), Stones (including gypsum) other than marble (2%) and other commodities (9%). The challenges faced in movement of containers via rail, and low share in domestic container movement have been discussed. The report conducts sector-specific case studies to understand the dynamics for select sectors' goods movement, including Automobile, Cement, and Foodgrains. The study also analysed the challenges- infrastructural, operational, and end-to-end connectivity and suggests actionable reforms based on stakeholders' discussions for these sectors. For example, in the automobile sector, despite a rise in automobile transportation by rail in the last few years, the share of railways in the automobile movement has been significantly low. In the passenger vehicle segment, almost 95 percent of the transportation occurs via roads. To increase the freight traffic for this sector, Indian Railways can tap into the Sports Utility Vehicles (SUVs) and two-wheeler segment traffic by modifying the wagon design to allow double stacking SUVs and allow side loading of two-wheelers.

The national transporter faces several infrastructural, operational, and connectivity challenges leading to a shift of freight traffic to roads. Stakeholder discussions reveal that it takes approximately 2-3 days longer for transportation via rail than the road along the major routes. The increased transit time by rail and pre-movement and post-movement procedural delays such as wagon placement, loading and unloading operations, multi-modal handing, etc., hamper freight movement by rail. Lack of necessary terminal infrastructure, maintenance of good sheds and warehouses, and uncertain supply of wagons are some of the infrastructural challenges faced by the customers. This results in high network congestion, lower service levels, and increased transit time. The absence of integrated first and last-mile connectivity in rail increases the chances of damage due to multiple handling and increases the inventory holding cost. Shippers expect greater service levels and proper

handling of their goods. Absence of timetabled services, inconsistent supply of rakes, and lack of integrated first and last-mile connectivity impacts the transit time and increases the cost of freight operations for the customers.

Based on the identified challenges, the report suggests a roadmap of reforms to increase the domestic rail share and improve efficiency. The private sector can play an important role in enhancing operational efficiency and strengthening the rail infrastructure through Public-Private Partnerships (PPPs). Operational efficiency for loading/unloading, warehousing management, station services, automation, and digitization of various processes could be outsourced to the private sector. Similarly, for first and last-mile connectivity, a separate entity can be created by the railways in partnership with the private sector as a single point of contact for customers to handle multiple legs of movement and ensure smooth transportation of goods. The report proposes a revenue model based on stakeholders' discussions - a PPP model is suggested for a few dedicated container freight trains from point to point based on the Build-Own-Operate approach. An Uber-like model for cargo wagons in passenger trains, wherein the customers can book the wagon using an online application, is also proposed in the reforms section. To enhance efficiency in the rolling stock maintenance process, railways can increase the validity of brake power certificate for the rakes. There is significant potential in improving the rail efficiency and percentage of rail freight in the domestic freight. The suggested reforms will address some of the major challenges faced by the Indian Railways to ensure seamless rail freight operations, increase in the share of rail freight in the modal mix, and subsequently, increased revenues for railways.

CHAPTER 1

SCOPE AND OVERVIEW

SCOPE AND OBJECTIVES

- To study the modal share pattern and understand the rail freight patterns
- To conduct international benchmarking and document best practices in rail freight movement
- To outline the challenges in modal shift to rail
- To undertake interactions with multiple stakholders in the ecosystem
- To prepare case studies on select sectors which can potentially ensure increased traffic for railways
- To prepare a roadmap for reforms to increase modal share of rail in freight movement

Indian Railways, the nation's lifeline, connecting people and moving cargo, plays a vital role in the country's logistics. Over the years, it has witnessed a significant increase in passenger and freight segment traffic. However, the investment in rail infrastructure has not matched the pace with the increasing traffic. The focus of the Indian Railways has been on carrying bulk-commodities. It has led to a loss in the uptake of commodities that often move in smaller lot sizes. The national transporter faces several challenges affecting customer satisfaction and discouraging them from using rail.

Railways in India has been losing freight share to other competitive and flexible modes such as the roads over the years. High logistics cost remains a challenge for the business community in the country. Estimated at 14 percent of the GDP, the logistics cost is one of the highest compared to many developed countries. Based on studies, the country's savings would be USD 50 billion if this cost comes down to 9 percent and would lower many products' prices.[1] Transportation cost accounts for the majority of the overall logistics cost. Hence, it is necessary to strengthen the rail transportation, as it is cheaper and more energy-efficient than the other modes. Upgrading and expanding the railway infrastructure, improving operational efficiency, and providing end-to-end connectivity to create customer confidence will help in enhancing the freight traffic.

This study analyses rail and road freight share over the years and understands why the shift in freight traffic from rail to road. It deep dives into the freight and passenger

1. Addressing India's high logistics cost. Business Line. 2017. https://www.thehindubusinessline.com/opinion/addressing-indias-high-logistics-costs/article9732208.ece

segments of the railways by analysing the various parameters such as the revenue stream from these segments, growth in rolling stock infrastructure, interpreting Indian Railways financial performance through the operating ratio and the high time required for wagon maintenance. A detailed comparison of various measures such as the fare-to-freight ratio, logistics performance index, operating ratio, etc., of Indian Railways with other countries is performed in the International Benchmarking section. India's low rail freight share and fare-to-freight ratio, and high operating ratio compared to the developed nations suggests that increasing the rail modal will require consistent efforts. However, Covid-19 appears to be a turning point in the freight transportation of the country. Despite the unprecedented challenges because of the pandemic, impacting global and domestic supply chains - the Indian Railways utilised it as an opportunity to serve the various industries.

The section on product matrix analyses the shares of a range of goods transported via rail, including the freight movement of industrial outputs like coal, cement, iron ore, steel, petroleum, food grains, fertilizers, and containers. A detailed analysis of sector-specific case studies on automobile, cement, and, foodgrains is presented in this section to understand the different challenges faced by these sectors in using rail for movement of goods and suggest insightful ways to increase the freight domestic share of railways.

The report explains the challenges faced by different industry players to transport goods by rail, and the limitations of Indian Railways. It presents a common ground to address the issues based on discussions with stakeholders at multiple levels & suggests reforms to increase the rail freight volumes – with the right investment, technological developments, and modifications in the existing policies.

While the obstacles seem daunting, there is potential to overcome them through the right reforms and best practices. It is essential to understand each industry's distinct nature and focus on the specific requirements to improve the ease of transporting via rail.

CHAPTER 2

BACKGROUND

A well-established transport system is an integral part of a country, not just to connect people but also to move goods. The modes of transportation have changed with time depending upon people's behaviour, income, technology, and demand for goods. The movement of freight is a prime component of all supply-chains and logistics systems. In FY18, the total freight transportation was 4,464 million tonnes across India.[2] The freight movement is dominated by road, accounting for 65 percent of the freight movement, 26 percent by rail and the remaining by modes such as coastal shipping, inland waterways, pipeline and air.[3] In the coming years, the country's freight logistics sector is expected to grow at a rate of 6-7% annually. Due to the various infrastructural, operational and end-to-end connectivity challenges faced by the Indian Railways, it has continuously lost modal share in freight transportation.

Freight transportation depends on various factors such as shipper attributes (size and location), product attributes (type, value, volume, size, weight and perishability), the distance between the origin and destination, and the flow rate of frequency at which transportation is required. The decision to choose transportation mode is shaped by cost, accessibility, transit time, reliability, frequency, and flexibility. A premium is placed on flexibility to move goods as the cost and transit time can be reduced if the mode is flexible. Since the roadways are the most flexible in providing door-to-door service, India's reliance on the roads is much higher than rail, water and air.[4] There has been a gradual shift to move goods from rail to the road over time, even for goods traditionally moved by rail.

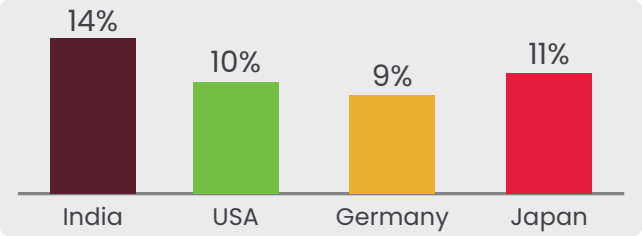
With growing industries and the e-commerce market, the logistics demand is changing everywhere. As supply chains become more globally dispersed, the quality of a country's logistics services can determine whether or not it can participate in the global economy. The logistics value chain includes three units – transportation, warehousing, and administration. A majority of the logistic costs comprise transportation of goods, which provides for end-to-end movement of goods from the manufacturer to the customer, accounts for 60 percent of the total cost.[5] An efficient supply chain management requires a coordinated and integrated logistics system. Two critical aspects required are - efficiency in moving raw materials to the manufacturing plant and quickly moving out finished goods to the end consumer.

The Indian logistics industry stood at USD 160 billion in 2019 and has grown at a compound annual growth rate (CAGR) of 7.8 percent during the last five years. Logistics costs in India are 13-15 percent of the product cost, much higher than the global average of 6 percent. In 2018, India ranked 44 in the World Bank Logistics Performance Index (LPI) across 160 countries. However, India's

2. National Rail Plan – India. Ministry of Railways, RITES.
3. Enhancing the efficiency of freight movement. Shakti Sustainable Energy Foundation. 2016. https://shaktifoundation.in/work/transport/freight-movement/
4. Freight On Road: Why EU Shippers Prefer Truck To Train. European Parliament. 2015.
5. India Logistics & Warehousing. Knight Frank. 2014.

LPI rank has varied over the years, from the mid-40s in 2010 to 54 in 2014 and improved to 35 in 2016.[6]

Logistics Cost as a Percentage of GDP

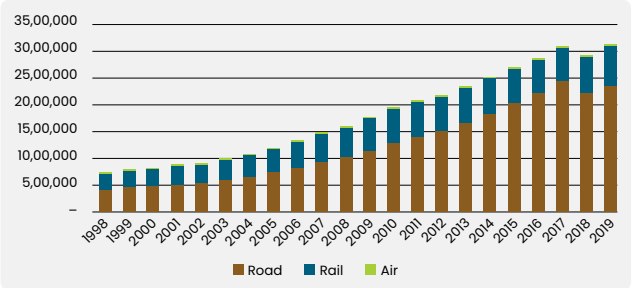


A look at the comparable costs of different forms of transportation suggests that freight movement cost is highest in the road sector. It costs around INR 2.5/tonne per km to transport goods by road, compared to INR 1.06/tonne per km by water and INR 1.36/tonne per km by railways.[7] However, the ease and positives of road transport have taken precedence over the costs.

Trends in Freight Movement by Mode

Indian railways is the 3rd largest railway system globally, with a vast route length network, spread over 1.2 million km and an employee base of 1.3 million. With two major segments, passenger and freight, it runs over 13,000 passenger trains and 9,000 freight trains, carrying around 23 million passengers and 3.3 million tonnes of freight every day from 7,349 stations (2018-19).[8] Indian Railways target is to increase its freight traffic to 3.3 billion tonnes by 2030 from 1.2 billion tonnes in 2019. It is projected that the freight traffic will further increase after the commissioning of the Dedicated Freight Corridors (DFCs).[9] Among the various modes, railways and waterways play a dominant role in meeting transport requirements for long-distance and bulk commodity movement. Road freight provides greater accessibility in terms of integrated connectivity between two points and flexibility to transport different volumes of various product categories. In comparison, air transport is preferred for time-sensitive and high-value goods. The share of freight carried by rail has decreased over time, and road transportation is gradually increasing over the years by improving connectivity between cities, towns, and villages.

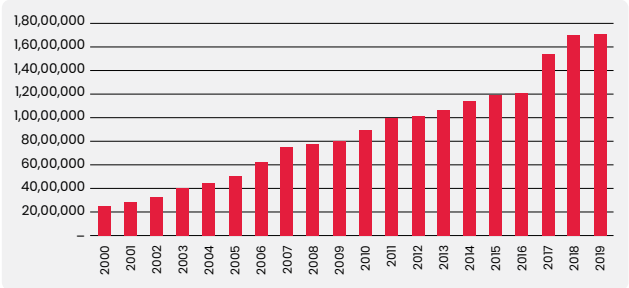
Freight Volume Carried by India's Rail, Road and Air transport (million tonne-km)



Source: OECD and World Bank Database

Note – Data estimated for road freight volume for 2018 and 2019

Container Port Traffic in India (TEU: 20 foot equivalent unit)

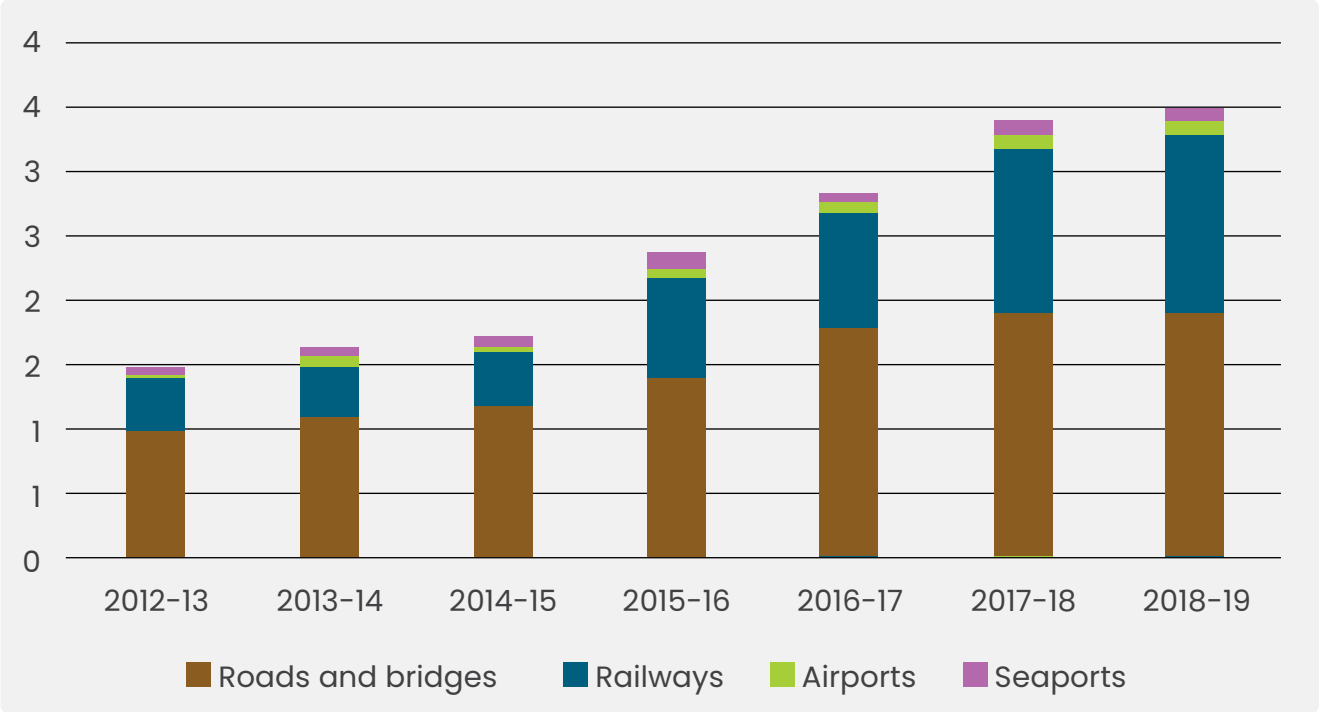


Source: World Bank Database

6. Logistics on the Move. The Business Today. 2019. https://www.businesstoday.in/magazine/special-reports/logistics/on-the-move/story/337229
7. When it comes to moving things, Indians just hit the road. Live mint. 2017. https://www.livemint.com/Money/fzAZ8hyYWauiQkWVOrMesI/When-it-comes-to-moving-things-Indians-just-hit-the-road.html
8. Indian Railways Yearbook. Ministry of Railways
9. Indian railways: Network, investments, market size, govt initiatives. 2020. https://www.ibef.org/industry/indian-railways.aspx

India's road network has expanded vastly in the last few years as compared to the other modes such as waterways, air and rail. The road network has increased from 4.7 million km in 2011 to 5.89 million km in 2020. Highway construction increased at 21.4 percent CAGR between FY16 to FY19; in FY19, 10,855 km of highways were constructed. In March 2020, National Highways Authority of India (NHAI) accomplished the highest ever highway construction of 3,979 km. Huge investments are being made in developing the road sector, with government policies such as urban road connectivity, a plan for enhanced road construction as part of the Bharatmala project, and the Sagarmala project.[10] However, India's dependence on roads for freight movement grew at an even faster pace, with a growth rate of 10.2 percent per year in the last five years; vehicles' usage has outpaced the expansion of the road network. For example, the National Highways (NHs) constitute 1.6% of the total Indian road network but carry over 40% of road-based traffic, making it the most critical road sector segment.[11] The freight logistics sector accounts for nearly 7% of the total carbon dioxide (CO_2) emissions in India.[12] This percentage will increase further as the demand for goods transportation in the country increases. To curtail emissions from logistics segment, it is essential to improve the efficiency of logistics and encourage a modal shift towards more cleaner modes, such as the railways.

Sector Wise Infrastructure Investment (INR lakh crore)

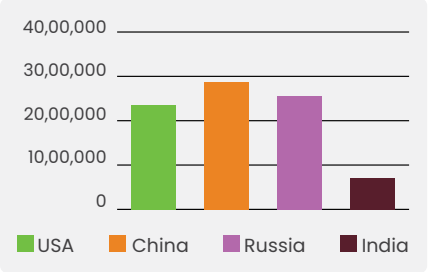


Source: National Infrastructure pipeline. Department of Economic Affairs, Government of India. Vol-II.

10. Road Infrastructure in India. IBEF. 2021. https://www.ibef.org/industry/roads-india.aspx
11. Indian Railways Re-birth of the Colossus, Edelweiss. 2017
12. Sustainable Freight Transport. https://shaktifoundation.in/work/transport/freight-movement/

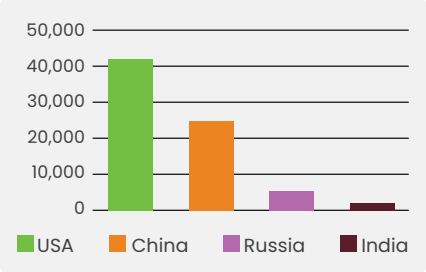
The majority of India's international trade occurs through seaports; thus, the quality of ports is essential to enhance trade. The public and private sector have made investments in this sector to improve the port capacity and connectivity. The cargo traffic handled by the ports increased at a CAGR of 5 percent from 1,052 million tonne to 1,185 million tonne from FY15 to FY19. However, the cargo handling operational efficiency and productivity at the Indian ports remains below the optimal level. Similarly, in the airports segment, with investments from both the government and the private sector, India has seen extensive growth. The country has become one of the major domestic civil aviation markets globally, with immense potential for further growth. The total air cargo traffic grew at a CAGR of 6.7 percent from FY16 to FY19. However, due to different challenges faced in freight transportation, freight carried by Indian railways, airports and seaports is significantly lower than the global majors such as the USA and China.

Freight Carried by Railways (million tonne-km) in 2019



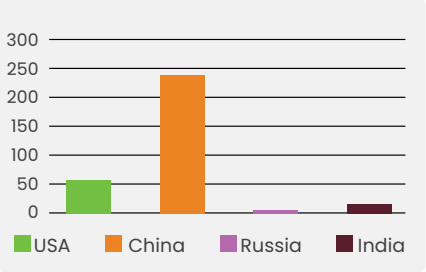
Source: World Bank Database

Freight Carried by Air Transport (million tonne-km) in 2019



Source: World Bank Database

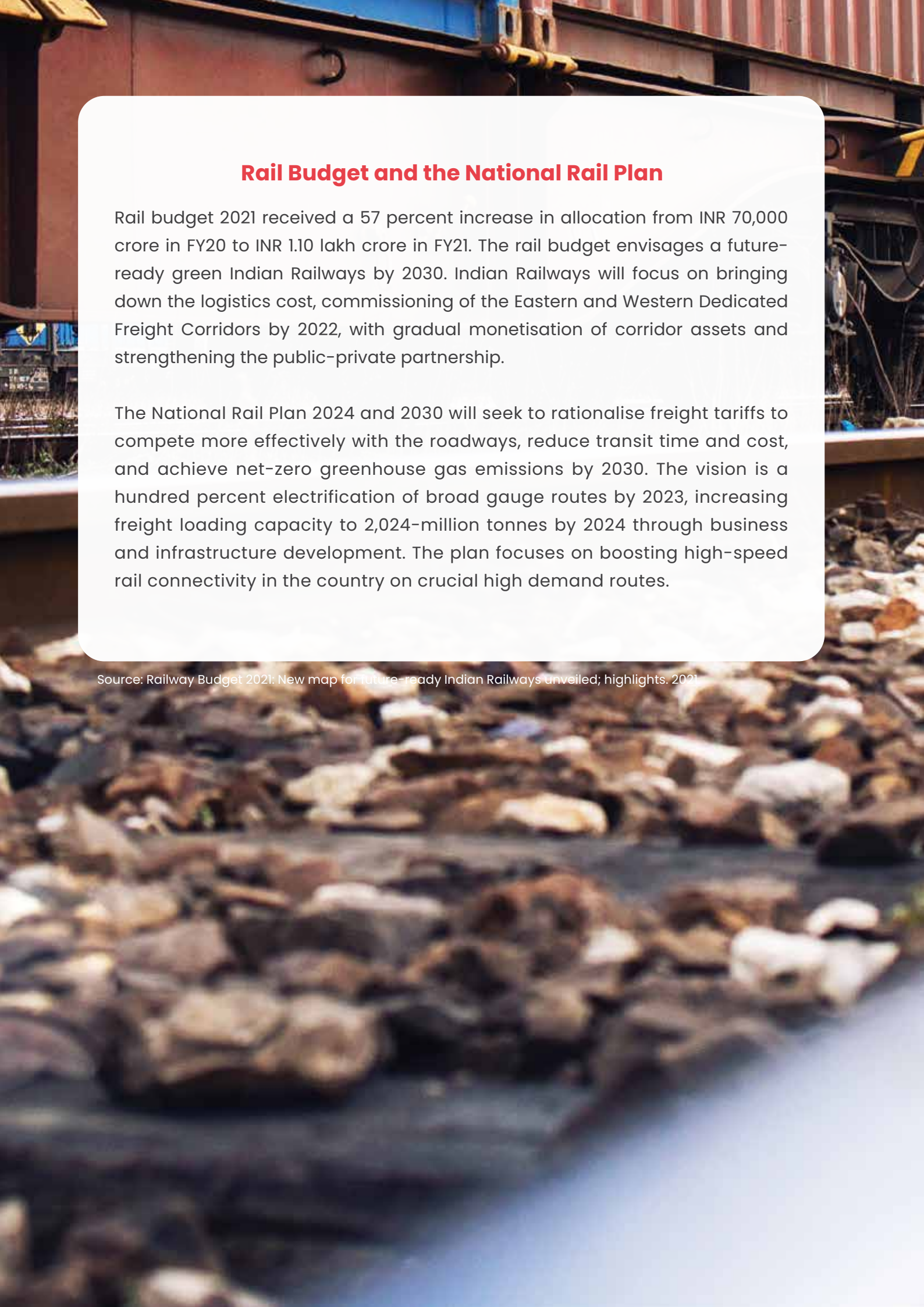
Container Port Traffic (million TEUs) in 2019



Source: World Bank Database

Railways can carry more than six times the traffic that could be carried by road by using the same quantity of fuel. It is cost-effective and results in lower energy consumption and CO_2 emissions. However, transportation by rail currently presents a challenge, as the requirements of industries are changing. The reliance on roads has increased overtime as the road network gradually became better than the other modes for movement of goods. Factors such as lack of first and last-mile connectivity, high transit time, and limited intermodal connectivity discourage shippers from using rail for freight movement.

The comparative advantage behind a modal shift are costs, convenience, speed, and reliability. The Indian Railways has been taking many initiatives to improve the modal share by investing in infrastructural developments, various schemes and policies to improve the overall efficiency of transporting goods. While the share of Indian Railways in the freight movement is low, there is significant potential in improving the rail efficiency and percentage of rail freight in the country's domestic freight.



Rail Budget and the National Rail Plan

Rail budget 2021 received a 57 percent increase in allocation from INR 70,000 crore in FY20 to INR 1.10 lakh crore in FY21. The rail budget envisages a future-ready green Indian Railways by 2030. Indian Railways will focus on bringing down the logistics cost, commissioning of the Eastern and Western Dedicated Freight Corridors by 2022, with gradual monetisation of corridor assets and strengthening the public-private partnership.

The National Rail Plan 2024 and 2030 will seek to rationalise freight tariffs to compete more effectively with the roadways, reduce transit time and cost, and achieve net-zero greenhouse gas emissions by 2030. The vision is a hundred percent electrification of broad gauge routes by 2023, increasing freight loading capacity to 2,024-million tonnes by 2024 through business and infrastructure development. The plan focuses on boosting high-speed rail connectivity in the country on crucial high demand routes.

Source: Railway Budget 2021: New map for future-ready Indian Railways unveiled; highlights. 2021

CHAPTER 3

APPROACH AND METHODOLOGY

This project was envisaged to be undertaken in four stages – situational assessment, engagements, analysis and delivery. The following table lists the main activity strands against each of these stages. The analysis is based on primary surveys using the Delphi technique, which is a process for obtaining and refining the opinions of a group of respondents over successive rounds of interviews. The Delphi method is also known as the estimate-talk-estimate technique (ETE). It is a well-organized and qualitative method of forecasting by collecting opinions from various experts through several rounds of interviews. The outcome of the interviews is used to forecast future scenarios, predict an event's likelihood, or reach a consensus about a particular topic.

Major Stages and Activity Strands

Situational Assessment

Preliminary engagements with the policy establishment and the stakeholders

Detailed study of secondary information

Gathering insights into the short and long term reform measures to be focussed on

Further finetuning of objectives, if required

Engagements

Extensive stakeholder interactions covering important areas

One-to-one discussions with relevant government departments and key stakeholders in the EXIM chain

Analysis

Data analysis on freight movement patterns and trends, the overall modal share of rail freight and commodity-specific movement through rail

Preparation of sector-specific case studies

Analysis of qualitative information gathered from stakeholders and data from relevant agencies

Delivery

Preparation of report covering the status of rail freight operations, bottlenecks faced and practical reform areas for improving modal share of railways in freight movement

Workshop and discussion to gather detailed feedback from stakeholders on the draft report

Finalisation and submission of the report

3.1 Multi-stakeholder Engagements

Detailed discussions with relevant departments and key stakeholders have been conducted for the preparation of this report. The table below lists the multi stakeholder engagements conducted for the report.

Policy Establishment	Government bodies	Trade Bodies	Logistics players
Logistics Division at Ministry of Commerce and Industry	Major seaports	Business chambers (national/local)	Logistics divisions of leading industry players from automobiles, cement, and food grains
Ministry of Shipping	Container Corporation of India Ltd (CONCOR)	Sector-specific associations – Society of Indian Automobile Manufacturers (SIAM), Cement Manufacturing Association (CMA)	Freight forwarders
Ministry of Railways	The Federation of Indian Export Organisations (FIEO)	Importers/ exporters	Container Freight Stations (CFS)
		Associations of clearing agents	Inland Container Depots (ICD)
		Freight forwarders	

* This is a preliminary list, and will be updated as we connect with more stakeholders

3.2 Data Collection and Compilation

Data analysis on freight movement patterns and trends, the overall modal share of rail freight and commodity-specific movement through rail has been done using various primary and secondary sources. Qualitative information gathered from stakeholders and primary data from relevant agencies is detailed in the multi-stakeholder section *(see section 3.1)*.

Secondary data sources used for the analysis are listed below:

- Indian Railways Yearbook
- OECD Database
- The World Bank Database
- Statista Research and Analysis
- Other Academic and Research Studies (listed as references at the end of the report)

CHAPTER 4

AS-IS ASSESSMENT

This chapter does a detailed assessment of the Indian Railways situation and establishes the baseline trends of rail movement over the years. It compares India's logistics and operations with global majors in the international benchmarking section and presents the opportunities that Covid-19 has brought.

4.1 Baseline Trends of Movement by Rail

India is one of the fastest-growing economies globally, with an economic size of USD 2.94 trillion in 2019-20.[13] The economic growth has been accompanied by a rise in freight movement volume over the period. The freight transportation by railways increased at CAGR 3.9 percent from 794 million tonnes in 2008 to 1,221 million tonnes in 2019. However, the Indian Railways has been facing several infrastructural and operational challenges, resulting in slow speed of trains, congestion, and delay in supply of rakes, and subsequently high transit time. Approximately 65 percent of the high-density sections and 40 percent of the total sections run at an utilisation rate of more than 100 percent. The busiest network connecting the four major metros - Delhi, Kolkata, Chennai, and Mumbai (the Golden Quadrilateral) and diagonals (with the East-West diagonal extending to Guwahati) account for less than 16% of the overall route network but contributes 58 percent of the total freight and 52 percent of the passenger traffic.[14]

Freight Volume Carried by Indian Railways

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Freight Volume (Million Tonnes)	794	833	888	922	969	1,008	1,052	1,095	1,102	1,106	1,160	1,221
Growth Rate (%)	9%	5%	7%	4%	5%	4%	4%	4%	1%	0%	5%	5%

Source: Indian Railways Yearbook

Freight traffic is the primary source of revenue for Indian Railways. Approximately 40 percent of the total trains running daily on Indian Railways are freight trains, accounting for more than 65 percent of the total revenue in FY20.[15] Despite higher passenger volumes on a shared network, India has the lowest fare-to-freight ratio (the ratio of passenger fares and freight charges) of 0.3, compared to several other countries, including Japan (1.9), Germany (1.5) and China (1.2). The policy choice to keep the passenger fares low results in freight overpaying its share due to which railways posted the lowest operating ratio of 98.4% in FY18, which improved slightly to 97.2% in FY19. Over the past decade, freight rates have increased by 91 percent

13 The top 25 economies in the world. Investopedia.https://www.investopedia.com/insights/worlds-top-economies/#:~:text=India%20Nominal%20GDP%3A%20%242.94%20trillion,the%20United%20Kingdom%20and%20France.

14 Indian Railways Re-birth of the Colossus, Edelweiss, 2017

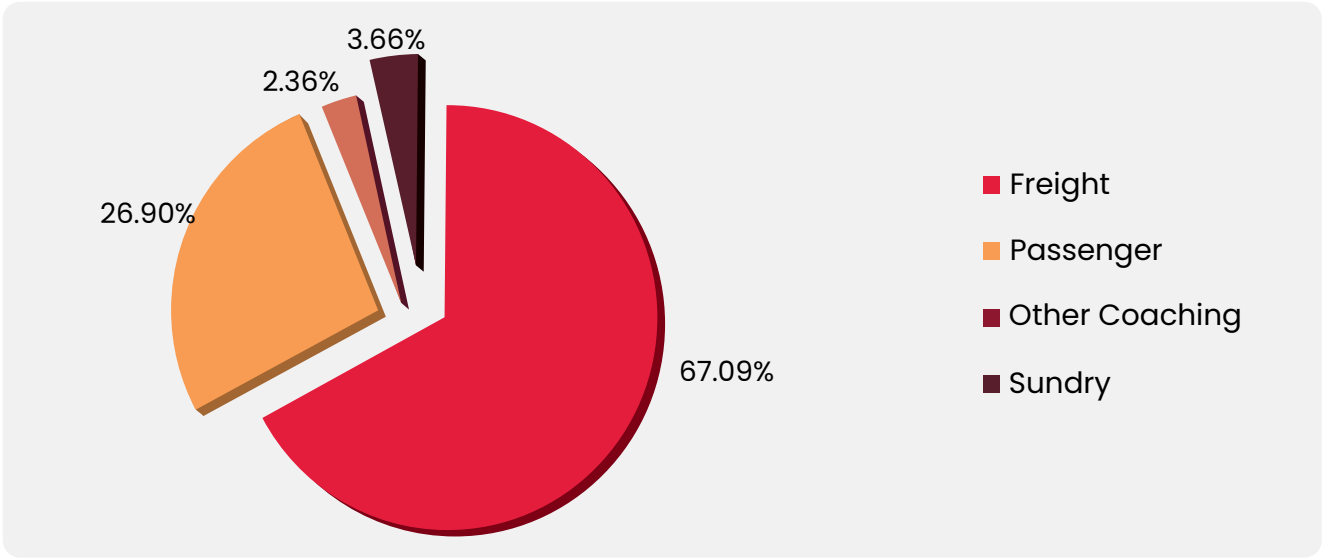
15 Indian Railways Industry Report. 2020. https://www.ibef.org/industry/indian-railways.aspx#:~:text=Indian%20Railways%20is%20among%20the,freight%20daily%20from%207%2C349%20stations

compared with a 28 percent increase in passenger rates. The passenger traffic uses two-thirds of capacity but accounts for only one-third of the total revenue. Due to the high freight tariff, the railways have been steadily losing freight market share. An estimated increase in permitted axle load of commercial vehicles by 25 percent has led to a further reduction in modal share of railways in freight transport.[16]

Moreover, the investment in infrastructural development in railways has not kept pace with the traffic resulting in congestion at the over utilised routes. There has been an addition of only 13,000 km to route length since 1950-51, which is less than 0.5 percent per annum, while the economy's growth has been over 4.5 percent per annum. With the slow expansion of the rail infrastructure, the introduction of each new passenger service has been at the cost of freight traffic.[17] As a result, railways have been facing stress, and significant routes face congestion and oversaturation.

Snapshot of Key Indicators: Indian Railways

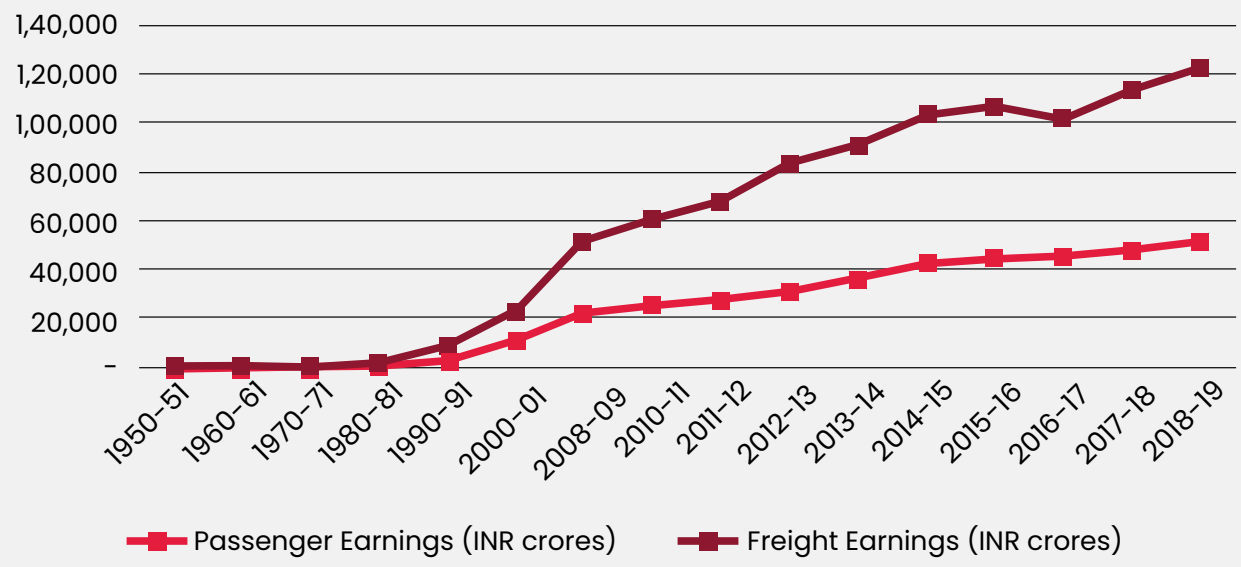
Indian Railways Revenue Break-up by Segment, 2019



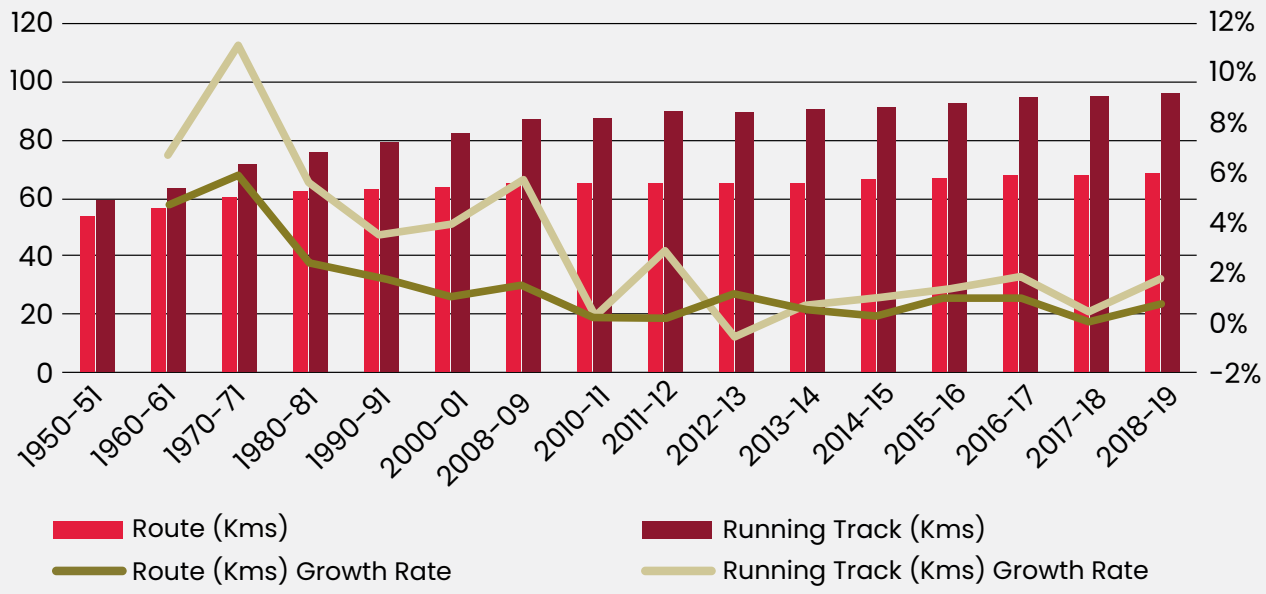
16 Govt may Task Aviation Regulator to Fix Railway Passenger Fares, Freight Rates. Business Line. 2020. https://www.thehindubusinessline.com/economy/logistics/govt-may-task-aviation-regulator-to-fix-railway-passenger-fares-and-freight-rates/article32223556.ece

17. Mattoo, Ajita. Indian railways: Agenda for reform. Economic and Political Weekly. 2000.

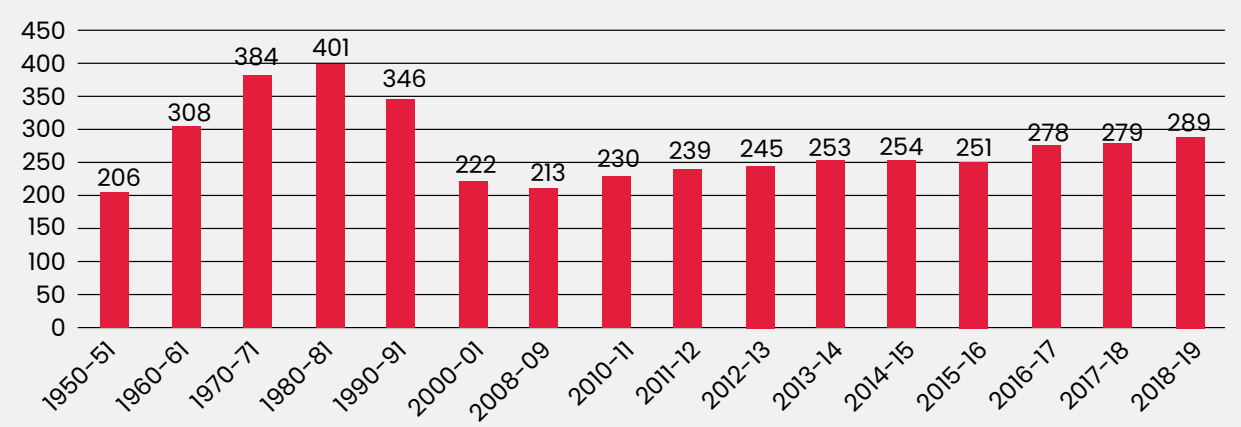
Railway Earnings: Freight vs Passenger



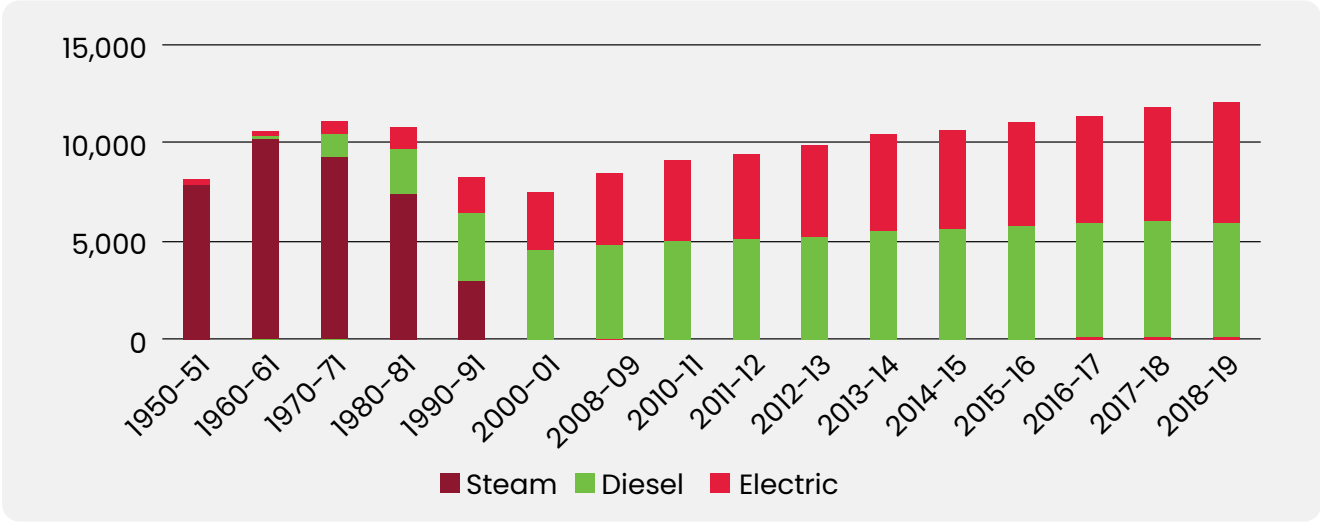
Line Capacity (in thousands)



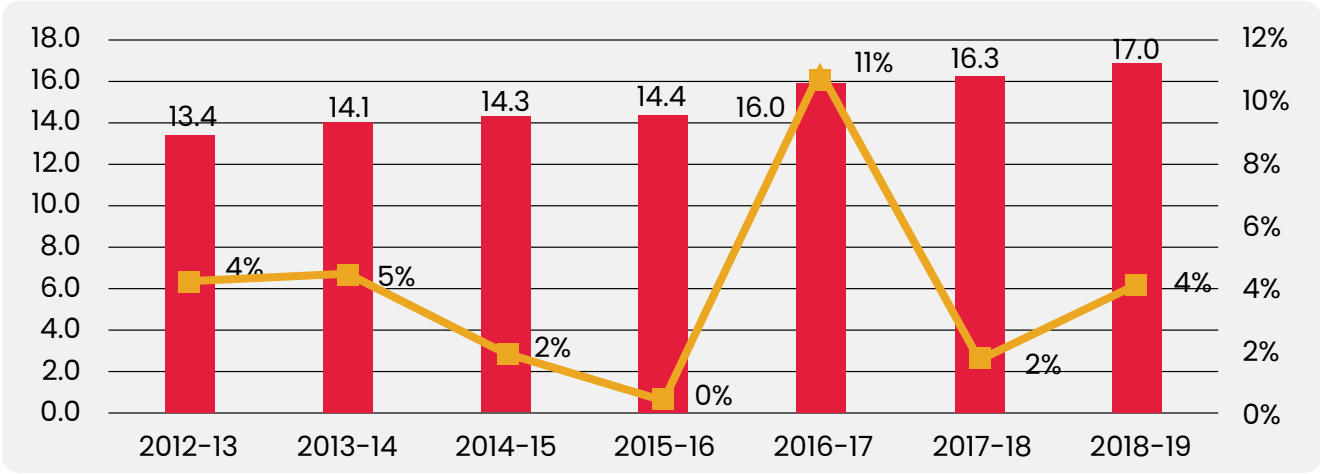
Rolling Stock: Wagons (units in thousands)



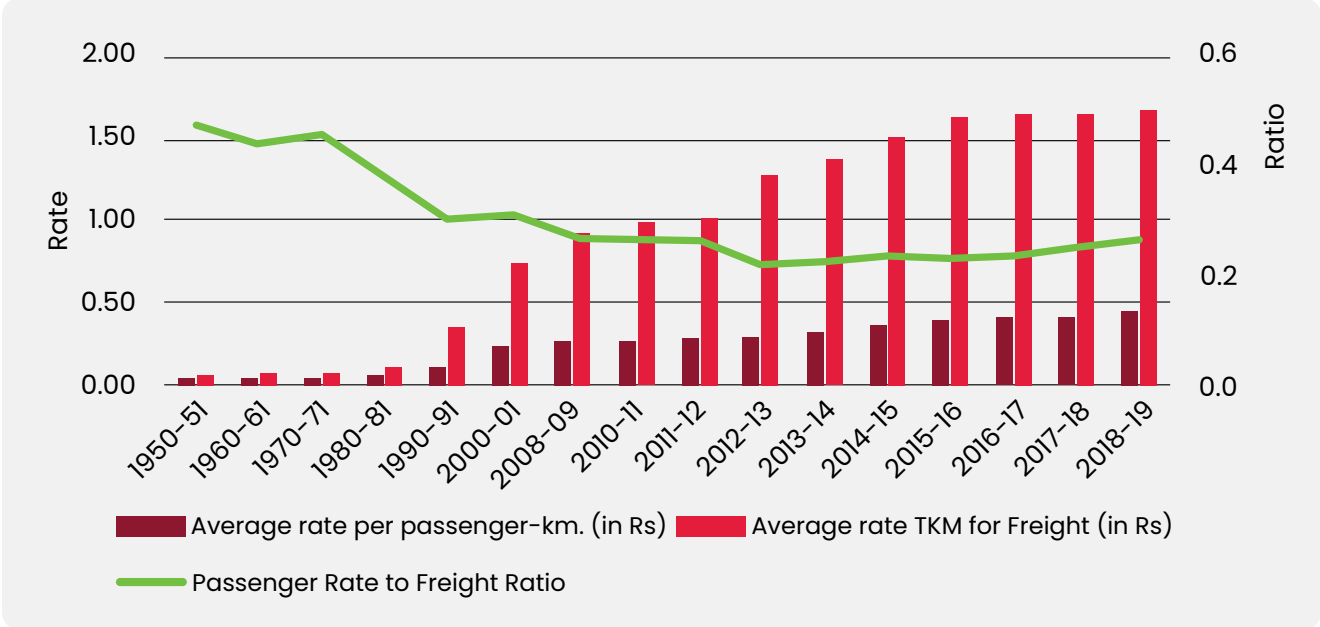
Rolling Stock: Locomotives (units)



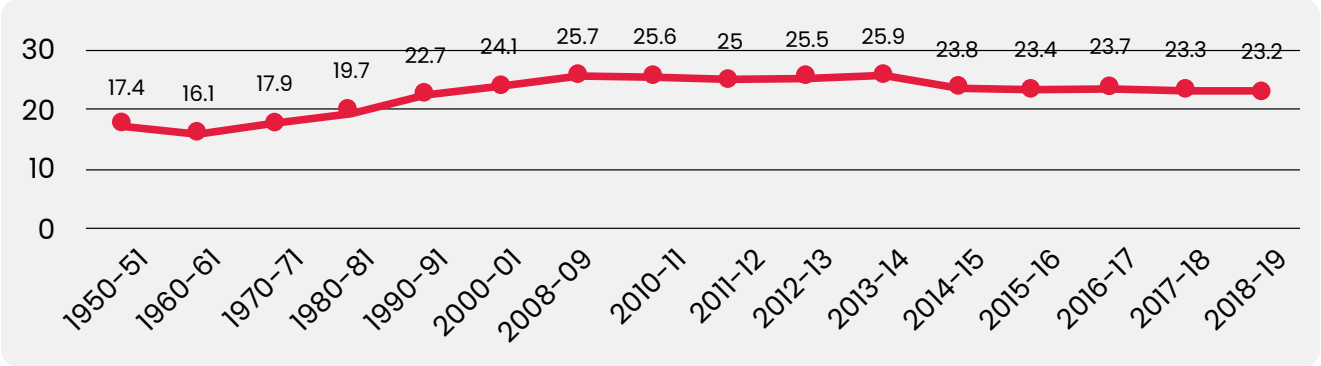
Wagon Utilisation: Total Carrying Capacity (Million Tonnes)



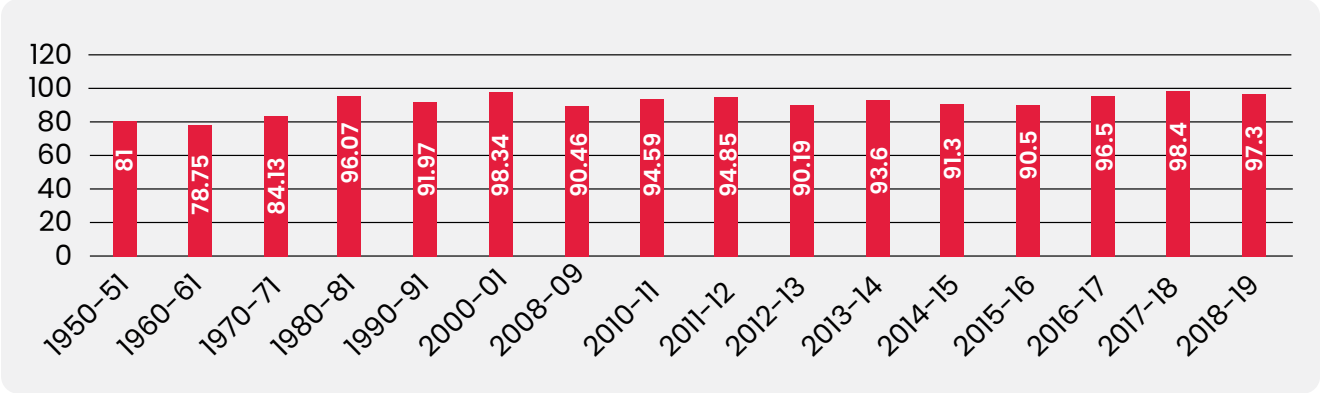
Average Passenger and Freight Rate, and Fare to Freight Ratio



Average Freight Train Speed (km/hr)



Operating Ratio (%)



Source: Indian Railways Yearbook

Key Findings:

- **Revenue:** Railways earns revenue primarily from passenger and freight traffic. Indian Railway's dependence on freight traffic has increased, and passenger traffic has decreased over the years. In 1951, 41 percent of the railways' revenue came from the passenger segment and 51 percent from the freight segment. This share has been steadily declining for the passenger segment and increasing for the freight segment. In FY19, freight accounted for 71 percent of the total revenues of the railways. Based on discussions with the Niti Aayog, it was also observed that in the case of the freight, the revenue earnings are 40 percent more than the operational expenses.
- **Line Capacity:** The growth rate for line capacity[18] in route km has been lower than expected. In 1961, the growth rate was 6 percent, which fell between 1 to 2 percent from 2001. Currently, the total route km in the Indian Railways stands at 67,415 km.
- **Rolling Stock:** Rolling stock[19] in Indian railways has not witnessed a significant change compared to the increase in freight demand. The total number of wagons has declined by 29 percent from 1981 (400,496 units) to 2019 (289,185 units). Further, there has been no significant improvement

in the number of units of locomotives over the years. In 1980-81 locomotives (steam, diesel and electric) stood at 10,908 units, while in FY19, it witnessed a minimal increase to 12,147 units.

- **Wagon Utilisation:** Optimal use of the wagon design and enhancing the wagons' carrying capacity are essential to increasing freight earnings. However, the total carrying capacity of wagons in Indian Railways has not significantly improved in the last few years. The average growth rate has been only 4 percent over the previous five years. It increased from 14.3 million tonnes in FY15 to 17 million tonnes in FY18.
- **Fare to freight ratio:** The average passenger fare to average freight tariff in India is 0.3, one of the lowest among the global majors. This ratio has declined from 0.5 in 1951 and stagnated between 0.2 and 0.3 from the 1990s onwards. The passenger segment's traffic volume is high because of low passenger fares, but the revenues are disproportionately low.
- **Train Speed:** The addition of passenger traffic has harmed the speed of goods trains because of the priority given to passenger trains. Though the speed of goods trains should be on an average 75 kmph, the freight trains' actual average speed is only 22 kmph.[20] The average freight train speed was 17.4 km/hr in 1951, which increased to 25.9km/hr in 2013-14 and started declining afterwards. In 2018-19, the freight train speed was 23.2 km/hr.
- **Operating Ratio:** Operating Ratio indicates how efficiently railways can earn with every rupee spent on the development.[21] It is calculated as the ratio of working expenses to gross earnings. A lower operating ratio is regarded as better and indicates the system's sound financial health. In FY19, Indian Railway's operating ratio was 97.3%, which means that Railways is spending 97.3 paise to earn 100 paisa - indicating minimal surplus. A high operating ratio has created a vast investment gap for capacity expansion.
- **Maintenance efficiency:** The time taken for the maintenance of rakes by Indian Railways is much greater than the ideal time. After a rake's brake power certificate validity reaches the maximum limit (running time or the number of days), they are sent to the already congested yards, thus increasing the maintenance time. It eventually impacts the timely supply of rakes and increases the turn around time. The maintenance of the equipment is very important to the safe operation of the railway line and requires huge investment on facility maintenance bases and labour cost. In Indian Railways, the process of detecting defects in locomotives and wagons is mostly based on

18 Line capacity means the number of trains that can be run on a section in 24 hours.

19 The term rolling stock in rail transport refers to any vehicle that moves on tracks. It includes coaches, wagons and train sets.

20 Mattoo, Ajita. Indian railways: Agenda for reform. Economic and Political Weekly. 2000.

21 Indian Railways' Operating Ratio (%). The Economics Times. 2017. https://economictimes.indiatimes.com/economy-dashboard/indian-railways-operating-ratio-/articleshow/56736893.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

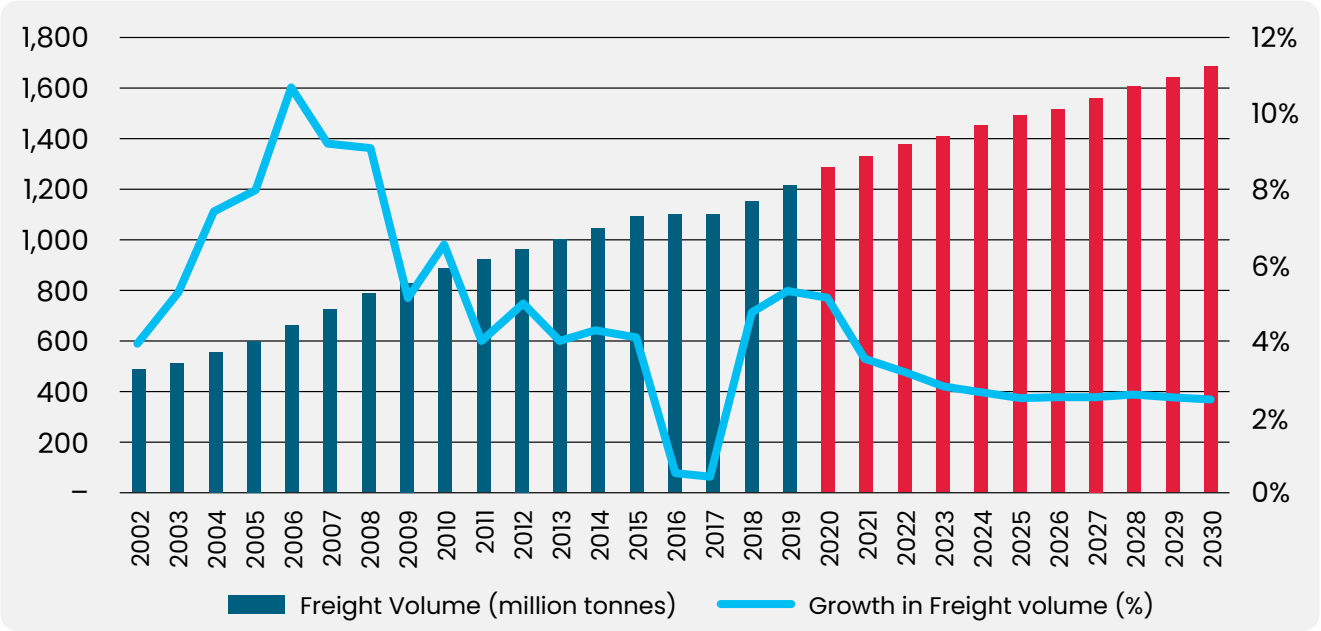
manual inspection which is costly and time consuming. There is a need to automate the maintenance process and follow a time-based or condition-based predictive maintenance approach. In addition to investing in rolling stock, Indian Railways should also focus on efficient management of wagon maintenance, which will lead to timely supply of rakes.

Indian Railways has its limitations to move goods efficiently compared to the countries with a well-developed rail network. The national transporter has always focused on bulk freight transportation limiting the freight basket to raw materials for industries such as power, iron, and steel plants. Transportation of non-bulk commodities accounts for a small share in the rail freight movement.

4.1.1 Freight Volume Forecast

Total freight volume for Indian Railways is projected using the simple linear regression technique[22]. It describes the relationship between two variables (dependent and independent) based on the sample data and predicts the dependent variable's value based on the value of the independent variable. A conservative estimate of rail freight volume for the years 2020 to 2030 is performed using the sample freight volume data for the years 2000 to 2019, using the least-squares method. Based on estimates, the rail freight volume will increase from 1.2 billion tonnes in 2019 to 1.7 billion tonnes in 2030. In this analysis, the dependent variable is rail freight volume (in million tonnes), and the independent variable is

Indian Railways Freight Volume Forecast (million tonnes)



Source: Indian Railways Yearbook, estimated for 2020 to 2030

22 Simple linear regression only looks at the linear relationship between the dependent and independent variables; is sensitive to outliers; and the results are based on only the x variable

the time-period (years). The regression equation is as follows:

$Yi=\alpha+\beta Xi$

Where Yi is Rail Freight volume (in million tonnes), Xi is the Time Period, α is the intercept value and β is the slope of Xi.

Freight Volume and Price

The price charged for freight movement by railways is one of the most important factors influencing the freight volume. The demand sensitivity to change in price can be calculated using the principle of price elasticity of demand, which is a measure of the change in the quantity demanded of a product in relation to the price change. Expressed mathematically as:

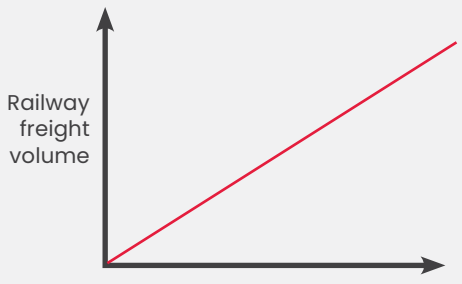
Price Elasticity of Demand (ed) = % Change in Quantity Demanded / % Change in Price

	elastic demand	unitary elastic demand	inelastic demand
	$\|ed\|>1$	$\|ed\|=1$	$\|ed\|<1$
price rises	income falls	no change	income rises
price falls	income rises	no change	income falls

An economic survey for 2014-15 reports that freight traffic in Indian railways is more sensitive to price changes than passenger traffic. It showed that the freight traffic sensitivity to price changes was 55.4 percent, while the same for passenger traffic was 14.4 percent. The price of railway traffic alone has a significant effect on its freight volume. The railway freight volume decreases with a corresponding increase in freight price. In addition, railway freight volume is impacted in the same orientation by the change in the price of other competitive transport modes. Other macro variables such as the change in GDP, industrial production, etc., also impact the freight volume.

The Relation Between Railway Freight Volume and Railway Price

The Relation Between Railway Freight Volume and Other Transport Mode's Price



* Shi, Ying. Fang, Xiaoping. Chen, Zhiya. Price Analysis of Railway Freight Transport under Marketing Mechanism. Central South University, China. ScienceDirect. 2012.

* Railway Price Traffic is more price sensitive. The Hindu. 2016.

4.2 Comparative Cost and Time Analysis: Rail and Road

Railways are the primary carrier of bulk commodities such as coal, iron and steel, food grains, and fertilisers. However, India is a consumption-driven economy with a total size of USD 2.9 trillion in 2019, and consumable goods occupy a significant logistics share. Rail transportation being less flexible in India, road capture the majority of the stake in consumer goods' supply chain. There are various infrastructural, operational and, connectivity constraints that have further augmented this problem in railways. Despite privatization in the container segment of Indian Railways, the domestic container movement has hardly witnessed any growth. The domestic container business has been hovering around 2% of the total traffic carried by rail. Due to limited services by rail for the non-bulk cargo, the majority of the domestic container freight share is taken over by roadways. More shippers move their cargo by road since it is cheaper. The challenge for Indian Railways is to reduce the cost as the way road transport has been able to achieve.

The movement of non-bulk commodities over rail requires a well-developed intermodal container ecosystem, including freight aggregators, intermodal container terminals, suitable wagons, scheduled rail services, and first and last-mile connectivity options. However, a lack of these rail services makes the road more attractive in shipping costs and services. Indian Railways charges a flat haulage fee for containers irrespective of the commodity moved, making rail non-competitive to the road.

Cargo Movement Prices by Road

Route	Distance (Kms)	Approximate Price INR per Kg (upper limit)
Bombay to Chennai	1,335	3 to 5
Bombay to Assam	2,921	8
Bombay to Delhi	1,416	3.5

Source: Direct Interactions with logistics stakeholders

The below analysis suggests that despite comparative long-haul cost for rail transportation and road, fixed costs like the handling and last-mile increases the overall cost and reduce the freight loading potential for Indian Railways. The below table provides a cost breakup of a 24-ton container from Mumbai to Delhi via rail and road.

Mumbai to Delhi Container Movement Cost Comparison (in INR)

Category	Approximate Cost by Rail (INR)	Approximate Cost by Road (INR)
Long Haul Cost	45,000	45,000
First and the Last Mile		
Handling Cost	10,000	
Connectivity Cost	20,000	
Total	75,000	45,000
Cost per Kg	3.125	1.875

Source: Direct Interactions with logistics stakeholders

Along major routes, Delhi-Bengaluru, Delhi-Mundra, Delhi-Mumbai, and the like, stakeholder discussions reveal that **it takes approximately 2-3 days longer for transportation via rail than the road**. It is primarily due to increased transit time by rail and pre-movement and post-movement procedural delays such as wagon placement, loading and unloading operations, multi-modal handing etc. Based on dwell time study,* the transit time of trains from JNPT to ICD Tughlakabad (Delhi) was 60 hours and, the Mundra port to ICD Tughlakabad was 84 hours in December 2018. There is a need to enhance the cargo efficiency in pre and post-movement procedures and improve the transit time of cargo trains.

In August 2020, Indian Railways launched India's first privately-operated and the longest roll-on, roll-off (RO-RO) freight service between Bengaluru and Solapur. Around 7,000 trucks run daily between the two points, and it takes approximately 38 hours to reach the final destination. With the introduction of RoRo rakes, this time will reduce to 17 hours. Each RO-RO rake can transport ~42-45 trucks, which can get on and off the rakes with quick turn-around time. The service will help railways provide end-to-end service and at the same time save energy consumed by trucks and also lower environmental pollution and congestion on the roads.

Source: Karnataka CM flags off Bengaluru to Solapur RORO train. The Hindu. August 2020
*There are seasonal variations in container trains transit time. http://www.jnport.gov.in/dicdc_and_fieo_report

High rail freight costs hamper container freight movement. A fair price for container movement is essential to increase the domestic container freight volume. Indian Railways needs to push aggressive discount schemes to compete with road transportation. Better freight discounts are necessary to make container movement by rail economical for improving the container freight share.

Railways have taken few initiatives to enhance the container movement, such as discounted prices on special rakes for closed-circuit trains and reduced freight in RoRo trains that can be implemented on other routes to increase domestic container movement.

- **Special rakes for closed-circuit movement -** Indian Railways has allowed a 50 percent discount on container freight movement for the closed-circuit movement of container trains from JNPT to CFS in Mumbai, barely 100 km distance between the origin and destination. This route's cost per container is INR 2,500 (INR 0.1 per kg) by rail and INR 4,500 via road (INR 0.18 per kg) for a 24-ton container.

- **RO-RO trains Bombay to Goa** - A RO-RO train consists of 45 trucks loaded with an approximate haulage charge of INR 2 to 3 lakhs per train. The rakes are unloaded and reloaded with trucks from the Kolad good shed to Verna (12 kms from Madgaon) and cover a total distance of 450 km.

Cargo Movement Prices for Different Categories

Train Category	Route	Information from the Stakeholders	Cost Comparison
Parcel Wagon	Bombay Rajdhani	INR 3 lakhs per box (15-ton box)	INR 20 per Kg
RO-RO Train	Bombay to Goa	INR 2 lakh per train	INR 0.33 per kg
Container Train	Bombay to Delhi	INR 40.50 lakh per train (INR 45,000 per box and min 90 boxes in each train)	INR 1.875 per kg
Special Rakes for Closed Circuit Movement-short distance	JNPT to CFS (Mumbai)	INR 2400 per container	INR 0.10 per kg

Source: Direct interactions with logistics stakeholders

Container Train Operators (CTOs) can lower costs through increased efficiencies such as higher asset turnover and faster turnaround time to become a reliable mode for long-haul freight movement. Companies will also function better if a few strategic multimodal logistic parks are located across the country. Additionally, the Indian Railways can also utilize the cargo wagons in the passenger trains to their full potential. There are two cargo wagons in each passenger train. Currently, 80 percent of the cargo wagons remain unutilized. By **Uberizing (uber-like model) one of the cargo wagons in each passenger train,** customers can book the wagon using an online application. It can be one way to directly increase the freight traffic - without any additional investment in infrastructure. Indian Railways may keep operating one of the two cargo trains traditionally.

Utilization rate of Cargo Wagons in Passenger Train

Number of Passenger Trains	Number of Cargo Wagons in Passenger Trains	Utilization (%) of Cargo Wagons as per stakeholder estimates
13,523	27,046	~20 percent

Source: Indian Railways Yearbook; Direct Interactions with logistics stakeholders

With the e-commerce platform picking up at a significant pace, online retail penetration in India is expected to reach 10.7% by 2024 from 4.7% in 2019. The COVID-19 pandemic has impacted consumers' buying habits and the choice of market platform, the brick and mortar retailers have sensed the urgency to expand their digital presence. Growth in India's e-commerce is likely to come from better penetration into FMCG, apparel, appliances, health, and personal care, improving the payment ecosystem, and shopping ease. India is the second-largest online market globally, with over 560 million internet users. The tech-savvy millennials and the digital wave will contribute to the growth of e-commerce. Opportunities in the logistics chain for quick movement of goods for e-tail players will expand the railway's product basket and increase revenue. **Railways should focus on building an e-commerce transportation system with special trains that would enhance capacity planning, track movement of goods, improved infrastructure and freight movement security via the rail network.** The improved transportation of parcels by the Indian railways will ensure quick and convenient movement for e-commerce platforms.

Public Private Partnership in Railways

PPPs in railways can bring an influx of investment, increase operational efficiency and bring in modern and clean technology. The prime focus of PPP models in Indian Railways should be to provide greater customer satisfaction, enhance digitization and improve efficiency. Based on extensive stakeholders' discussion, a PPP model is suggested for a few dedicated container freight trains from point to point (between two metros or industrial hubs to warehousing hubs) could be adopted by Indian Railways. This model could be based on the Build-Own-Operate approach, wherein the Indian Railways will be responsible for providing the infrastructure, and the private sector be responsible for operations and management. The model is detailed below:

Railways to provide ten dedicated container freight trains on major routes with a distance of at least 1,000 kms (should be studied and selected based on data) for which the cargo is operated and managed by the private sector. The railway haulage payable to Indian Railways for 90 boxes (24 tons-cargo in each box) could be INR 0.70 per kg per 1,000 kms. The freight forwarders would have to provide a minimum guaranteed cargo load of at least one container. Using this model, if the Railways operates ten trains a month for five years and, for a distance of 1,000 kms with a two-way traffic - the revenue for Indian Railways would be as follows:

10 trains X 0.70/kg X 24,000kg X 90 container X 60months X 2-way = INR 181.44 crores

According to stakeholder estimates, this model will timely cover the indicative cost of replacement (mentioned below) and would also provide a reasonable margin for the Indian Railways.

- Locomotive - INR 12.5 cores
- Wagons - INR 15 crores
- Containers - INR 2.5 crores
- Rail tracks - INR 50 cores
- Rail siding - INR 30 crores and;
- Power cost of 0.02% of freight

In the proposed model, railways create/ provide the infrastructure for ten trains and open rail siding at both the ends. The operation and management of equipment and labour, and the transport facility for first and last-mile connectivity will be handled by the private players. The revenue generated through this approach can be shared by adopting a revenue sharing or a royalty based approach. In the revenue sharing model, the concessionaire (private player) may commit a certain agreed share with the railways, with a condition of minimum guaranteed revenue to the railways. On the other hand, in the royalty based approach, the private operators will pay royalty per tonne or per container of

cargo to the Indian Railways. Both these models are used in the maritime based PPP projects. The model concession agreement could be decided in such a way that revenue-sharing or the royalty shared by the private players with the Indian Railways could be re-calibrated vis-à-vis traffic flow.

Once the success of the proposed model is established, similar approach can be replicated in commodity specific wagons and other privatisation areas such as warehouses, terminals and end-to-end connectivity. Further, private players can also be encouraged to invest in additional rail infrastructure.

Source: Direct Interactions with logistics stakeholders

In several countries, private business rents some specific physical assets, such as rolling stock, which saves the railway from financing those assets itself. **For example, in 2003, Russia began allowing the private sector to rent freight wagons to the railway, making it profitable through a change in tariff rules. The new policy created a vibrant market where the private sector provided USD 50 billion toward replacing the railway's extensive stock of old wagons.** Around 85 percent of freight wagons in Russia are now privately owned. Besides, the private sector can sell services to the railway, such as track maintenance. In that case, the investor deploys its equipment and facilities, finances the working capital involved, and provides the labour.

*Source: Keys to attracting Private Capital for Railway Development. World Bank Group. 2015

4.3 International benchmarking and best practices

The trade flows across the world are increasing with a rise in global trade and trade agreements, and the international rail freight transport market is expected to grow at a CAGR of 2 percent for the period 2020-2025. However, the rail industry across countries is facing severe competition from roadways.[23] The railway systems are heavily investing in infrastructure to reduce costs for customers and to increase rail freight. For example, China is efficiently using the advanced rail infrastructure for speedy and low-cost movement of goods. It uses special trains for carrying containers that connect significant ports to the inland. In addition, China has dedicated railway lines to move container traffic and planned double-decker container carriages for greater efficiency. Also, the rolling stock maintenance standards are higher and the equipment failure rate is lower which eventually leads to a faster wagon turn-around time and increased wagon utilisation rate. As a result, China's rail freight cost (tonne/km) is three times lower than India's.[24]

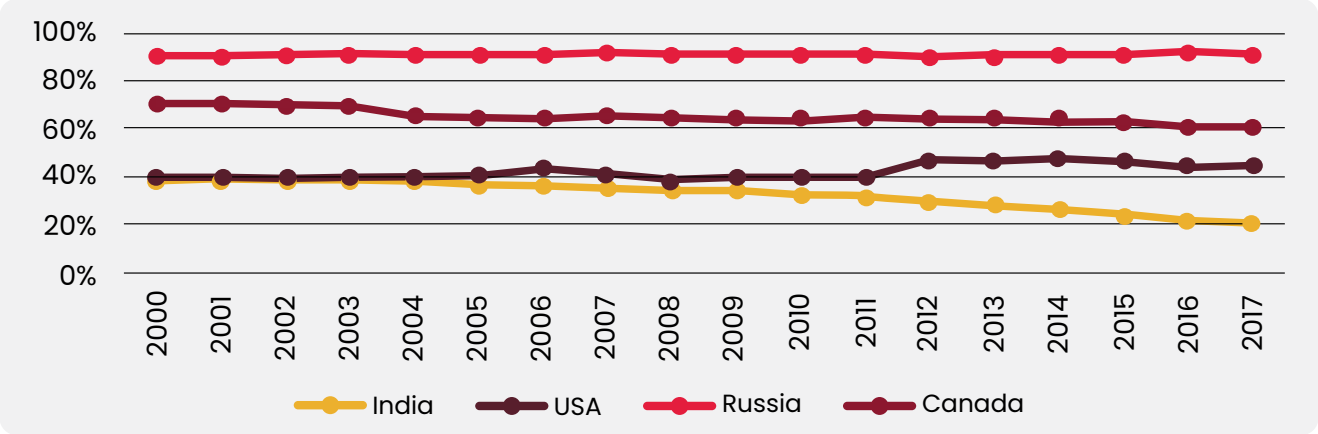
The increasing dependence on roads for freight transportation has resulted in a low freight share by railways in India as compared to developed countries like the USA (45%), Canada (61%), and Russia (91%). The fare-freight ratio (the ratio of the average passenger fare to average freight rates) for the Indian Railways is 0.3, South Korea (1.4), France (1.3), China (1.2), Malaysia, and Indonesia (0.9), and Thailand (0.7). In India, the railway fares have stagnated for years, and fare prices have lagged behind the inflation level. Countries like Canada have seen a shift in the road to rail goods movement due to the structural changes accompanied by the rising cost of fuel and strict restriction on driving hours, leading to increased road transport prices. They have also simultaneously invested in improving railroads for efficiently transporting goods over long distances.[25]

23 Rail Freight Transport Market- Growth, Trends, And Forecast (2020 - 2025). Mordor Intelligence.https://www.mordorintelligence.com/industry-reports/rail-freight-transport-market

24 Mukundan, Harish. A Comparative Study of Maritime Operations in India. MIT. 2007. http://web.mit.edu/harishm/www/papers/13bsmthesis.pdf

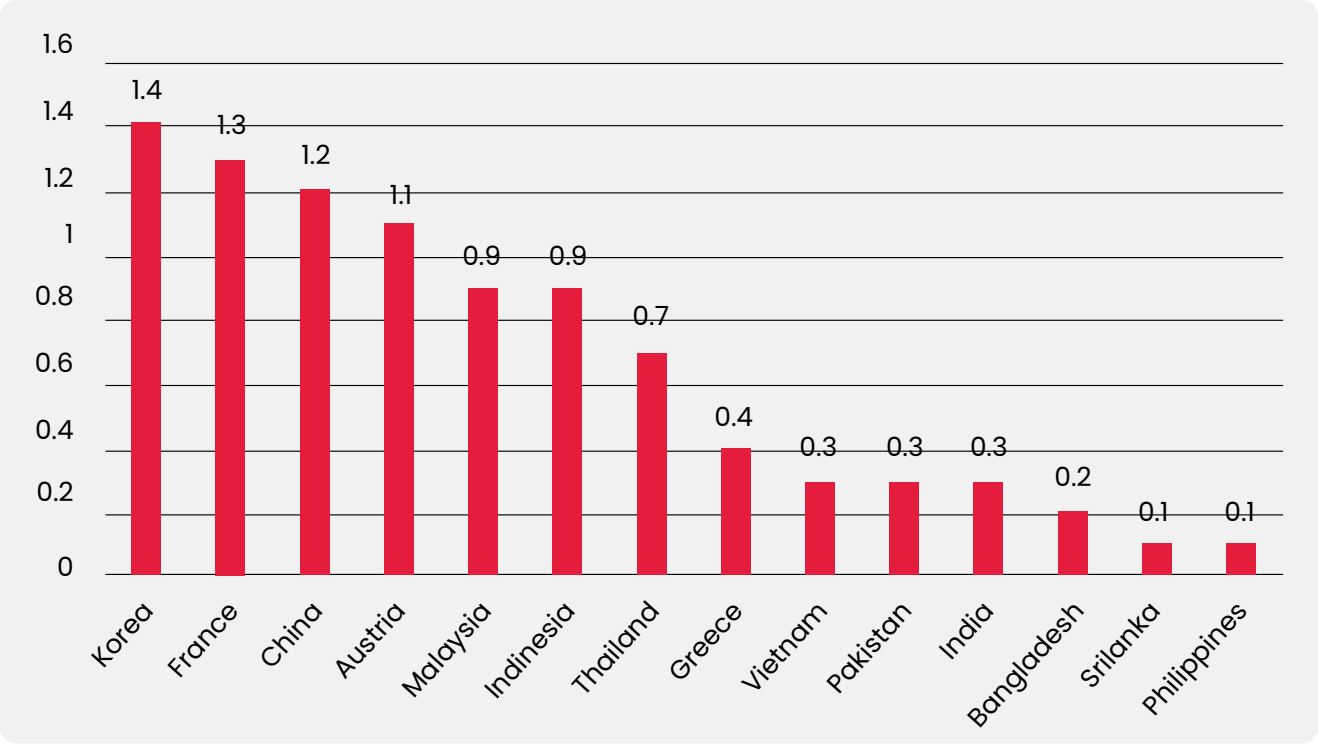
25 Berg, Claudia and others. Transport policies and development. Taylor & Francis. 2016. https://www.tandfonline.com/doi/full/10.1080/00220388.2016.1199857; https://www.fool.ca/2014/09/02/why-billionaire-bill-gates-owns-canadian-national-railway-company/

Share of Freight by Rail of Total Inland Freight



Source: OECD Database

Ratio of Average Passenger Fare to Average Freight Rates (NTKM)



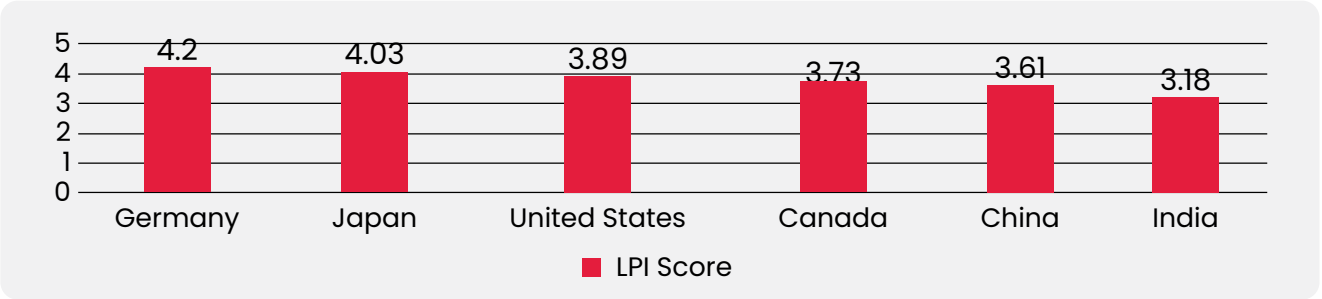
Source: NTDPC India Transport Report 2014

4.3.1 Logistics Performance Index

The logistic Performance Index is a benchmark for logistics competence and skills of a country, the quality of trade-related infrastructure, and the price of international shipment. The Logistics Performance Index score reflects a country's logistics performance based on several parameters such as the efficiency of the customs clearance process, quality of trade- and transport-related infrastructure, ease of arranging competitively priced international

shipments, quality of logistics services, ability to track and trace consignments, and frequency of shipments to reach the consignee within the scheduled time. The index ranges from 1 to 5, with a higher score representing better performance. In 2018, India's logistics performance index score stood at 3.18, which is lower than global majors such as Germany (4.2), Japan (4.03), and the USA (3.89).

Logistics Performance Index Score

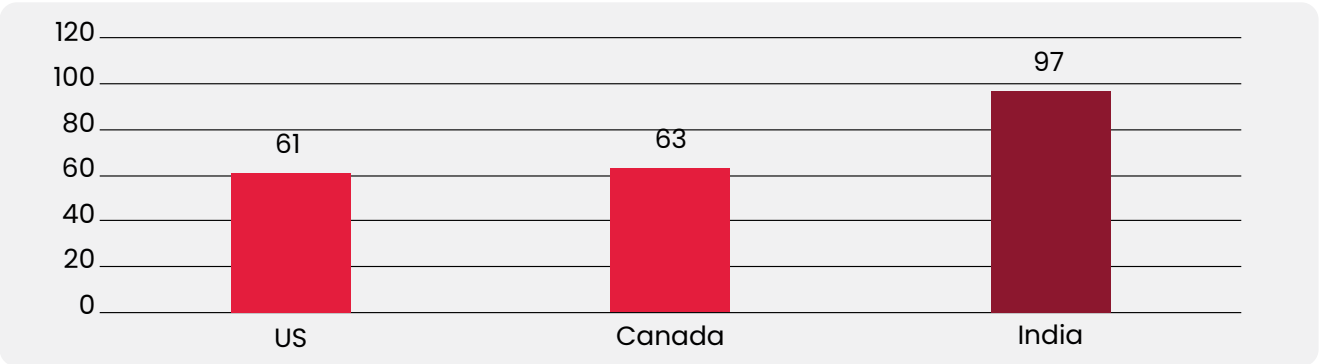


Source – The World Bank

4.3.2 Logistics Cost as a Share of GDP

India's logistics cost as a share of GDP is 14 percent, which is high according to the global standards - the USA (10 percent), Germany (9 percent), Japan (11 percent). High dependence on roads has increased the cost of logistics adding to the overall industrial cost. Road freight in India dominates movement of high-value items such as automobiles, pharmaceuticals, electrical goods, hardware, furniture etc.[26] The Indian Railways are running at an inefficient operating ratio of 97.3 percent compared to 61 percent of USA and 63 percent of Canada. Based on studies, an operating ratio of above 85 percent is an indicator of poor financial health of a country's railways as they are less likely to cover the total costs with increased dependence on outside support.[27]

Operating Ratio Comparison (Percent), 2019



Source: Statista. Operating Ratio for US is Union Pacific Railroad and Canada - Canadian National Railways

26 India's logistic costs higher than BRIC nations. The Times of India. 2017. https://timesofindia.indiatimes.com/business/india-business/Indias-logistic-costs-higher-than-BRIC-nations/articleshow/14151707.cms

27 Efficiency in Railway Operations and Infrastructure Management. International Transport Forum. OECD. 2019 https://www.itf-oecd.org/sites/default/files/docs/efficiency-railway-operations-infrastructure_1.pdf

Global Practices:

In the USA, the importance of rail freight traffic rapidly declined after the Second World War. From 1950 to 1980, the market share of rail freight dropped from 56 percent to 37 percent. The economic condition of freight rail deteriorated so much that it was close to collapse by the 1970s. Severe competition from road transport operators contributed further to this situation. In the absence of sufficient revenues, railways were not able to maintain their networks appropriately. However, the US federal government and the rail industry recognized that the leading cause for rail freight's weak state was the strict regulatory framework and the authorities' price regulation. While the purpose of the regulations was to protect shippers from high or discriminatory freight rates, it constrained railways in supplying efficient services, muted innovation, and lowered income to invest in advanced equipment and infrastructure. Due to increased flexibility and economic freedom, railways could design services based on customer needs, quote market-based freight rates, and deal with the infrastructure as required. Following steps were taken to improve rail share in the US.[28]

1. Deregulation of rail freight traffic and free-market conditions for the freight segment was considered the key to improving competitiveness. It allowed railways to charge freight service rates based on market needs with minimal intervention from the regulatory bodies.

2. Introduced dedicated intermodal services in partnership with logistics service providers such as parcels and motor carriers.

3. Technological innovations such as double-stack wagons, shuttle trains, IT-based central reservation systems, RFID, and OCR identification technologies at the terminal.

4. Huge investments in rail and intermodal traffic to expand the network from single to double or triple track line, raising clearance for double-stack trains, advanced signalling systems for capacity increase, investment in terminals, wagons, and locomotives.

5. The US Class I railways voluntarily report performance data on the Association of American Railroads (AAR) website. The AAR performance statistics acted as a marketing and benchmarking tool for the railways, and constitute as an information source for the customers. Based on a standardized methodology, they provide statistics for three features::

    - Wagons on line - the average daily number of wagons on the network
    - Terminal dwell - the average time a wagon spends at a specified terminal location
    - Train speed - average velocity achieved for line-haul movement excluding terminal time

28 Benchmarking Intermodal Rail Transport in the United States and the Europe. International Union of Railways. UIC. 2019. https://uic.org/diomis/IMG/pdf/DIOMIS_Benchmarking_Intermodal_Rail_Transport_in_the_US_and_Europe.pdf

6. A radical transformation of timetables by introducing timetables matching customer requests.

As a result, the total volume measured in revenue ton-miles doubled, and the market share of rail reached 41 percent. The freight railways enhanced their productivity by more than 160 percent. In addition to the above reforms, this result could be attained through numerous mergers, especially among the Class I railways, the more efficient employment of equipment, staff, and facilities, and the sale or abandonment of poorly used lines. In the US, deregulation of the freight segment completely changed the ability to work directly with shippers.

International benchmarking is done based on data available from secondary sources. For a more comprehensive understanding, it is suggested to make on-the-ground visits to meet international stakeholders and learn global practices from a policy-making and implementation lens.

4.4 Turning Crisis into an opportunity: Initiatives Taken by Indian Railways during Covid-19

At the onset of the COVID-19 pandemic, the passenger trains were suspended from March 24, 2020, till July 2020. However, goods and services continued to be transported through trains carrying essential commodities to various parts of the country. During this period, special railway parcel vans were made available for quick mass transportation for the state governments and the e-commerce entities. The provision of parcel trains by Indian Railways was initiated to increase the rapid transit of goods and bolster supply chains' efficiency to help in the movement of small quantities and essential items such as dairy products, medical equipment, medicines, groceries, edible oil, etc.

Despite the unprecedented challenges because of the COVID-19 pandemic, the Indian Railways took several initiatives to boost the freight operations. Resulting which the freight loading in August 2020 was 4.3 percent higher than the same period last year. Till August 2020, the total freight loading was 81.33 million tonnes higher than the same period the previous year.[29] Further, in September 2020, the rail freight increased by 14 percent. The freight revenue stood at INR 9,896 crores in September 2020, whereas in September 2019, the same was INR 8,716 crores.[30] The demand remained low for many industries, and manufacturing output weak post the lockdown period. Due to lower demand, the movement of goods declined across the country; however, the share of rail freight increased significantly.

29 Indian Railways takes Series of Initiatives in Traffic and Non-Traffic field to Boost Freight Operations. 2020. IBEF. https://www.ibef.org/news/indian-railways-takes-series-of-initiatives-in-tariff-and-nontariff-field-to-boost-freight-operations

30 Freight loading by Indian railways go up by 15% in September. Opindia. 2020 https://www.opindia.com/2020/10/freight-loading-indian-railways-trains-increase-september-100-million-tonnes-speed-double/

"Almost all commodities have shown positive growth in September and that gives a good indication of the real revival of the Indian economy...It indicates that Indian economy is recovering and the economic activities are improving. Despite COVID-19 challenges, Indian Railways has taken many initiatives for business development and a lot of initiatives were taken to boost freight loading and the result has come in September" CEO & Chairman, VK Yadav, Railway Board.[31]

Utilizing the COVID period as an opportunity, the Indian Railways substantially increased the speed of freight trains. Compared to the previous year, approximately 72 percent increase has been observed in freight trains' average speed during 2020-21. Some of the measures[32] taken to boost rail freight movement include:

- Specially designed Parcel vans to ensure an uninterrupted flow of essential commodities
- 5 percent discount on loaded containers (addition to 25 percent on empty containers) from March 2020 onwards
- Two-point unloading permitted for Automobile traffic for the Automobile sector from August 2020
- Limit on the number of co-users in private siding removed for all sectors from August 2020
- Round trip traffic (RTT) policy – charging of lower class for all sector – long lead concession – 15 to 20 percent for coal, iron ore and steel and short lead concession -10 to 15 percent for all sector (except for coal and iron ore) from July 2020.
- The distance restriction on mini rakes of 1500 KM removed with a small surcharge for foodgrains and other sectors.
- A Freight Business Development Portal was launched as a one-stop solution to ensure ease of doing business with Railways. The focus will be to deliver the best services to the customers.

To foster the freight operation of Indian Railways, special trains such as Kisan Special Parcel Trains have been introduced. These trains are for the transportation of perishable items at affordable prices. The initiative has been taken by the Indian Railways with the involvement of the private sector. The focus is to provide a seamless supply chain for perishable goods and ensuring benefits for both farmers and consumers. Some of the identified special trains, routes, and seasons include[33]:

31 Freight loading by Indian railways go up by 15% in September. Opindia. 2020 https://www.opindia.com/2020/10/freight-loading-indian-railways-trains-increase-september-100-million-tonnes-speed-double/

32 Indian railways takes several initiatives in tariff, non-tariff field to boost freight operations amid COVID-19 challenges. 2020. Zee News. https://zeenews.india.com/economy/indian-railways-takes-several-initiatives-in-tariff-non-tariff-field-to-boost-freight-operations-amid-covid-19-challenges-2306001.html

33 Mango Special to Banana Special: Kisan Rail gets on track. The Indian Express. 2020. https://indianexpress.com/article/india/kisan-rail-farmers-indian-railways-6674609/

Special Train	Route	Season
Onion and Banana Special	Nashik and Jalgaon to Delhi	between March and December
Mango Special	Andhra Pradesh to Delhi	between April to June
Banana Special	Anantpur to Jawaharlal Nehru Port Trust in Mumbai	
Sapota (chiku) Special	Surat, Valsad and Navsari in Gujarat to Delhi	between April and November
Protein Special for packaged meat	Dadri or Kanpur areas in UP to ports in Gujarat and Mumbai	

In India, the Courier, Express, and Parcel (CEP) market is estimated to grow at a CAGR of more than 10.5 percent, mainly due to the growth in the e-commerce segment, increased internet penetration, and improved technological innovations. In 2018, India's parcel volume witnessed a 21 percent increase and reached 2.5 billion, while global parcel volumes reached 87 billion in 2018, up from 74 billion in 2017.[34] With the growth in e-commerce, India's market for parcel shipment is growing at a significant rate. Assurance of timely delivery and low volume consignments are critical characteristics of parcel shipments. There is an enormous opportunity for Indian Railways to tap into this segment and consolidate with the private sector.

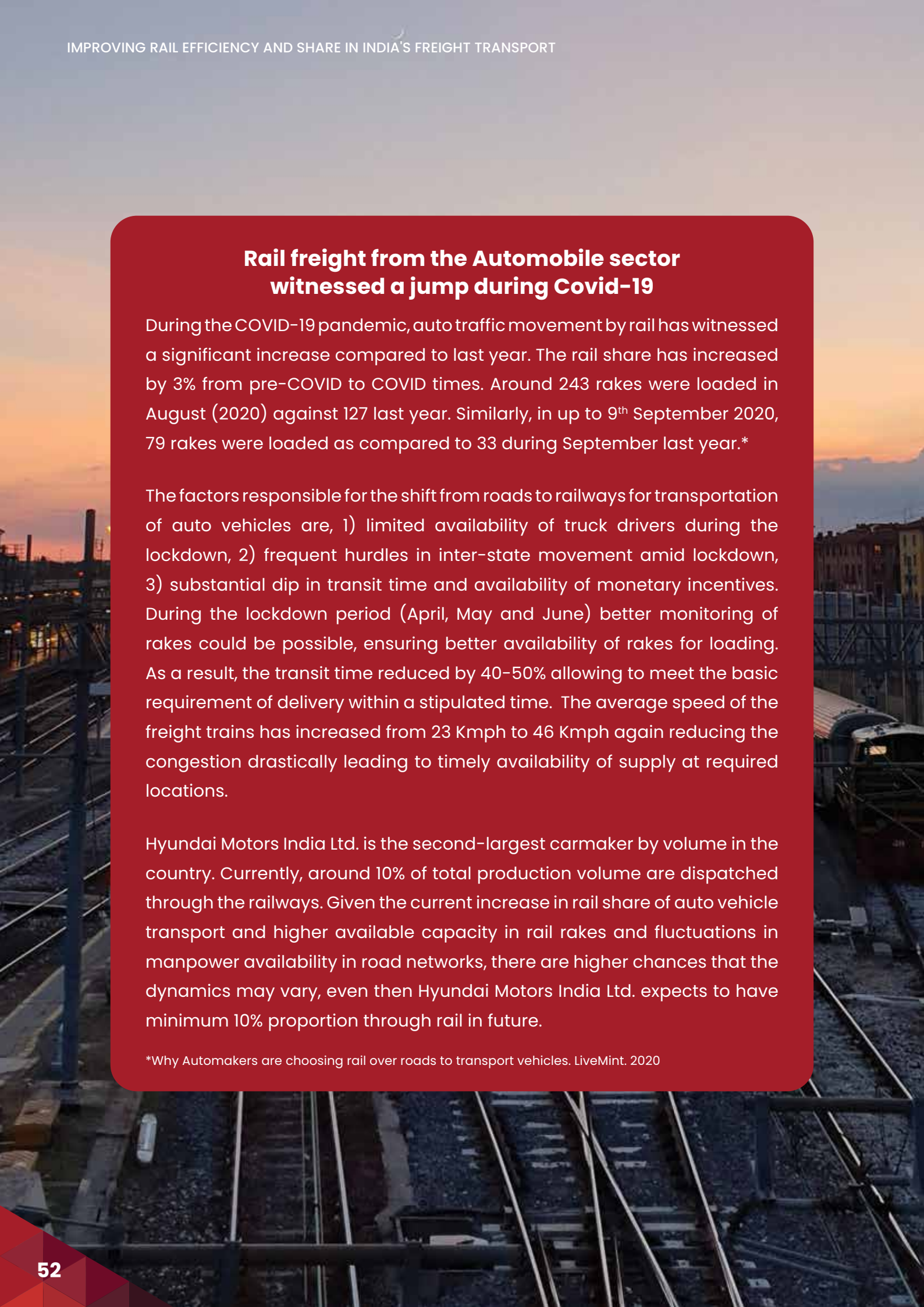
For smaller volumes and shorter distances, road transport has been a preferred mode. However, the special parcel trains were introduced by Indian Railways for smaller volumes on time-tabled and customer-specific routes during the crisis. Railways have been successfully aggregating and transporting goods in scheduled parcel trains. With an increased focus on parcel business growth, essentially for the small traders, and a medium to long-term strategy, the railways can attract a significant parcel traffic volume. Indian Railways can strengthen the supply chain through joint participation with e-commerce and 3PL players. The parcel business can enhance freight business and attract time-sensitive cargo to rail

34 India Courier, Express, and Parcel (CEP) Market Growth, Trends, Covid-19 Impact and Forecasts (2021-26) https://www.mordorintelligence.com/industry-reports/india-courier-express-and-parcel-cep-market

– for example, fast-moving consumer goods (FMCG), pharmaceutical, fruit and vegetables, machine parts, etc.

Currently, Indian Railways has a negligible share in the shipment of FMCG goods. However, there is an immense opportunity for the railways in this segment as it is the fourth largest in the Indian economy. With a value of USD 49 billion in FY17, it comprises three sectors – Food and Beverages (F&B), Household and Personal care, and Healthcare. Household and personal care constitute 50 percent of the total FMCG sales in India.[35] The logistics of the FMCG sector is highly time and price sensitive. With the increased flow of parcel trains, the sector players can rely on railways for timely delivery of products.

35 Sector overview. The Federation of Indian Chambers of Commerce & Industry (FICCI). https://www.ficci.in/sector-details.asp?sectorid=73



Rail freight from the Automobile sector witnessed a jump during Covid-19

During the COVID-19 pandemic, auto traffic movement by rail has witnessed a significant increase compared to last year. The rail share has increased by 3% from pre-COVID to COVID times. Around 243 rakes were loaded in August (2020) against 127 last year. Similarly, in up to 9th September 2020, 79 rakes were loaded as compared to 33 during September last year.*

The factors responsible for the shift from roads to railways for transportation of auto vehicles are, 1) limited availability of truck drivers during the lockdown, 2) frequent hurdles in inter-state movement amid lockdown, 3) substantial dip in transit time and availability of monetary incentives. During the lockdown period (April, May and June) better monitoring of rakes could be possible, ensuring better availability of rakes for loading. As a result, the transit time reduced by 40-50% allowing to meet the basic requirement of delivery within a stipulated time. The average speed of the freight trains has increased from 23 Kmph to 46 Kmph again reducing the congestion drastically leading to timely availability of supply at required locations.

Hyundai Motors India Ltd. is the second-largest carmaker by volume in the country. Currently, around 10% of total production volume are dispatched through the railways. Given the current increase in rail share of auto vehicle transport and higher available capacity in rail rakes and fluctuations in manpower availability in road networks, there are higher chances that the dynamics may vary, even then Hyundai Motors India Ltd. expects to have minimum 10% proportion through rail in future.

*Why Automakers are choosing rail over roads to transport vehicles. LiveMint. 2020

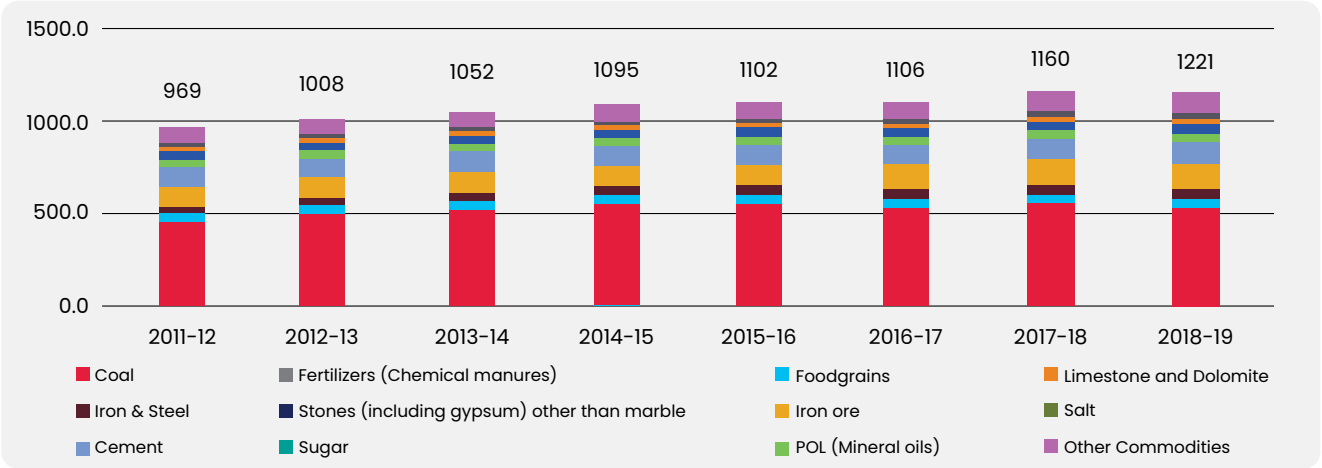
CHAPTER 5

PRODUCT MATRIX AND SECTOR-SPECIFIC CASE STUDIES

5.1 The Product Matrix

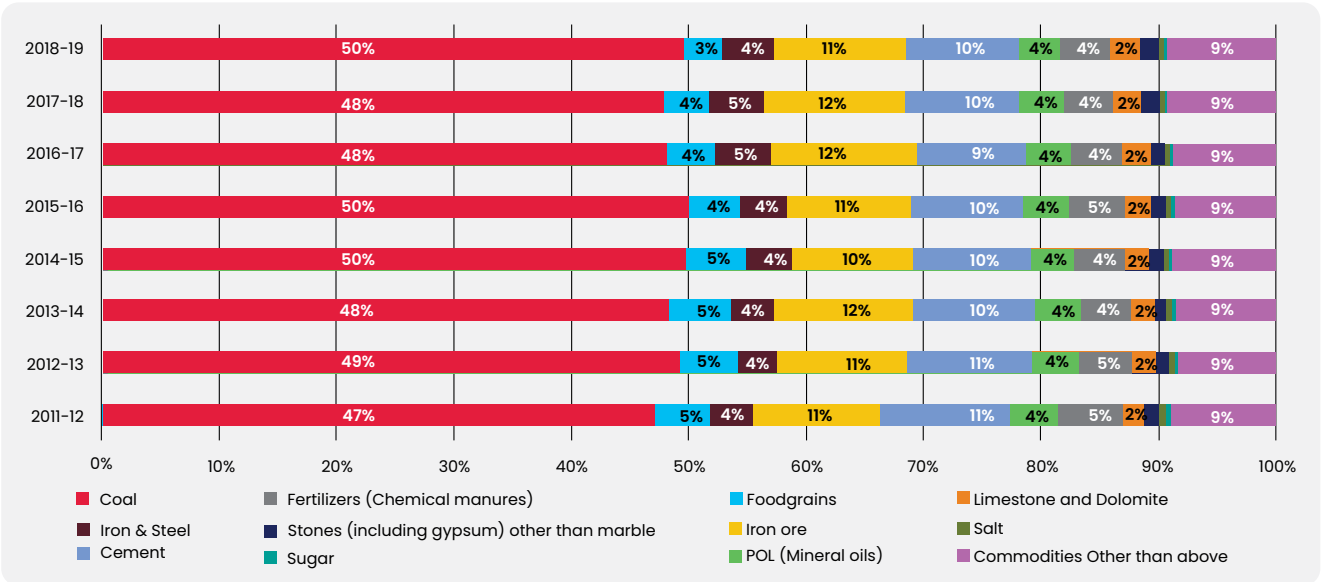
Railway transports a wide range of goods and industrial outputs such as coal, cement, iron ore, steel, petroleum, and agricultural products such as foodgrains and fertilizers. Railways are amenable for bulk movement of raw materials from producing centres to factories, and finished/semi-finished products from factories to consumption areas or ports for exports. In 2018-19, coal constituted 50 percent of the total freight movement of 1,221 million tonnes, followed by Iron Ore (11%), Cement (10%), Mineral Oil (4%), Fertilizers (4%), Iron & Steel (4%), Foodgrains (3%), Limestone and Dolomite (2%), Stones (including gypsum) other than marble (2%) and other commodities (9%). Transportation of coal and cement accounts for more than 50 percent of the total freight movement of the Indian Railways.

Movement of Bulk Commodities by Indian Railways (Million Tonnes)



Source: Indian Railways Yearbook

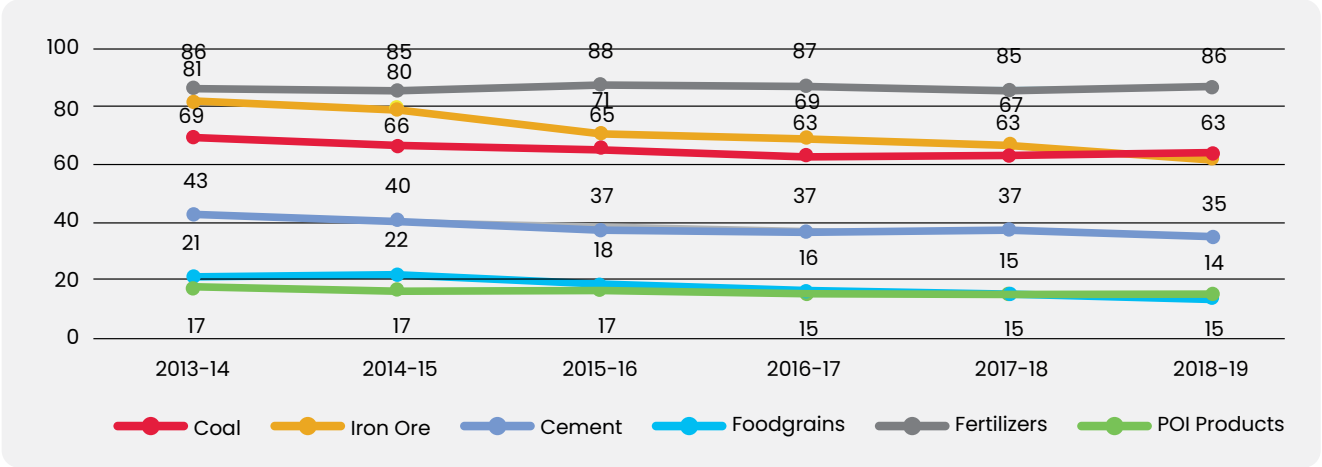
Movement of Bulk Commodities by Indian Railways from 2011-12 to 2018-19 (%Share)



Source: Indian Railways Yearbook

For bulk commodities, such as coal, fertilizers and iron-ore, the majority of the share of the total production and imports is transported by the Indian Railways. For example, in 2018-19, more than 50 percent of the total Fertilizers, Coal and Iron ore is transported via rail. Cement share accounted for 35 percent, while Mineral Oil (Pol) transportation by railways was 15% of its total production and imports. Foodgrains and POI products have the least share in rail transportation. With freight traffic being sensitive to price hikes, railways have steadily lost market share to roads in various commodities like cement, foodgrains, and POI.[36] While cement and fertilisers have moved to roads, petro products have moved to pipeline. Indian Railways has managed to contain the market share only for commodities which are comparatively challenging to shift to other modes.

Rail Coefficient for Major Commodities Carried by the Indian Railways as a Percentage of Total Production Plus Imports

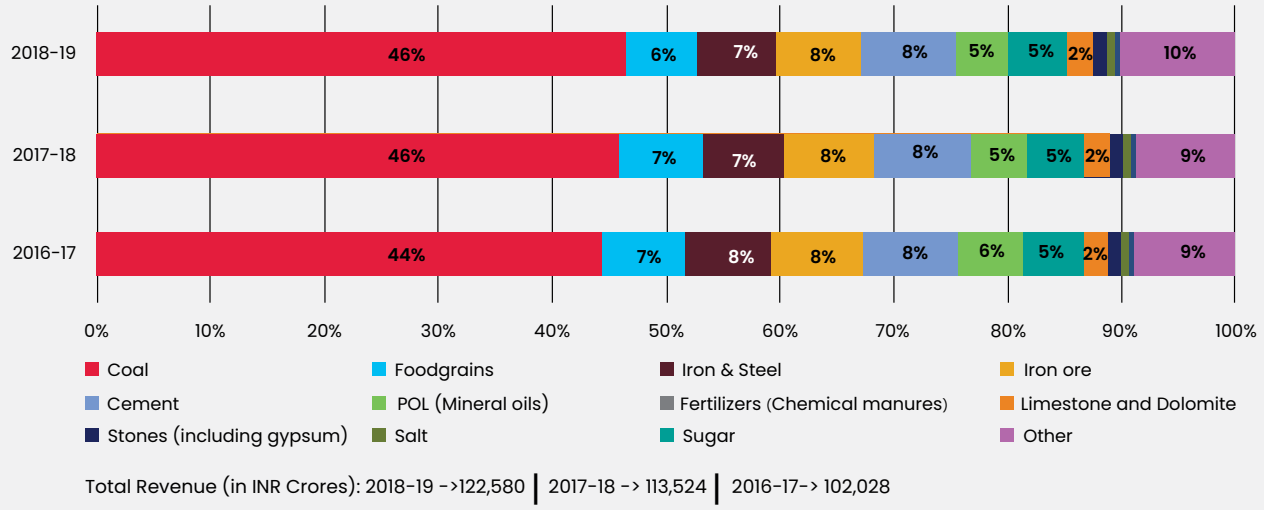


Source: Indian Railways Yearbook

Indian Railway's total revenue is witnessing a decline as the national transporter's revenue has decreased by 20 percent from FY17 to FY19. The below figure shows the commodity-wise freight earning of Indian Railways from FY17 to FY19. Coal has the maximum share in railways revenue, accounting for 46 percent of the total. The other significant commodities include Foodgrains (6%), Iron and steel (7%), Iron ore (8%), and Cement (8%).

36 Indian Railways Re-birth of the Colossus. Edelweiss. 2017

Percentage Share of Commodity wise Freight Earnings by Indian Railways



Source: Indian Railways Yearbook

Indian Railways has focussed on bulk freight transportation, and the freight basket is limited to raw materials for industries such as power, iron, and steel plants. The share of non-bulk commodities in rail freight is around 30 percent of the total which is lower than expected. However, railways have been trying to include more commodities in the freight basket, such as fly ash, steel coils, containers, automobiles, and FMCG.[37] Consistent efforts are required to increase the share of non-bulk commodities that can be attained through various initiatives, such as introducing commodity specific wagons' design and development.

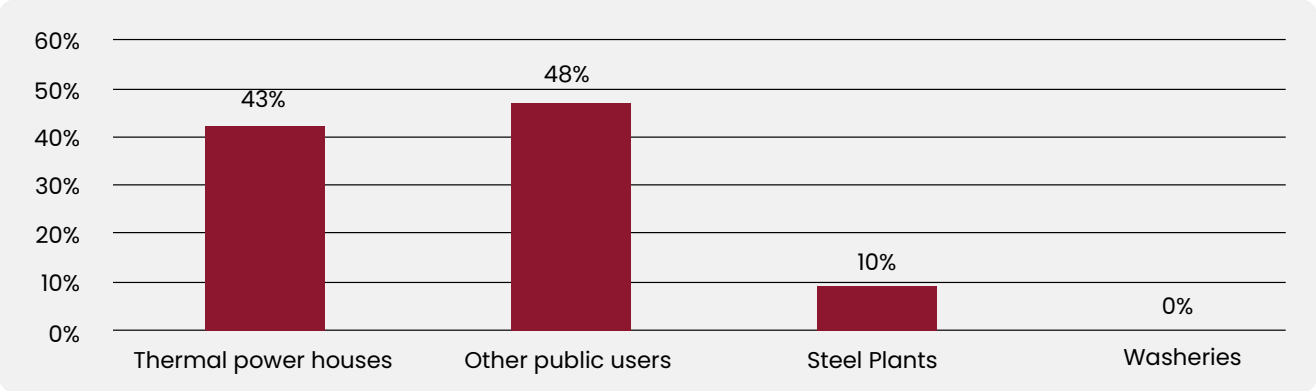
Commodity wise analysis

Coal

Coal reserves in India are majorly concentrated in the country's eastern parts; however, it is supplied across the nation. Due to the skewed production and bulk transportation requirement, the railway is a preferred mode for coal movement. Coal and railways in India are heavily interdependent. In FY19, 605 million tonnes of coal was transported through railways. Coal accounts for 50 percent of the total freight and has a 46 percent share in railways revenue. Coal is mainly transported to thermal powerhouses, steel plants, washeries, and other public users. In FY19, 43 percent of the coal was supplied to thermal powerhouses, 10 percent to steel plants, and 48 percent to other public users.

37 Indian Railways Sees 'Alarming' Shortfall in Expected Freight Traffic Revenue. The Wire. 2019. https://thewire.in/government/indian-railways-freight-revenue-shortfall

Coal : Tonnes Carried by Indian Railways for different Segments, 2018-19

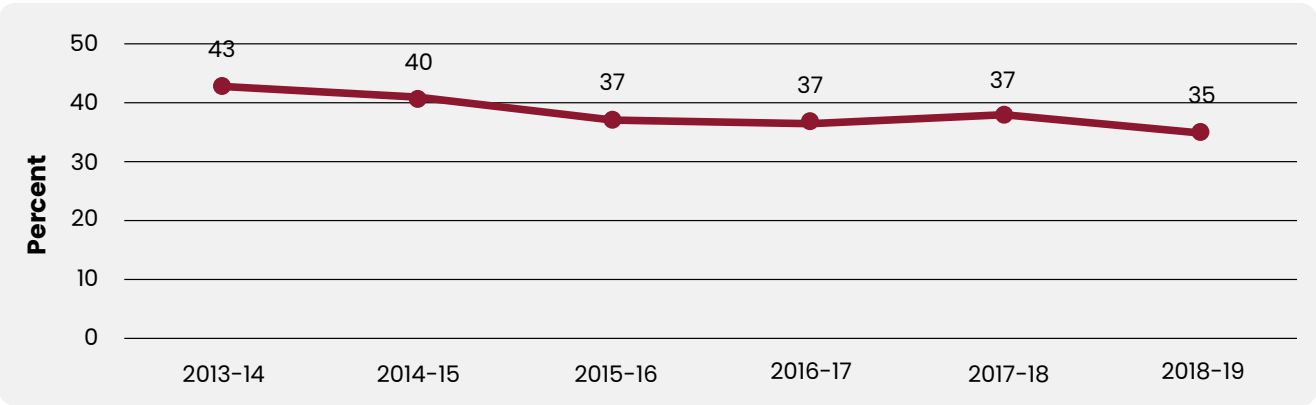


Source: Indian Railways Yearbook

Cement

In the cement industry, transportation is required for the final product cement, intermediate product clinker, and raw materials such as coal, gypsum, fly ash, and slag. Freight and logistics costs account for 20-25% of the total cost for cement companies.[38] The cement rail coefficient declined from 43 percent in 2013-14 to 35 percent in 2018-19 mainly because of higher rail freight and an increase in cement's intra-regional movement. Indian Railways have taken many initiatives to improve the share of cement freight. Many schemes and policies have been introduced, such as the LTTC (Long Term Tariff Contract), high capacity wagons, etc. However, the industry is constrained by several challenges that restrict cement companies to use rail extensively for their transportation needs.

Percentage of Cement Carried by Indian Railways of Total Production and Imports



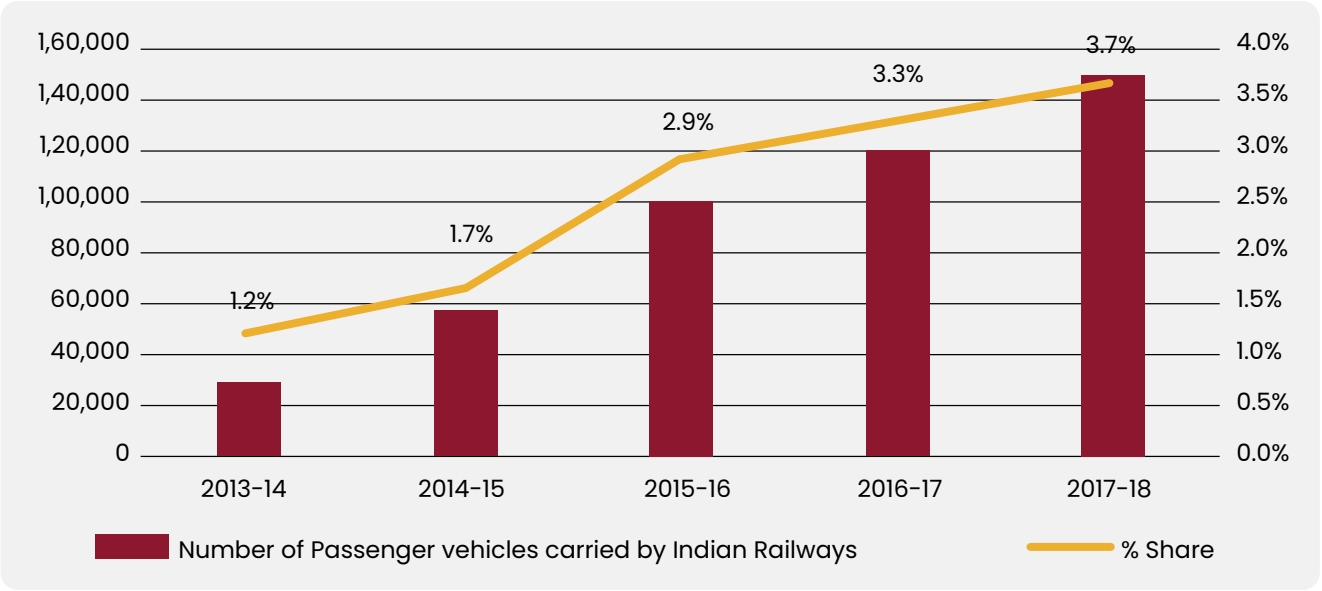
Source: Indian Railways Yearbook

38 A long haul for railways to win back cement freight. LiveMint. 2017. https://www.livemint.com/Money/VLSashnKfvMR7pMlaEd9RM/A-long-haul-for-railways-to-win-back-cement-freight.html

Automobile

India's automobile industry is the fourth largest globally, with domestic production of 26.3 million and sales of 21.5 million vehicles in FY20. Two-wheelers and passenger vehicles account for the highest share of domestic output and sales. The Auto freight movement involves long-distance movements (>1000km) from the plant to the dealers' location. Indian Railway's share is currently less than 5 percent of the total automobile movement across the country. The rail coefficient in auto traffic is 70% in the US, 35% in Europe, while it is only 3.1% in India. As the industry is expected to grow in the coming year, there is immense scope to capture the automobile traffic via rail. Various studies have indicated that Indian Railways can increase its share of auto traffic to 20% with proper reforms and infrastructural changes.[39] Indian Railways initiated several measures to capture automobile traffic. One of the key initiatives is the launch of the AFTO policy in 2010.

Share of Passenger Vehicles Carried by Indian Railways of the Total Passenger Vehicle Production



Source: Increasing Rail Share in Freight Transport in India, The Energy and Resources Institute

Foodgrains

India is the second-largest producer of foodgrains globally. Of the total foodgrains production, around 40-50% of the total market surplus of rice and wheat is procured by the Government, dominating as a buyer in the market. For a few states, such as Punjab and Haryana, 80-90% of the produce is purchased by the government. Such large procurements have made the government largest buyer

39 Indian Railways Re-birth of the Colossus, Edelweiss. 2017. https://www.edelresearch.com/showreportpdf-35319/RAILWAYS_-_SECTOR_REPORT-JAN-17-EDEL

of rice and wheat in the domestic market. As per Indian Railways Yearbook, the revenue generated for railways through foodgrains during (2018-19) is INR 7,615.98 crore, whereas the same for 2017-18 year was INR 8,402.81 crores resulting in 9.4% decrease of revenue. The share of Indian railways freight movement for foodgrains has been witnessing a decline in the past few years. To increase the share of foodgrain transportation, various initiatives such as traffic rationalisation, new policy guidelines for stations to stations rates have been taken by the Railways.

Containers

India has been witnessing high growth in non-bulk traffic movement. There is a significant demand for transportation of the non-bulk goods as the production centres are usually at farther distance from the consumption centres. Because of the convenience of moving the non-bulk commodities in containers, the containerized traffic has increased significantly in the last decade. The growth in container traffic handling at the Indian Gateway ports has grown from 7.58 million TEUs in 2008 to 14.6 million TEUs in 2018.[40] With rising trade, the growth in domestic container traffic is also immense.

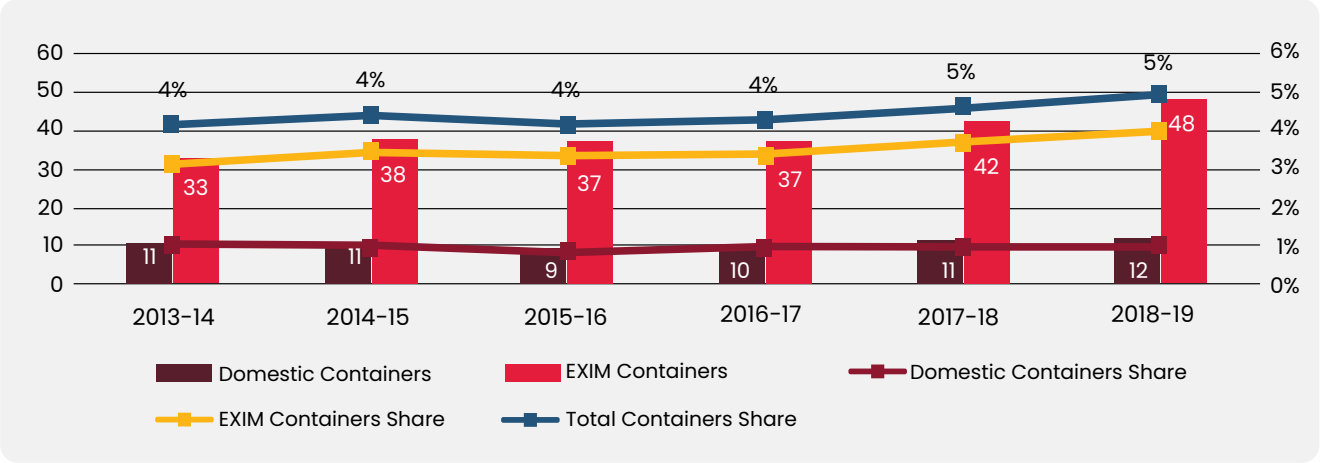
In 2006, Indian railways allowed private container operators to enter the rail-based container traffic movement. It was the first significant step by the national transporter to allow private freight operators in the railway operations to increase the rail share of containerized and non-bulk traffic. However, an increase in container traffic was witnessed only in the initial years, which stagnated afterward.[41] Transportation of non-bulk commodities such as FMCG, pharmaceuticals, parcels, and fruits and vegetables requires a well-established rail infrastructure. There are currently 18 private container train operator (CTO) and CONCOR operating the container service in India.[42] Container Corporation of India (CONCOR) is a government subsidiary under the Ministry of Railways. Other significant players in this sector are Gateway rail freight, Pristine logistics, and Adani Logistics. The share of container transport in India is mainly towards roads due to various challenges faced in movement by railways such as high transportation cost, lack of adequate intermodal facilities, wagon and container lessors, timetables rail services, and last-mile connectivity. As a result, India's container traffic is only 4 percent of the total rail freight volume. This share has been stagnant over the last few years ranging between 4-5 percent.

40 Container Corporation of India Ltd. https://www.concorindia.com/futureplan.asp

41 Container Corporation of India Ltd: Domestic facilities & service. https://concorindia.co.in/ddivision.asp

42 Ministry of railways has decided to give 25 % discount in haulage rate on transport of empty containers and empty flat wagons. Press Information Bureau. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1555966

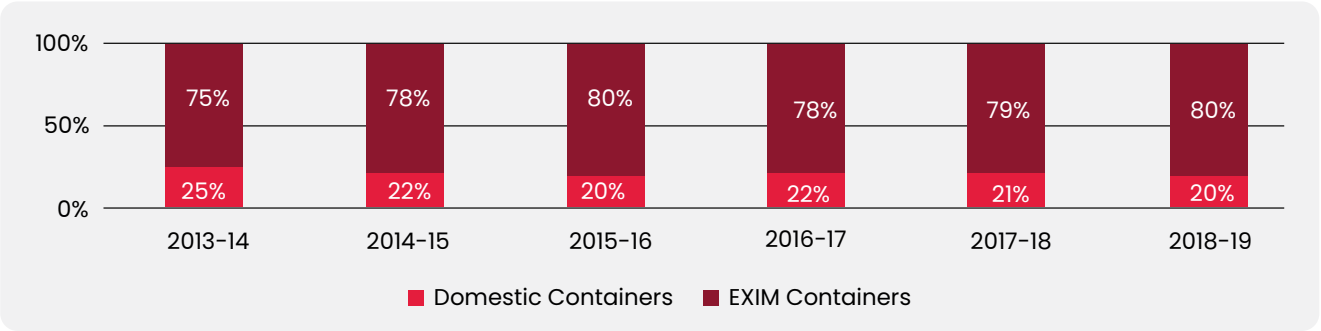
Containers Carried by Indian Railways (Million Tonnes)



Source: Indian Railways Yearbook

The majority of the container movement by Indian Railways is formed by the export-import (EXIM) sector, while the transportation in the domestic segment is dominated by the roadways. EXIM containers account for 4%, and domestic containers for only 1% of the total railway traffic. Domestic traffic is much lower than the global majors such as the US where the share of domestic containers is around 10 percent. Within the total container segment, in 2018-19, EXIM sector contributed 80 percent, and domestic sector constituted only 20 percent of the total container traffic of the Indian Railways.

Share of Domestic and EXIM Containers in Total Containers Carried by Indian Railways



Source: Indian Railways Yearbook

Indian Railways has taken many initiatives to increase container traffic volume. Some of them include a discount at 25% on actual haulage rate per Twenty Feet Equivalent Unit (TEU) on the transport of empty containers and empty flat container wagons to facilitate the movement of containers by rail towards ports, thereby leading to higher loading by rail from ports.[43] The double-stack dwarf containers introduced by Indian Railways

43 Ministry of railways has decided to give 25 % discount in haulage rate on transport of empty containers and empty flat wagons. Press Information Bureau. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1555966

are smaller in size and can allow better capacity utilization on the electrified routes. A dwarf container is 6 feet 4 inches in height, capable of holding a capacity of 30,500 kgs, and would enable double-stack movement of cargo. The use of dwarf containers will lower logistics costs and will make railways competitive to the road. The Indian Railways has also announced a five percent freight rate discount for all container train operators to attract more rail mode containers. The discounts started from August 4, 2020, will be valid till April 30, 2021.

However, there are many challenges faced by private train container operators, which have caused low domestic container movement in India. Some of the challenges include, lack of appropriate infrastructure – as the majority of the domestic container terminals have small-scale operations, which makes the terminal services expensive for the consignors. Lack of assured transit time has been hampering container movement in India, particularly in the tier two sectors. Suboptimal service by Indian Railways to the CTOs, as Indian Railways doesn't guarantee a timely supply of locomotive power, resulting in delays in container trains' movement. As the preference for locomotive power supply is given to the CONCOR trains, for others, the containers remain stuck at Container Freight Stations or Inland Container Depot (ICDs). Thus, making it difficult for the private CTOs to consolidate the wagon load quantities and deliver the goods on time. This problem has two sides – firstly, CTOs other than CONCOR, struggle to attract traffic in the absence of assurance of timely delivery of goods. Secondly, the Indian Railway's ecosystem doesn't allow private CTOs to increase business. Due to these issues, the positive impact of privatisation in the container segment is not visible in the national transporter's efficiency. Other factors include - lack of end-to-end modal services and high haulage charges for container trains. Lack of availability of 40 feet trailer to conduct last-mile operations. Considerable investments in wagons and containers by the container operators in the absence of a widespread wagon leasing system.

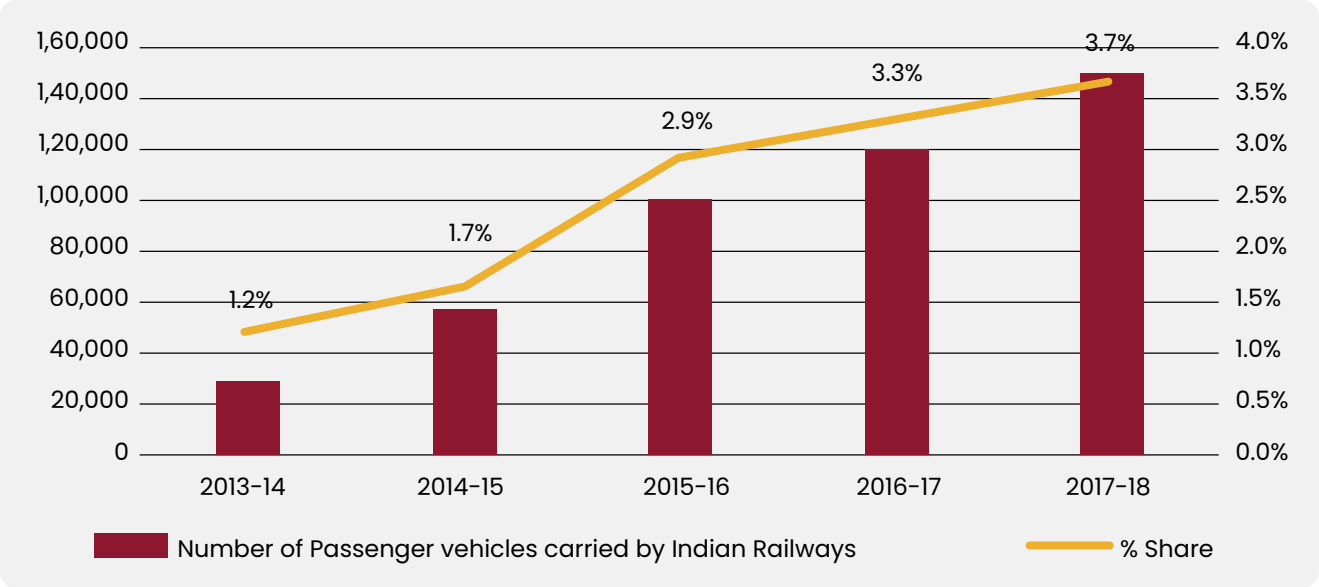
5.2 Case Study: Automobile

The automobile sector of India holds significant importance in the economic growth of the country. The industry contributes around 7 percent to the GDP of India. Between FY16 to FY20, the domestic automobile production increased at a growth rate of 2.36 percent, with 21.5 million vehicles manufactured in FY20.[44] The sector is dominated by two-wheelers and passenger vehicles, accounting for 81 percent and 13 percent of the total vehicle sales—followed by commercial vehicles and three-wheelers, constituting 3 percent each in the domestic market share. In FY20, automobile sales declined by 22 percent compared to FY19. However, in recent months a significant increase has been witnessed in automobile sales by some primary industry players.

44 Indian Automobile Industry Report. IBEF. 2020. https://www.ibef.org/industry/india-automobiles.aspx

India's automobile production is concentrated in a few regions of the North, West, and South. However, the vehicles are sold across the country through dealers[45] at various locations. Hence, there is a requirement for the extensive movement of vehicles from the manufacturing plant to the dealers' location. The average distance between the origin and destination locations for the door-to-door transportation of automobiles is often greater than 1,000 km, making these movements ideal for efficient bulk transport modes such as the railways. Despite this, less than 5 percent of the total vehicles are transported by the railways, and the majority via road. In the last few years, the Indian Railways has introduced many changes to improve auto freight volume carried by trains. An improvement in the share of rail in the country's auto freight traffic has also been seen, particularly in the passenger vehicle segment. The percentage of passenger vehicles carried by railways increased from 1.2% in FY14 to 3.7% in FY18. The target is to increase this share to 30% by FY24. Many policy changes have been introduced, and special rakes have been inducted in the recent past through suggestions from various industry stakeholders.

Share of Passenger Vehicles Carried by Indian Railways of the Total Passenger Vehicle Production in India



Source: Increasing Rail Share in Freight Transport in India, The Energy and Resources Institute

The above chart depicts that the passenger vehicle segment's rail share has steadily increased over the years because of various initiatives taken by Indian railways in the last few years (listed below in detail). However, the growth rate has been lower than expected (with an average increase of less than one percent every year) as the industry faces several challenges to use rail for transportation of vehicles (listed below in detail).

45 Dealers are independent franchises and have direct relations with the OEMs

Initiatives by Indian Railways, 2013-2018

1. **Modification of the AFTO scheme:** One of the key initiatives taken by Indian Railways is implementing the Auto Freight Traffic Operator (AFTO) scheme[46], initially introduced in 2010 to enable private players to invest in wagons (BCACBM) and exclusively operate them as per their requirement. The AFTO policy was amended in 2013, followed by further modifications in 2017-18, to encourage auto companies to join the scheme. Initially, there were only two licensees – Maruti[47] and APL Vascor[48]. The scheme gained some traction after certain amendments in the policy by Indian Railways, such as the reduction in license fees from INR 5 crore to INR 3 crores, decrease in minimum rake requirement from 3 rakes to 1 rake (see detailed table below). As of now, there are a total of 6 licensees of this policy.

There are mainly two types of rakes used for the transportation of automobiles - BCACBM and NMG. The AFTO licensees own the BCACBM rakes. A BCACBM rake is a double-deck rake with a composition of 27 wagons and has an accommodating capacity of ~318 small cars. The Indian Railways has inducted a total of 26 BCACBM rakes under the AFTO scheme to date. On the other hand, the NMG (New Modified Goods) are modified passenger coaches with a single deck rake that can accommodate up to ~125 small cars in 25 wagons.

S.No	Original Clause	Modified Clause
1.	The applicant had to deposit a License fee of INR 5 crores to get a license for 20 years	The applicant has to deposit a License fee of INR 3 crores to get a license for 20 years
2.	Minimum of 3 rakes had to be procured by the applicant	Minimum of 1 rake has to be procured by the applicant
3.	The applicant had to procure full rake composition, including the brake van, as notified by Indian Railways with 4% additional wagons as spares	The requirement for procurement of maintenance spare wagon has been reduced from the existing 4% per rake to 4% of the total cumulative holding of the AFTO

46 Automobile Freight Train Operator (AFTO) refers to the parties who invest in procurement of rakes and arrange traffic for loading and unloading in the Auto Freight Trains, owned by the company after obtaining permission from the Ministry of Railways under this policy.

47 Maruti was the first licensee of the AFTO policy and it contributed significantly in the wagon/rake design, terminal design

48 First third-party logistics provider in India to offer rail-based services under an AFTO licence

4.	Auto Ancillaries and Auto Spare Parts were included in reverse direction only	As per the policy, the transportation of Automobile and Auto Spares by AFTOs was permitted only in one direction. This restriction has now been lifted. AFTOs will be able to utilize their rakes for loading in different directions and will be able to optimize the utilization of their rakes
5.	If the immediate preceding trip has been charged at loaded rates for all wagons, the next trip was charged at loaded rates for loaded wagons and empty rates for empty wagons. This provision was permitted only for one leg of the circuit of a rake	Full load charging (even if one wagon is loaded) and next trip charging on actual loading basis, which was earlier available for only one leg of the circuit of a rake has now been extended to all alternate legs of the circuit of a rake

Source: Direct Interaction with SIAM

2. **Multipoint unloading:** The Railway Board has also approved multipoint unloading for automobile traffic, allowing automobile traffic to be loaded in NMG, BCCNR, BCACM, or any other similar type of wagon (other than BCACBM) to unload at multiple points with a maximum distance of 500 km between two continues destination (unloading) points.[49]

3. **Auto-Hubs:** Development of Auto Hubs for automobile manufacturers to carry the traffic by rail in bulk and allow secondary distribution to dealers in the nearby catchment areas. Auto-hubs also provides an opportunity to aggregate automobiles to be able to offer a full rake load.[50] For example, auto-hub at Walajabad (Southern Railway) and Farukhnagar (Northern Railway). Works are underway for the up-gradation of facilities at these auto hubs.[51]

4. **Online Portal:** Introduction of single window portal by Indian Railways for customers to informs about any queries/grievances and place requests for issues like design modification, maintenance issues, and any other suggestions. Indian Railways has also been organizing workshops and discussions with the Auto companies and RDSO on the optimum utilisation of rakes and its design.

49 Indian Railway. 2020. http://indianrailways.gov.in/railwayboard/uploads/directorate/traffic_comm/Freight_Rate_2020/RatesCircular%20No_%2019%20of%202020.pdf

50 Automobile hub in Indian railways – Indian railway news. Indian Railway News. https://indianrlynews.wordpress.com/tag/automobile-hub-in-indian-railways/

51 Railways emerges as the preferred carrier of automobile in the country. Press Information Bureau. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1530554

Challenges faced by the Auto Industry

Despite a rise in automobile transportation by rail in the last few years, the share of railways in automobile movement is significantly low. In the passenger vehicle segment, most transportation occurs via roads using trucks and trailers (around 95 percent). The rail penetration in auto freight is low in India compared to other countries. For example, automobile freight traffic is 40 percent in Europe and more than 70 percent in the United States.[52]

The automobile industry manufactures a high-value product, as a result of which the industry is sensitive to the transit costs, which often determine the final margin of their profits. The majority of automobiles' transportation occurs via road because of the ease of transportation, minimum intervention in handling, and assured transit time. Once the vehicles are loaded on trucks or trails, it is easy to transport them to the final destination.

Vehicle movement by rail has certain limitations in the country. One of the major challenges for auto companies is multiple handling of vehicles. There are other challenges such as the design of rakes as they cannot accommodate double stacking of Sports Utility Vehicles (SUVs). The first mile includes moving the cars by trucks to the nearest railway station, which takes around two to three days. It involves various costs such as the cost of trucks, drivers, fuel, and parking. A similar cost is incurred for the last mile, and vehicles have to be unloaded quickly and moved to a safe location. The loading and unloading of vehicles is also a challenging process as companies get only 8 hours to load/unload the vehicles on rakes; otherwise, a penalty in the form of stabling charges is levied. Loading/unloading within the specified time is difficult during the peak season, while in the lean season, 30 percent of the rakes remain underutilized. Transportation via rail for short distances is costly to companies and time-consuming.[53]

However, in 2020, auto traffic movement by rail has witnessed a significant jump as compared to the previous year. Before that, an average share of 10 percent of the monthly volumes of auto companies was dispatched by trains. This share increased to 13 percent of the total monthly volumes in August 2020. In August 2020, 243 automobile rakes were loaded as compared to 127 last year for the same period. In the absence of passenger trains, railways' transit time has improved by 40-50 percent (enabling timely delivery of cars to the customers), and the speed has also doubled from 23 kmph to 46 kmph. Railways have attracted more automobile traffic due to the reduced congestion on tracks and increased speed of trains, and also the limited availability of truck drivers, and the disruptions faced by truckers on the road network due to several restrictions during the pandemic. The table below lists in detail the industry players' challenges and recommendations based on suggestions made by the stakeholders.

52 A rake's progress in India: How one 3PL is growing rail services for finished vehicles. Automotive logistics. 2019. https://www.automotivelogistics.media/policy-and-regulation/a-rakes-progress-in-india-how-one-3pl-is-growing-rail-services-for-finished-vehicles/39053.article

53 Direct Interactions with Industry Players

Challenges and Recommendations to Increase Share of Rail in Domestic Automobile Movement

	Challenge	Recommendation	Actionable
Infrastructure			
Design of rakes	• In passenger vehicle segment design of BCACBM rakes doesn't allow the loading of SUVs in both decks. • In the two-wheeler segment, side loading of vehicles in BCACBM rakes is not possible. Two-wheelers have to be driven from one end to the other. • A BCACBM rake can carry about 3000 two-wheelers	• Demand for Sports Utility Vehicles (SUVs) is growing, and its share is expected to increase. Railways can tap this traffic by upgrading wagon height to taller wagons to allow double stacking of SUVs. • The two-wheeler segment constitutes 80 percent of the automobile industry. More than 90 percent of the two-wheeler movement is by road. There is huge potential in this segment to shift the freight traffic to rail. Some of the suggestion by industry players include: Allow sideloading of two-wheelers in the BCACBM rakes for faster loading/ unloading	Medium to Long Term
Multiple Handling and First Mile	• The first mile by railways involves multiple handling, cost, and time. It takes 2-3 days from aggregating demand to moving cars in trucks to the nearest railway station	• Sidings in automobile plants will avoid multiple handling and first-mile problem. Efforts are needed to identify specific locations of automobile plants where railway sidings could be put in place, and having sidings inside automobile plants will avoid both multiple handling and first mile issues. • The industry has suggested the option to transport trailers, loaded with vehicles, through Railways. RDSO could jointly work with Commercial Vehicle Manufacturers to check if it is feasible to develop trailers, which can be coupled to the Tractor and the Railways for interchanging from road to rail and vice-versa.	Medium to Long Term

Terminal Infrastructure and Auto Hubs	• Lack of basic terminal infrastructure and security at Auto-Hubs. The slow process of getting approvals for upgrading Private Freight Terminals	• Upgradation of terminal and siding infrastructure and Auto Hubs with loading/unloading infrastructure like movable ramps, trailers, all-time electricity, uniform flooring of approach roads, service facilities for the safety of vehicles, and dust-free parking space. All of this can be attained Public Private Partnership	Short to Medium Term
Rake unavailability and lack of maintenance	• Rake unavailability, poor maintenance, and low quality of rakes discourage the customers to use rail	• Ensure good quality rake provision to the auto companies. Frequent quality checks to ensure the safety of vehicles during transit via rail	Short to Medium Term
Operational			
Lack of Assurance in Transit Times	• Lack of Assurance in Transit Time makes it difficult for OEMs/ logistic companies to ensure timely delivery of vehicles to dealers/ consumers	• Preparing realistic timetables and adherence to the schedules is essential to sustain the confidence. Improvement in Assured Transit Time during the Covid-19 pandemic has strengthened the confidence of Auto companies in Railways	Short to Medium Term
Freight Rationalisation	• Rail is not economically viable and competitive to the road for shorter distances	• To make railways competitive to the road for distances less than 1,000 km - railways should consider reducing freight rates of NMG and BCACBM rakes	Short to Medium Term
Demand Aggregation and Stabling charges	• Cumulating bulk demand for the BCACBM rakes is challenging for companies. A penalty in the form of stabling charges is levied if loading/unloading exceeds 8 hours' time limit	• Indian railways should consider increasing the loading/unloading time limit at the stations from 8 hours. The time limit should be based on the total number of cars at the station or should vary from lean demand and peak demand period	Short to Medium Term
Response to requests and queries	• Delayed response to the requests, complaints, and queries of Auto companies	• Fast and quick response to customers' requests on use of terminals, land lease, etc. Companies appreciate railways initiative to launch online portal and a single window concept for this purpose	Short Term

Policy Related			
AFTO policy	• The uptake of AFTO policy is slower than expected. Several factors like the insufficient number of rakes, high lead time of indent placement to rake availability discourage OEMs and 3PL to use rail. • Multi point unloading is permitted for rakes NMG, BCCNR, and BCACM	• The AFTO policy has been appreciated by industry players. However, the suboptimal infrastructure and challenges by rail have resulted in low uptake of the policy. The fees for the AFTO policy can be revised further, as in addition to the fees (INR 3 crores), the companies have to invest in the rakes (INR 15 crores). A further revision in the AFTO fees by Indian Railways will help in attracting more companies to join the scheme. • Allow multi-point unloading of BCACBM rakes	Short to Medium Term
Slow approval process	• The design approval process by RDSO takes 1-3 years, depending upon the complexity of design and RDSO's capacity	• The rolling stock design and approval process should be simplified, and the process to get approvals for designs and implementation of wagons should also be relaxed by the RDSO	Medium Term
Exports	• Infrastructure development for exports to neighboring countries	• Development of infrastructures such as more loading terminals across the country facilitating auto exports via rail to neighboring countries such as Nepal, Bangladesh, and Sri Lanka. For example, Railways loaded 87 Mahindra Bolero pick-up vans from Navi Mumbai in Maharashtra and transported to Benapole in Bangladesh in October 2020.[54]	Medium Term

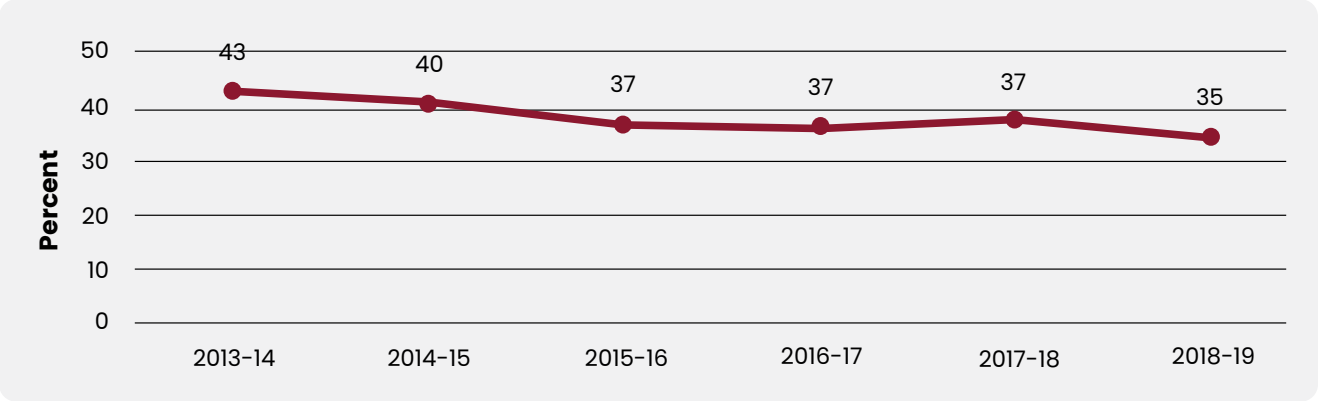
Source: Direct Interaction with stakeholders

54 Mahindra exports Bolero pickups to Bangladesh on Indian Railways network. 2020. https://www.autocarpro.in/news-national/mahindra-exports-bolero-pickups-to-bangladesh-on-indian-railways-network-77558

5.3 Case Study: Cement

Cement has been an essential commodity for rail freight in India. It is the second-largest revenue source for the Indian Railways and contributed around INR 10,166 Cr of freight revenue in 2018-19 (~10% of the Indian Railways freight earnings). However, rail, which is considered the most economical mode of transport for cement and clinker, has been shifting to the road. It is a transport intensive industry because of the need to move raw material and finished goods to the destination. Hence, the logistics cost forms a significant component of the total cost, about 20-25 percent of the cement delivery value chain.[55] The modal share for cement by rail has been declining for the last several years from 52 percent in 1999 to 32 percent in 2011-12 to about 23 percent in 2018-19.[56] The cement rail coefficient has also declined from 43 percent in 2013-14 to 35 percent in 2018-19. A decline in rail share is caused mainly because of higher rail freight and an increase in the intra-regional movement or short-distance movement of cement. In the presence of a large number of cement suppliers, high regional price variation, the cement manufacturers find it profitable to transport cement to adjoining regions instead of long distances.[57] Cement movement for lower distances (less than 250-300 km) is more economical by road than rail, which has additional costs of multiple handling and last mile. Cement manufacturers find rail cost-efficient for higher distances greater than 700km. Rail being the primary medium for cement movement for decades, has been dominated by road over the past few years.

Percentage of Cement Carried by Indian Railways of Total Production and Imports



Source: Indian Railways Yearbook

Contemporary cement is commonly referred to as Portland cement, which is produced in various forms. It can be distinguished by attributes such as main raw materials and their composition. The main constituents or raw materials such as clinker, limestone, gypsum, silica fume, and fly ash etc. are used to manufacture

55 Logistics. Cement Manufacturers Association. https://www.cmaindia.org/key-areas/logistics/

56 Logistics. Cement Manufacturers Association. https://www.cmaindia.org/key-areas/logistics/

57 Cement transportation by railways falls 11.8%. Live mint. 2012.https://www.livemint.com/Home-Page/RtDcTygseYUWwpaC4zxpML/Cement-transportation-by-railways-falls-118.html

cement in different proportions depending on the form of cement. Cement manufacturing occurs in two stages. In the first stage, clinker is produced in a furnace by heating raw materials (mainly limestone) and small amounts of other materials. A resulting chemical reaction yields a molten substance, which forms clinker after the substance is rapidly cooled. In the second stage, clinker is grounded with gypsum and other materials which yields cement in the form of a grey powder. The manufacturing of cement occurs on cement lines at production plants. These plants are mostly situated near quarries with deposits of limestone and other raw materials consumed during the production of cement. Cement manufacturing is one of the most capital intensive industries as it involves high capital costs to construct a cement plant.

The Indian cement industry ranks 2nd largest in the world in terms of production. In 2018, 502 million tonnes of cement was produced in the country, which is around 8 percent of the global installed capacity. The industry comprises mostly of regional players with an increasing local presence. For instance, southern and western regions have the highest production (70 percent of India's production) and highest demand (60 percent of India's demand). In the southern region, Andhra Pradesh has the highest installed capacity, which is around 49 percent of the region's total installed capacity. Madhya Pradesh, Gujarat, and Rajasthan have the highest installed capacity in Central, Western and Northern regions. At the same time, Chhattisgarh leads the Eastern region with 35.5 percent of total installed capacity in the region.[58] Of the total capacity, 98 percent lies with the private sector and the rest with public sector. There are around 100 cement companies in India, 210 large cement plants, 350 mini cement plants. However, the top 20 companies account for more than 70 percent of the country's cement production.[59] The majority of the large cement plants are located in Andhra Pradesh, Rajasthan, and Tamil Nadu.

On the other hand, many small and mid-size cement companies are increasing across regions to cater to the rising demand of cement. The cement industry is growing at a rate of 6-7 percent per annum. With increased spending on infrastructure and housing, development of smart cities, investment in railways and roadways – the cement industry is expected to grow further in the coming years.

However, there are various challenges involved in the movement of cement in the country, which forms a significant share of the total cost of cement. The movement of cement involves inward and outward movement. Inward movement is the transportation of raw materials (coal, gypsum etc.) to cement plants. Outward movement is the transportation of cement and clinker from manufacturing plants to

58 Indian cement industry analysis. Business Opportunities in India: Investment Ideas, Industry Research, Reports IBEF. 2014. https://www.ibef.org/download/Cement-August-2014.pdf

59 Indian cement industry analysis. IBEF. 2021. https://www.ibef.org/industry/cement-presentation#:~:text=A%20total%20of%20210%20large,%2C%20Rajasthan%2C%20and%20Tamil%20Nadu.

the final destinations. The requirement to transport raw material and finished goods to the destination make cement a freight intensive industry. Since a large portion of the cement demand is regional (within 300 km) it is cost-effective for the companies to use the road for the movement of goods. However, the modal choice depends on various other factors. The long lead transportation cost per ton of cement is less via rail than road; however, the last-mile cost in rail leads to a significant increase in the overall transportation cost.

Mode	Cost	Quantity	Efficiency
Road	INR 3 to 4 per ton per km	30 to 40 tonnes per truck	Low efficiency
Rail	INR 1.5 per ton per km (plus last-mile cost)	2,000 to 3,000 tonnes per rake	Very high efficiency

Source: Direct Interaction with logistics department of a leading player from the industry

There are various issues faced by cement companies in rail transportation that increase the cost, such as sourcing of raw materials from plants, first and last-mile cost, multiple handling, warehouse cost, losses due to damage of bags, railway charges such as wharfage and demurrage, etc. However, Indian Railways has taken many initiatives to improve the share of cement freight volume. Many schemes and policies have been introduced by Indian Railways, such as the LTTC (Long Term Tariff Contract)[60] under which cement companies provide a minimum guaranteed freight traffic – incentives of LTTC include the provision of a minimum guaranteed volume-linked discount based on incremental growth in traffic.[61] Additionally, other schemes such as own your wagon, freight incentive scheme for loading bagged consignments in open and flat wagons, upgrading wagon design from BOX/ BOXN type of wagons to BCN, introduction of wagon design from BCN rakes (~2300 tonnes of capacity) to higher capacity rakes BCNHL (~4000 tonnes of capacity), etc. which have increased efficiency to a certain level. Allowing cement transportation in mini rakes, which carries half of the load (20 BCN wagons, ~1100 tons) as compared to full rake (40 BCN wagons ~2200 tons) and two-point rakes that can be loaded and unloaded at two-points, usually a half-rake at a time, at pre-approved combinations of loading and unloading points.[62]

After the onset of Covid-19 pandemic, Railway Board has extended significant efforts to introduce positive changes to

60 Eligibility criteria for LTTC contract – 1 million tons p.a. of traffic via IR for existing customers and for new customers 3 million tons of guaranteed traffic over the duration of the contract (3-5 years) and at least 1 million tons of traffic in the first year; However, Ministry of Railways scrapped the LTTC policy in 2020. https://www.thehindubusinessline.com/economy/logistics/ministry-of-railways-ends-long-term-traffic-contract/article33387422.ece

61 https://www.livemint.com/Money/VLSashnKfvMR7pMlaEd9RM/A-long-haul-for-railways-to-win-back-cement-freight.html

62 https://www.irfca.org/faq/faq-freight.html

increase freight traffic and has been very supportive of cement companies' freight movement. This has led to an increase in rail share of cement from 21 percent in 2019 to 23 percent in 2020.[63] However, there are several challenges faced by the cement companies that need attention in the short run to improve cement freight traffic by Indian Railways. For example, due to the poor condition of roads near rail sidings, higher capacity trucks cannot be used. More number of smaller trucks are used for transportation. For instance, cement transportation that could be completed by 100 high capacity trucks takes 200-250 small trucks to finish the process.

Railways earn maximum revenue through freight operations and optimizing loading operations is one of the important steps in increasing revenue. Railways can increase traffic by improving rail connectivity to the upcoming or new cement plants. Building infrastructure such as warehouses, storage (good sheds), improving connectivity, or building connectivity to the plant siding can increase the potential rail share freight of cement. Similarly, smooth unloading is necessary so that wagon becomes available for the next loading. Reducing the time taken for unloading by addressing the infrastructural issues, using technology, and deliberation with industry players will improve rake availability and transit time. Some of the identified challenges and recommendations are detailed below.

Challenges and Recommendations to Increase Share of Rail in Domestic Cement Movement

Challenges and Initiatives for Cement Movement by Indian Railways

	Challenge	Recommendation	Actionable
Infrastructure			
Design of rakes	Aggregation of demand to load a BCNHL rake of 4,000 tons of capacity is challenging during the lean season. Loading in these rakes using the available mechanization is also difficult as the height of the door is less than the wagon height	Allow mini rakes (with a capacity of ~2000 tons) and two-point rakes for the transit of smaller volumes to better serve the market throughout the year (based on industry demand). To increase rake utilization, allow multiple companies with a common destination to fill the rake load jointly. Loading is efficient if the mechanization is compatible with the wagon design	Short to Medium term

63 2020 figure till Oct 2020. Source - Industry discussions

Terminal Sidings and Good Sheds	Lack of basic infrastructure at terminal sidings and Good Sheds	Investment in basic infrastructure at the terminal sidings and Good Sheds. Electricity and lighting for night time unloading and operate machinery, uniform approach roads to the terminals allowing higher capacity trucks to enter the terminal, availability of labour for night time unloading, clean platforms, and sanitation facility for the labour. Safety and security of storage of goods by installing cameras and deploying staff to look after the goods	Medium to Long term
Rake Unavailability	Rake unavailability especially during peak season, impacts delivery time. The time between rake indent and availability varies from 3-4 days compared to less than one day for the road	Low supply of wagons and uncertainty for cement and clinker movement is one of the reasons causing a shift by industry players from rail to road. Improving rake availability based on industry demand, conducting industry dialogue during wagon planning stage, preparing a futuristic plan for transparent allocation of rakes (considering peak and lean season of the industry) will help in increasing cement freight	Short to Medium term
Bulk loading	Lack of bulk cement infrastructure for movement by rail. At present bulk cement is around 5% of the total cement industry	Railways offer various advantages for bulk cement movement - such as reduction in loss of cement, no seepage due to multiple handling or bag bursts. Bulk wagons can carry more cement. Railways can tap into the growing bulk cement market by investing in infrastructure (terminals and Good Sheds) for bulk cement handling	Medium to long term
Operational			
Round the clock unloading	Round the clock unloading is not permitted across all terminals	Allow round the clock unloading to improve wagon turnaround. Ensure staff availability to handle traffic at Good Sheds and terminals	Short term

Demurrage and Wharfage Charges[64]	Delay in unloading leads to penalties in the form of demurrage and wharfage charges	Operational efficiency can be improved by considering a phased reduction of demurrage and wharfage charges, especially when the delay can be attributed to the railway operations	Medium term
Lack of Mechanization and Labour Unions	Loading and Unloading of cement bags is a labour intensive and manual process. Non-mechanized unloading and the presence of labour unions increases cost and operating time for the industry	Mechanization of unloading process and non-unionized labour can improve the efficiency and productivity of labour. Use of carts and forklift trucks to unload the goods will help in faster unloading	Medium to Long term
Detention of Rakes	Detention of rakes at terminals increases transit time and congestion at terminals. Blockage of working capital of cement companies due to uncertainty in rake movement. Operations of companies are affected when the movement of raw materials stops due to rake detention	A regular check on the detention of trains outside signals or at stations adjacent to Goods Terminals, in shunting operations at roadside stations and enroute detentions	Short to Medium term
First and Last Mile Connectivity	Unorganized first and last mile services add up to the time and cost. Handling and last-mile services provided by small and unorganized players often results in inadequate manpower deployment and mechanization for goods handling	• Handling and last-mile problem can be addressed if Railways focuses on establishing a separate transportation unit for handling and the connectivity services. • An increase in cement and clinker production will increase rail freight movement.[65] Connecting cement clinkerization units to the railways will help in addressing the first-mile issue by rail.	Medium to Long term

64 Demurrage charges are levied for the detention of any rolling stock after the expiry of free time, if any, allowed for such detention. Wharfage is the charge levied on goods for not removing them from the railway after the expiry of the free time for such removal.

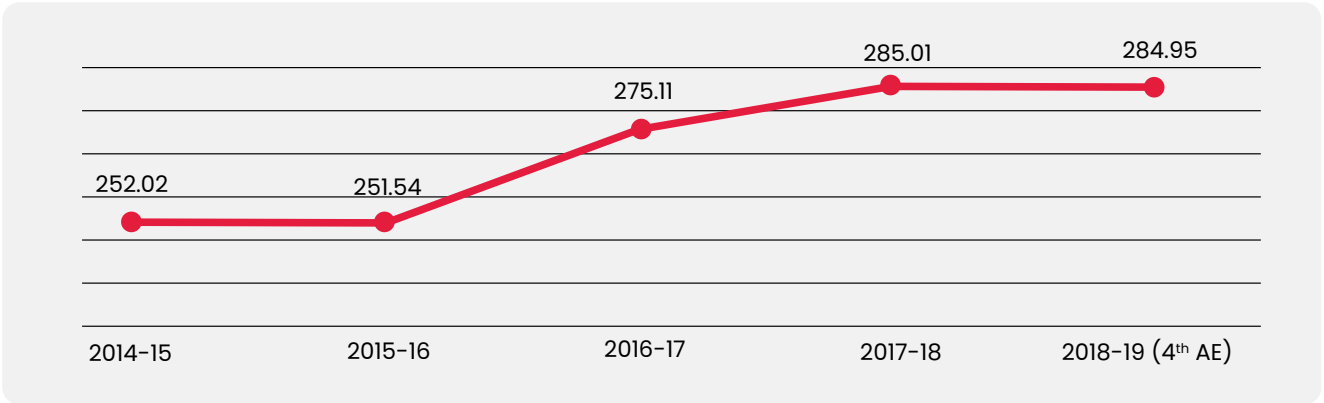
Policy Related			
LTTC Policy	Strict eligibility criteria of 1 million tons of production for the LTTC contract is challenging for small and mid-sized firms	• Reducing the eligibility criteria for LTTC contract will help attract more cement firms (including small and mid-sized). • For example, a reduction in AFTO scheme fees from INR 5 cr to INR 3 cr helped in a small uptake in the number of participants from the Auto sector. The number of participants increased from 2 to 6 after the reduction in fees and other amendments in the policy	Short to Medium term

Source: Direct Interaction with stakeholders

5.4 Case Study: Food grains

In India, agriculture is the primary source of livelihood. The sector provides livelihood to 58 percent of the country's population. The gross value added (GVA) by agriculture, forestry, and fishing was estimated at INR 19.48 lakh crore (USD 237.37 billion) in FY 2019-20. India is the second-largest producer of foodgrains globally. The total production of foodgrains in 2018-19 (4th Advance Estimate) was 284.95 MT[66]. In India, different varieties of grain (especially cereals & pulses) are produced, which are mostly consumed domestically. However, the basmati rice grown in the country has been well-received by the global market. Cereals have gained massive demand from the global market. In the year 2016-17, the export of cereals stood at USD 6074 million[67].

Production of Food Grains (Million Tonnes)



Source: Indian Railways Yearbook

65 B., Saurabh. B., Palash. Gupta, D.B. Factors impacting railway freight traffic in India. 2016. https://www.ncaer.org/publication_details.php?pID=264&pID=264

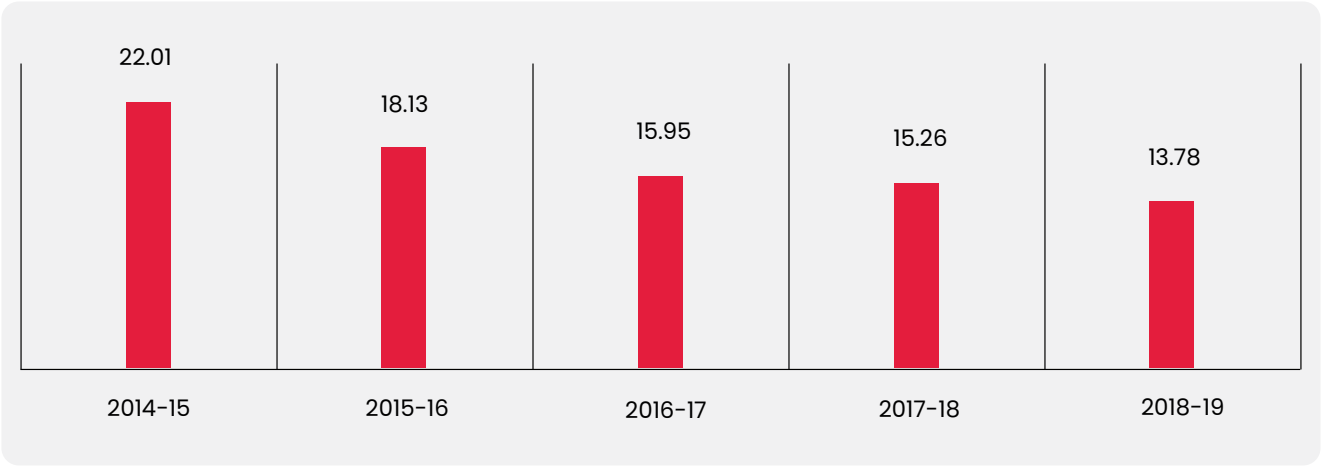
66 Indian Railways Yearbook. Ministry of Railways.

67 Opportunities in the Foodgrain Sector in India. Ministry of Food Processing Industries, Government of India. foodprocessingindia.gov.in

Of the total foodgrains production, around 40-50 percent of the total market surplus of rice and wheat is procured by the Government of India, dominating as a buyer in the market. For a few states, such as Punjab and Haryana, 80-90 percent of the produce is purchased by the government. Such large procurements have made the government largest and dominant buyer of rice and wheat in the domestic market. In terms of quantity, 40-42 million tonnes of foodgrains are transported by the Food Corporation of India (FCI)[68] across the country in a year. The movement operation of foodgrains undertaken by FCI encompasses around 1,906 FCI owned and hired depots/Slios, 557 railheads (owned by Indian Railways), and 98 FCI own sidings.

The majority of the procurement carried by the FCI is transported through railways. As per Indian Railways Yearbook, the revenue generated for railways through foodgrains during 2018-19 was INR 7,615.98 crore, whereas the same for the year 2017-18 was INR 8,402.81 crore, resulting in a 9.4 percent revenue decrease. As per the economic survey 2017-18, the Indian Railways freight movement's share has gone through a declining period. With the decline in freight movement, various initiatives were taken in 2017, including traffic rationalisation and new policy guidelines for stations to stations rates, etc.

Percentage of Total Production Plus Imports in Foodgrain Carried by Indian Railways During Last 5 Years



As per 2018-19 provisional data, 13.78% of the total production plus imports were carried by the Indian railways. The country's foodgrain sector is highly dependent on factors such as seasonal demand for the domestic and international market, in the case of unseasonal change, similar to 2014, which affected grain production, leading to a decline in total estimated output by nearly 5.5 percent. Other factors such as decline in foodgrains (cereals)

68 The Food Corporation of India is an organization created and run by the Government of India. It is a statutory body under the Ministry of Consumer Affairs, Food and Public Distribution, Government of India, formed by the enactment of Food Corporation Act 1964

consumption pattern and substitution by non-cereals have also impacted foodgrain's movement across the country. As per NSSO, the rural and urban demand for cereals has been decreasing steadily, whereas it is increasing for non-cereals rapidly. The decentralised procurement over different states has impacted the foodgrains traffic of Indian Railways, mostly relying on the movement of foodgrains from states of Punjab and Haryana to other states.

According to Doubling Farmers Income Report[69], the market produce is the primary source of income for farmers. The lack of connectivity to ensure that their harvest reaches the market in time results in lowering farmers' ability to monetise their produce. In the case of perishable items, lack of connectivity is even more critical. Such facilities, especially cold storage, exist in areas, but it is to be understood that these storage facilities are confined mostly to certain crop types (perishable produce) and not integrated with other requirements. Around 16 percent of the target set for creating integrated pack-houses, reefer trucks, cold storage, and ripening units have been met. A gap of around 84 percent in achieving the target on improving the state of storage and transportation of the farm produce still exists. In India, the majority of foodgrains are transported through the road network[70]. Higher use of roadways for transportation in the foodgrains sector is mainly due to proper connectivity with major domestic markets, timely delivery of commodities, assurance, and ability to connect to remote areas. In the case of railways, the cost is lower for commodity transportation, but due to lack of proper channels, aggregators, connectivity, and carrier transport, the mode is used less frequently.

Several initiatives have been taken up by the Indian railways to boost freight operations amid challenges due to COVID-19. During this period, the national transporter has achieved record loading of food grains, 80 percent[71] more than last year. Utilizing the COVID-19 period, Indian Railways has substantially increased the speed of freight trains. Introduction of Kisan Rail, an initiative to build a national cold supply chain for perishable goods including meat, milk, and fish. The rail will comprise of refrigerated coaches in express and freight trains. The focus of this initiative is on the transportation of perishable goods at affordable prices. This initiative is based on the public-private partnership model to provide a seamless supply chain of perishable goods. Railways working with FCI moved more than 800[72] rakes carrying over 20 lakh MT foodgrains across the country between March 24, 2020, and April 11, 2020.

69 Report of the Committee for Doubling Farmers' Income, Volume III - Post-production Agri-logistics: maximising gains for farmers. Department of Agriculture, Cooperation and Farmers' Welfare, Ministry of Agriculture & Farmer's Welfare. 2017. http://farmer.gov.in/imagedefault/DFI/DFI%20Volume%203.pdf

70 Report on Doubling Farmers Income

71 COVID-19 impact: Indian railways to earn whopping Rs 30,000-40,000 crore less from passenger trains. The Financial Express. 2020. https://www.financialexpress.com/infrastructure/railways/covid-19-impact-indian-railways-to-earn-whopping-rs-30000-40000-crore-less-from-passenger-trains/2038784/

Challenges relating to the procurement of foodgrains through rail observes infrastructure as key issues, however, issues which are related to other sector apply to foodgrains as well. Change in consumption pattern in both urban and rural areas require diversification of agricultural produce and value addition process. With the growth in per capita income, the consumption pattern has undergone a significant change, which would constrain the conventional pattern of foodgrains movement by Indian Railways carried out earlier.

Challenges and Recommendations to Increase Share of Rail in Domestic Foodgrains Movement

	Challenge	Recommendation	Actionable
Connectivity	Lack of access to reach designated market/mandis, storage and post-harvest management	Indian Railways with public and private partnership should provide support to farmers to reach their nearby markets. Since railways have a higher penetration in rural areas, however, connectivity between farmers and organised mandis/market is an issue. As per the National Farmers Commission, the average distance of the market should be within 5 km. Introduction of mechanism wherein intermodal connectivity can be used for procurement of grains from the rural parts of the country. • Remove information Asymmetry to keep the price in check • Comprehensive agricultural logistic – providing integrated post-harvest management solution with value-added services to fill in the gaps	Short to Medium Term

72 Railways transports 6.75 lakh wagons of commodities across country since March 23: Officials. Mysuru Today – Online News Paper Portal. Mysore news. 2020. https://citytoday.news/railways-transports-6-75-lakh-wagons-of-commodities-across-country-since-march-23-officials/

Infrastructure	Lack of infrastructure such as warehouses and storage facilities	Indian Railways has a vast network and connects rural areas to urban areas. With such connectivity, it is the primary source for transportation of foodgrains from farm-gate to organised markets. Development of an integrated warehouse for storage of foodgrains with proper facilities and amenities at freight terminals is important. • There is an urgent need to build a viable load for carrier or transport. Aggregation centres are required which will serve as a loading and dispatch facility at village and block level. • Dry goods storage system is required for long term holding crops. This can be achieved through modernisation of existing infrastructure and improved inventory management	Medium Term
Operational	Line capacity and, terminal Infrastructure are not developed to meet the growing demand of the sector resulting in delays in transit time and increased wastage	Involvement of private players in an increased movement of Kisan special trains to transport perishable goods for dedicated routes and seasonal commodities • Increase wagon utilization level by inducting commodity specific wagons instead of a common pool of wagons	Short to Medium Term

Source: Direct Interaction with stakeholders

CHAPTER 6

CHALLENGES AND REFORMS

6.1 Challenges in the modal shift to Rail

From 2008 to 2018, the Indian railways witnessed an increase in volume of 35 percent in the passenger segment and 55 percent in the freight segment. However, the investment in rail infrastructure has increased at a much smaller pace than the traffic. Over the years, the focus of Indian railways has been on carrying the bulk-commodities. There has been little effort to accommodate non-bulk goods. It has led to a loss in the uptake of commodities that often move in smaller lot sizes. For long–haul freight routes, the road is approximately 25–30% costlier than railways for distances less than 500 km, much higher than the global standards.[73] Though the truck distance travelled per day is constrained by various challenges, such as poor road infrastructure, single lane access in some areas, lack of efficient traffic management, and tolls and octroi, which increase the cost of freight transportation via roads. Despite these obstacles, the freight movement share is skewed towards roads mainly because of the flexibility of door-to-door service provided by road transportation. The national transporter faces several infrastructural, operational, and connectivity challenges leading to a shift of freight traffic to roads. In addition to the constraints, the substandard railway service poorly affects the customer satisfaction levels, which discourages them from using rail.

Operational Inefficiency	Suboptimal Infrastructure	Lack of Integrated Connectivity (First and Last Mile)
Low Capacity Utilisation of Cargo Wagons in Passenger Trains	Sub-optimal Design of Wagons	Issue of Multiple Handling
Lack of Assured Transit Time	Inadequate Terminal Infrastructure	Additional Cost due to Lack of Intermodal Infrastructure
Multi-point Unloading and Demand Aggregation Issue	Lack of Intermodal infrastructure	First and last-mile Connectivity
Huge Cost Difference Between Movement by Road and Rail	Delays in targeted completion of DFC, a flagship project for freight movement	
Uncertainty in Rake Supply	Overutilization of Line Capacity	
Slow Response Mechanism	Small Share of Non-Bulk Commodities	

73 Indian Railways Re-birth of the Colossus. Edelweiss. 2017

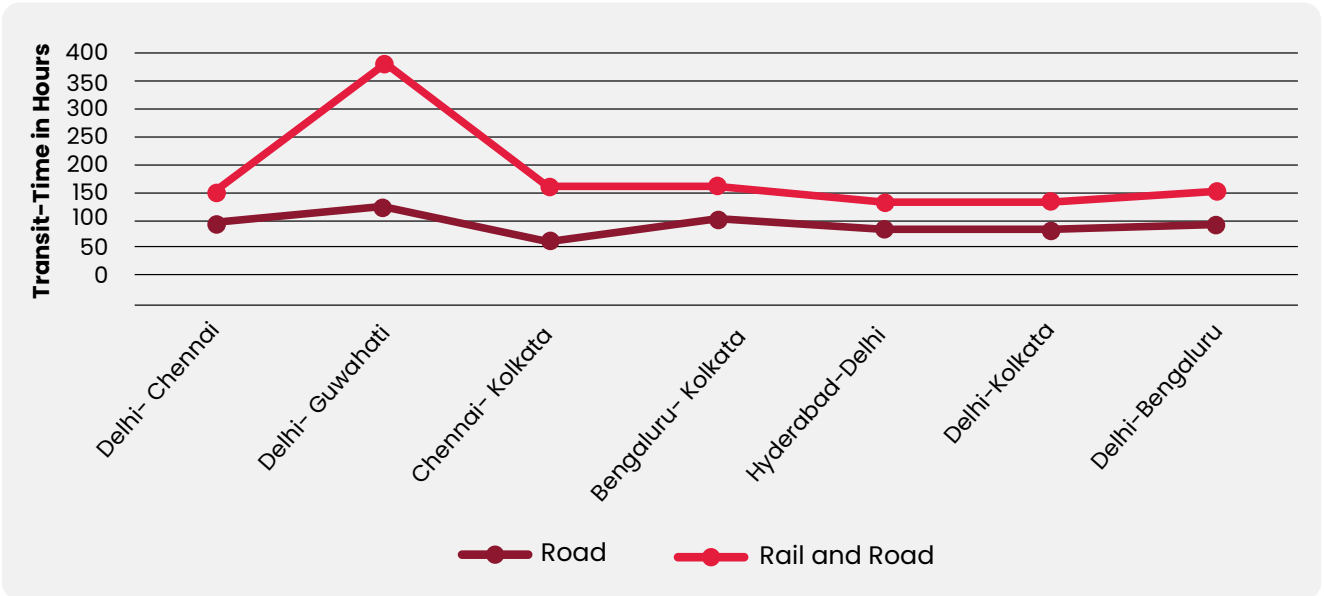
High Maintenance Time of Rakes	
Lack of Adequate Investment in Marketing	
Slow speed of Trains	

Source: Detailed Discussions with Stakeholders

6.1.1 Operational Efficiency

One of the primary determining factors of modal choice for freight transportation is the time component of logistics. Direct interactions with industry stakeholders cite concerns around timely delivery of services by Indian Railways, which is one of the reasons for the shift in freight traffic to roadways. The transit time by road is much lower as compared to rail plus road. In most of the routes depicted in the chart below, it takes almost double the time to transit goods via rail (plus road) against roads only. Shippers expect better service levels and proper handling of their goods when transported via rail. Absence of timetabled services, inconsistent supply of rakes, and lack of integrated first and last-mile connectivity impacts the transit time and increases the cost of freight operations for the customers.

Transit-time via road and Rail plus road



Source: Increasing Rail Share in Freight Transport in India. The Energy and Resources Institute

Lack of Assured Transit Time: In freight movement, guaranteed transit time with less variability is a priority for the customers, the absence of which increases the operational cost. Highly congested networks and detention

of trains causes uncertainty in rake movement and delays in product delivery. Lack of this significant service .i.e. assurance of transit time, prevents Indian Railways from attracting an increased volume of freight traffic. Commodities such as cement, automobile, FMCG, and pharmaceuticals are highly time-sensitive, and the logistics cost is a significant component of the overall cost. With high inventory holding costs in sectors such as automobiles, transit time assurance is essential for the OEMs. The container movement is also affected by the lack of assured transit time.

Uncertain Rake Supply: Uncertainty in rake supply and unplanned allocation discourage customers from using rail. Erratic supply of rakes during peak season, even to customers with high loading volume, increases dependency on the more secure mode .i.e. road. For commodities like cement, inadequate supply of rakes is a major issue as it is a transport intensive industry, and there is a need to move raw material as well as finished goods to the destination. The low supply of wagons and uncertainty for cement and clinker movement is one of the reasons causing a shift by industry players from rail to road. Similarly, consumers from the automobile companies have conveyed a shortage of rakes during the peak season.

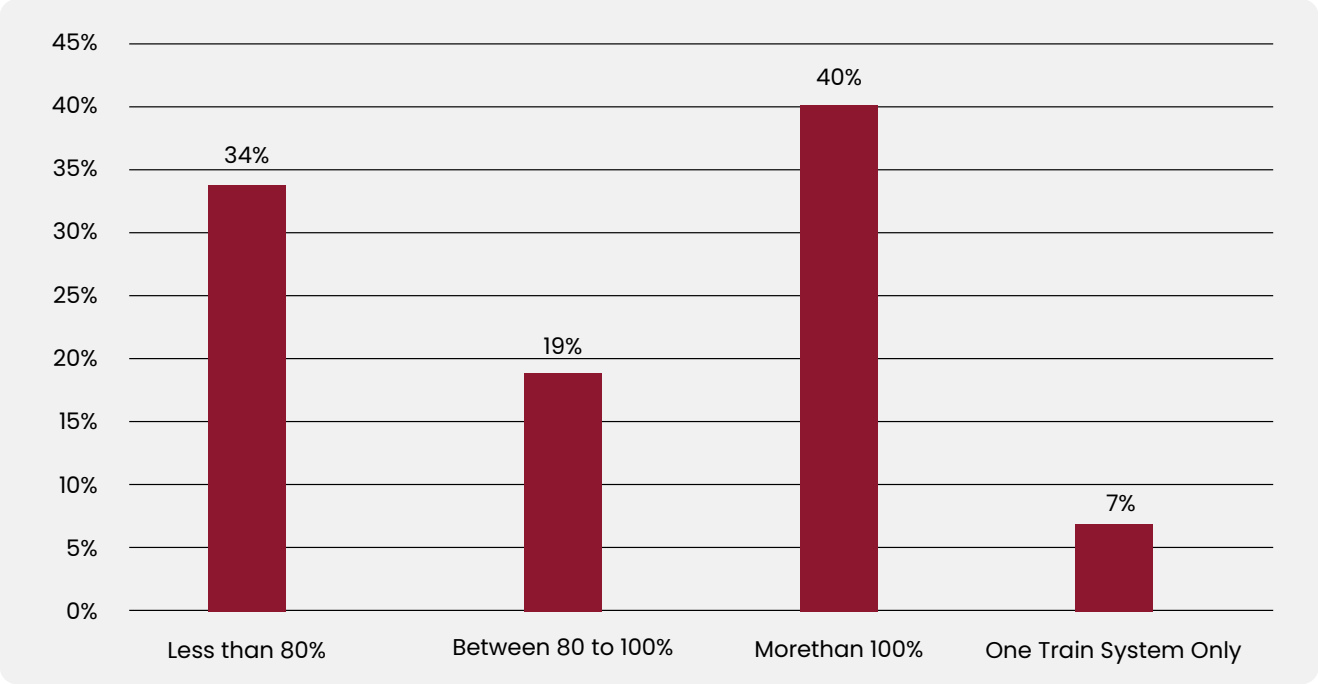
Design of Rakes and Demand Aggregation Issue: Inappropriate wagon design restricts loading gauge and leads to demand aggregation issue (in case of high capacity wagons). Delay in loading and unloading attracts penalties in the form of demurrage, wharfage, and stabling charges. For example, the automobile sector currently has a small share in rail freight but has huge growth potential. However, it is constrained by the limited supply of specialist wagons; and the rake design of BCACBM rakes limits the carriage of larger SUV type vehicles.

Slow Response: Delayed response on the requests, complaints, and queries of the customers, such as the use of terminals, approval for land lease, etc., results in customer dissatisfaction. Slow decision making, inadequate market orientation, and lengthy project approval cause a shift from rail to road.

6.1.2 Suboptimal Infrastructure

Delay in providing adequate infrastructure and sharing of lines by passenger and freight trains is one of the reasons causing significant traffic shift from rail to road. The customers face various challenges while transporting through rail such as lack of basic terminal infrastructure, maintenance of good sheds and warehouses, and unavailability of wagons as the rolling stock. This results in high congestion, customers face high network congestion, lower service levels, and delay in transit time.

Indian Railways: Line Capacity Utilisation



Source: Indian Railways Lifeline of the nation, Government of India, Ministry of Railways, 2015

Lack of terminal infrastructure: Unavailability of terminal infrastructure, such as uniform approach roads, electricity, mechanization, and sanitation facility, is a vital factor resulting in a falling share of freight by railways. Smooth entry and exit of freight vehicles is necessary for efficient loading and unloading operations, however, the area around a railway station comes under the jurisdiction of state government/ urban local body and coordinating between different agencies can be a challenge. Lack of basic infrastructure leads to decreased labour productivity, higher wastage, and risk of damage to the goods. For example, due to the absence of approach roads to terminals, higher capacity trucks cannot enter the terminal and have to be substituted by large number of smaller trucks. Loading and unloading at night become difficult due to poor lighting and lack of electricity. Improvement in the infrastructural quality will help in augmenting terminal capacity and improving rake turnaround time.

Line capacity overutilization: Over utilisation of line capacity leads to high network congestion at most routes, uncertainty in wagon availability, increased detention time of wagons causes a delay in rake placement and freight movement, and low-performance services for the end consumer. Based on a study by Indian Railways, 40 percent of the total 1,219 high density and other important networks are running at a capacity of more than 100 percent. In comparison, the optimal utilisation should be around 80 percent.[74]

Lack of investment in Rolling Stock: Rolling stock in Indian railways has increased at a surprisingly low rate compared to the

74 Indian Railways Lifeline of the nation. Government of India. Ministry of Railways. 2015

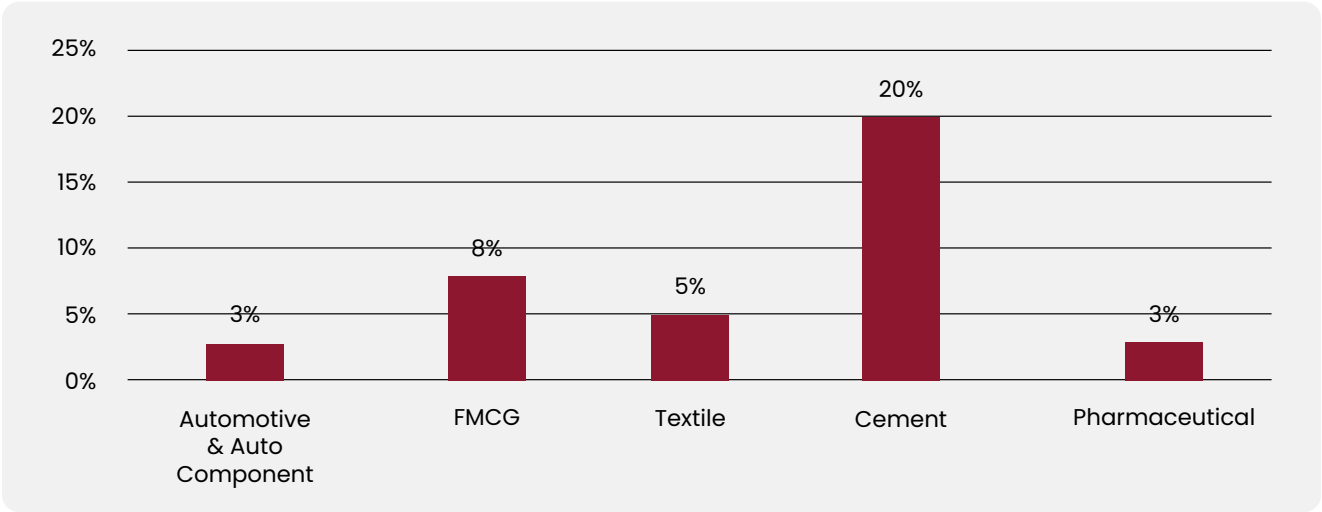
demand for transportation and freight movement in the country. The number of wagons has increased at an average of only 5 percent in the last three years. Further, there has been no significant addition to the locomotives over the years. Poor maintenance of the rolling stock increases the transit time for the customers. Due to lack of investment in the rolling stock, there is negligible diversification by the Railways in commodities being catered for.

6.1.3 Lack of Integrated Connectivity (First Mile and Last Mile)

In transportation, first and last-mile connectivity refer to the end segments of a transit journey, connecting the origin and destination points to the transit network stations. In the absence of integrated first and last-mile connectivity, the dependence on railway freight movement is gradually reducing. The increase in transit time, multiple handling, and inventory holding cost are some of the challenges faced by shippers due to the lack of end-to-end connectivity in rail.

Based on a study, the logistics cost as a percentage of the revenue varies from 3 percent to 20 percent, depending on the industry's characteristics. Each industry has its challenges, such as the automobile industry has high inventory carrying cost, and timely supply to the end consumer is crucial. In FMCG, the last mile connectivity is of utmost importance, and in cement, the logistics cost forms a significant part of the total cost. Hence, it is sensitive to any changes in the cost structure.

Logistics cost as a Percentage of Revenue



Source: India Logistics and Warehousing, Knight Frank India

High Cost: The issue of lack of connectivity between modes (rail and road) is a significant challenge faced by customers of Indian Railways. The existing logistics parks and good sheds are located away from the nearest railway stations making interchange between rail and road a costly and time-consuming process. Even for several bulk commodities that are moved by rail, last-mile connectivity

occurs through the road network. Hence, the total logistic cost involved in rail freight transportation increases in the absence of integrated connectivity.

Multiple handling: Lack of first and last-mile in railways leads to multiple handling of goods, because of which the risk of damage to goods is also high. In the case of high-value goods such as automobiles, the customer's tolerance to damage is extremely low, and in some cases, customers' can switch to different brands. Hence, the condition in which vehicles reach the customer is of utmost importance to the OEMs.

Lack of inter-modal infrastructure: Well-equipped inter-modal infrastructure such as logistics parks, good sheds, and private freight terminals is important for freight aggregation and disaggregation. Lack of all-weather storage is impacting the freight loading potential of Indian Railways. For example, in the cement sector, the unavailability of terminal handling sites for bulk material at appropriate locations is a constraint for transporting via rail. In the food grains sector, lack of integrated warehouse for storage of grains with proper facilities and amenities hampers movement by rail.

Small and Fragmented Logistics Companies: The majority of the truck operating companies in India are small private players, making it difficult for them to get direct contracts from the shippers. It gives rise to operational inefficiencies in the system, which increases the time and cost of transportation. The last mile is particularly critical because it influences various things such as customer satisfaction, delivery time, and cost. This leg of the logistics chain is dependent on the efficiency of the 3PL companies and the infrastructure for storage facilities.

6.2 Roadmap for Reforms

Freight transportation in India is over-dependent on roads. Though the country's rail freight costs INR 2 per ton-km less than the road, the cost difference is not big enough for shippers to switch to rail. While in the US, which has a well-developed rail system and competes closely with the road, the freight cost is around INR 15 per ton-km cheaper in rail than the road. In recent times, Indian Railways has undertaken several measures, such as special wagon schemes, commodity-specific operator schemes, terminal-related policies, etc., to cater to the customers' specific needs; and make rail an equally important mode for freight movement.[75] The private sector can play an important role in enhancing operational efficiency and strengthening the rail infrastructure through Public-Private Partnerships (PPPs). Operational efficiency for loading/unloading, warehousing management, station services, and automation and digitization of various processes could be outsourced to the private sector. Similarly, for first

75 India Logistics & Warehousing. Knight Frank India. 2014.

and last-mile connectivity, a separate entity can be created by the railways in partnership with the private sector (detailed in table 6.2.1) as a single point of contact for customers' to handle multiple legs of movement and ensure smooth transportation of goods.

The upcoming Dedicated Freight Corridors along the country's eastern and western corridors and multimodal logistics parks will ease the oversaturated line capacity constraints and improve the timing of trains. Dedicated Freight Corridor (DFC) is a 3,300 km long corridor, constituting the Eastern Corridor and the Western Corridor. The Eastern Corridor, which starts from Ludhiana in Punjab, will pass through Punjab, Haryana, Uttar Pradesh, Bihar, and Jharkhand and terminate at Dankuni in West Bengal, covering a distance of 1,856 km. The EDFC is projected to cater to several traffic sectors, including coal from the eastern coalfields, steel, food grains, cement, fertilizers, limestone, and general goods. On the other hand, the Western Corridor will cross the distance from Dadri to Mumbai, passing through Haryana, Rajasthan, Gujarat, and Maharashtra, covering a distance of 1,504 km.[76] The Western Corridor traffic mainly comprises container traffic, petroleum products, fertilizers, food grains, salt, coal, iron & steel, and cement.

Based on the enormous investments in DFC, freight traffic is estimated to increase significantly after its completion. The average speed of freight trains will increase from 25 kmph to 70 kmph and allow heavy-haul trains with a carrying capacity of 13,000 tonnes. With improved carrying capacity and the higher speed of trains on the DFC, the transportation time will reduce by 80 percent.[77] Running of double-stack trains will also be facilitated on the corridor.[78] DFCs will strengthen the manufacturing sector and spur the development of the country's logistics and warehousing segment. Though the project received approval from the Union Cabinet in 2006, the corridor's growth has been prolonged, due to which the targeted completion of the project has missed several deadlines. The projected increase in freight after the completion of DFC was 182 million tonnes in FY21 from 140 million tonnes in FY17, at a growth rate of 5.2 percent. The container traffic was expected to reach 5.3 million TEUs from 3.8 million TEUs in FY17.[79] The targets couldn't be achieved due to several reasons like procedural delays, land acquisition, environment clearances, and other related issues.

Timely completion of DFC is vital to the Indian Railways as the rail freight has increased, but the carrying capacity has not seen a corresponding increase. The

76 Dedicated Freight Corridor Corporation of India Limited. DFCCIL. 2021. https://dfccil.com/Home/DynemicPages?MenuId=75

77 India Logistics & Warehousing. Knight Frank India. 2014.

78 Faster speed, lower cost: How dedicated freight corridor will benefit Indian railways. NDTV.com. 2020. https://www.ndtv.com/business/faster-speed-lower-cost-how-dedicated-freight-corridor-will-benefit-indian-railways-2343987

79 Railways Industry Research Report. IBEF. 2018. https://www.ibef.org/download/railways-nov-2018.pdf

80 The railways' dedicated freight corridors: Thrice as fast, twice the load. India Today.2020. https://www.indiatoday.in/india-today-insight/story/the-railways-dedicated-freight-corridors-thrice-as-fast-twice-the-load-1754917-2020-12-31

81 Addressing India's high logistics costs. The Hindu Business Line. 2017. https://www.thehindubusinessline.com/opinion/addressing-indias-high-logistics-costs/article9732208.ece

Golden Quadrilateral corridor connecting the four major Indian cities - Delhi, Kolkata, Mumbai, and Chennai, is highly congested, accounting for only 16 percent of the total rail length but carries 58 percent freight and 52 passenger traffic.[80] The DFC could bring a massive change in India's freight transportation, particularly in its hinterland, and significantly boost several industries. It will facilitate railways to better serve the customers by providing reliable freight service at reduced cost and time. For instance, a container train moving from Delhi to Mumbai on DFC would cover 1400 km in one day.[81] Successful implementation of the DFC program will put India on the global spectrum as one of the world's largest heavy-haul freight operators by using the advanced technologies and approaches which can be extended to other freight corridors.[82]

Though DFC will be an essential link in the entire multimodal transport chain, the nodes where this rail link ends and connects to infrastructures, such as ICDs, ports, logistics parks, etc., are equally crucial for improving rail freight. Multi-Modal Logistics Parks (MMLPs) development at strategic locations is envisaged as a critical policy measure to rationalize logistics costs in India and enhance its competitiveness. MMLPs can serve various purposes such as freight aggregation and distribution, multimodal freight transport, integrated storage and warehousing, information technology support, and value-added services. It is estimated that logistics parks would lower the transportation cost for the major links by 10% by enabling freight movement on higher sized trucks and rail. These parks are proposed to be set on Public-Private Partnership mode, wherein the land will be acquired by the government and warehousing units will be developed by the private players. The Dedicated Freight Corridor Corporation of India (DFCCIL) proposes to provide rail connectivity to the logistics parks for which the private players would create the infrastructure. Logistics Parks are proposed to be set at areas with an adequate concentration of diverse industries and serve as significant production/ consumption centres. Several multimodal connectivity hubs are planned to be developed at the country's critical economic centres, such as Mumbai, Chennai, Hyderabad, Surat, Nagpur, and Assam. The development of MMLPs is dependent on the efficiency of the nodal agency and the third-party players.[83]

Indian Railways needs to put a perspective plan for improving infrastructure backed by adequate policy tools and encourage private participation in the operation and management of terminals, containers, and warehouses to efficiently utilize the resources.

82 Dedicated freight corridors: Transformation of Indian railways. 2021. https://ukdiss.com/examples/dedicated-freight-corridors-indian-railways.php

83 Developing Multimodal Logistics Parks in India. Asian Development Bank. 2020; Surat, Nagpur, Chennai, Mumbai to have multi-modal logistics hubs; land a key challenge. cnbctv18.com. 2020. https://www.cnbctv18.com/real-estate/surat-nagpur-chennai-mumbai-to-have-multi-modal-logistics-hubs-land-a-key-challenge-6BZ937081.htm

Improving Operational Efficiency: Operational efficiency can be improved by facilitating improvement in loading and unloading operations such as loading through low capacity rakes (mini rakes), assurance of transit time, allowing round the clock loading/unloading operations, keep a check on rake detention, and unloading operations at the terminals/ good sheds with adequate handling capacity in partnership with the private sector. Railway authorities to allow more time to load/unload goods mostly during the peak season and phased reduction of demurrage and wharfage charges should also be considered particularly when the delay can be attributed to the railway operations. Providing a timely response to customers' requests and queries is essential to improve customer satisfaction. Railways initiative to launch online portal and a single window concept for this purpose has been greatly appreciated by the customers, and more can be achieved through partnership with private operators to improve operational efficiency.

Enhancing Infrastructural Development: Indian Railways is working to overcome the challenges of saturated infrastructural capacity to enhance the modal share in freight. In addition to the mega projects such as the DFC, investment on upgrading basic terminal infrastructure and rolling stock will ensure an increase in the rail freight volume, some of which can be explored through partnership with private sector. In order to increase the loading of existing/bulk commodities and diversify its freight basket, Indian Railways should focus on facilitating movement by rail by providing rakes with sufficient volumes to justify trainload operations, investment in special equipment, initiatives to capture short-distance cargo and provide suitable rail-connected terminal facilities. Providing basic loading / unloading infrastructure like movable ramps, trailers, proper lighting for night time unloading, uniform flooring, service facilities for safety of goods. Rolling stock customization, especially for industries like auto, is a key step towards bringing the automobile load on Indian Railways. For Railways to compete with other transportation modes, there is an urgent need to upgrade and expand the railway infrastructure. It is thus important to engage the private sector to bring more funds and efficiency, thereby enhancing railway infrastructure.

Strengthening First and last-mile Connectivity: An integrated logistics structure, such as well-linked railway stations with first and last-mile connectivity, is the need of the hour. For example, in the cement industry, the first and last-mile costs account for 10 percent of the total logistics cost in rail transportation. To address the first and last-mile challenge, railways can create a separate entity in partnership with the private sector for integrated transportation of goods and ensure that the customers deal with a single entity for handling multiple legs of movement of goods. The entity would tie-up with transporters and freight forwarders for end-to-end goods movement. The last-mile connectivity and warehouse location

are essential for a shipper in determining and minimizing transportation costs. For instance, the Wagholi area in Pune district is located almost 16-18 km from the Pune railway station and 12-16 km from the city's prominent retail destinations. The travel time taken for the last mile distribution to the various parts of the city is less than an hour's drive from Wagholi, thereby increasing its attractiveness. Additionally, the connectivity with the major industrial hubs, such as Sanaswadi, Ranjangaon, and Chakan, is remarkably well from this cluster. An integrated logistics segment as part of the Indian Railways has long been awaited by many industries. While in the US and European rail freight segments expanded from being only operation-focused logistics providers to supply chain managers in the 1970s, the Indian railways has not diversified its operations. The table below lists in detail the overall challenges and actionable recommendations based on suggestions made by the stakeholders.

6.2.1 Overall Recommendations to Increase Share of Rail in Domestic Freight

Challenge		Recommendation
Operational Inefficiency	Low Capacity Utilisation of Cargo Wagons in Passenger Trains	**Proposing an Uber-like model for Cargo Wagons in Passenger Trains** • There are two cargo wagons in each passenger train. Currently, as per estimates 80 percent of the cargo wagons remain unutilized • By proposing an Uber-like model for one of the two cargo wagons, the customers can book the wagon using an online application. It can be one way to directly increase the freight traffic - without any additional investment in infrastructure. Indian Railways may keep operating the other cargo wagon, the way it is done currently, until the success of the proposed model is established
	Lack of Assured Transit Time	**Partnering with Private Sector in Loading/Unloading, Warehouse Management, Station Operations and Digitization of Cargo Booking and Tracking System to Ensure a Faster Turnaround Time** • Allow round the clock unloading to improve wagon turnaround. Ensure staff availability to handle traffic at good sheds and terminals • Strict adherence to time-table that is also crucial to sustaining customers' confidence • A check on the detention of trains should be exercised regularly to improve the speed of trains

	Multi-point Unloading and Demand Aggregation Issue	**Allow multi-point unloading of BCACBM rakes and greater availability of mini rakes and two-point rakes** • In the automobile sector, the Railway Board has approved multipoint unloading allowing automobile traffic to be unloaded in NMG, BCCNR, BCACM or any other similar type of wagon other than BCACBM rakes. Multi-point unloading should be allowed for the BCACBM rakes • Increased availability of mini rakes and two-point rakes for the transit of goods based on customers' needs
	Huge Cost Difference Between Movement by Road and Rail	**Introducing More Dynamic Discount Schemes for Rail Freight Movement** In order to compete effectively with the road sector, Indian Railways needs to introduce dynamic discount schemes to attract traffic. • Discount schemes for shorter distance closed circuit routes. For example, as gathered from stakeholder discussions, Indian Railways has offered a 50 percent discount on closed-circuit movement of container trains from JNPT to CFS in Mumbai, barely 100 km distance between the origin and destination. For this route, the cost per container (TEU) is approximately INR 2500 (INR 0.1 per kg) by rail and INR 4500 via road (INR 0.18 per kg) • Discount Scheme for non-peak season, when demand falls during monsoon; on return trips to minimize the movement of empty trains in the return journey; and loyalty programs offering discount on consistent freight movement by rail
	Uncertainty in Rake Supply	**Close Coordination with Industry Players for Demand-Supply Based Rake Planning and Allocation** The timely availability of wagons is essential for smooth operations. The peak and lean periods of different industries must be considered before planning rake allocation. • Meetings and discussions with industry players to understand the needs of the customers' will help in better planning and allocation of rakes • Modifying the AFTO policy for the Automobile sector to allow multiple empty routes in a closed-circuit route. It will increase rake utilization rate and reduce operation cost • Keep a check on the wagon maintenance time for increase in the utilisation rate. This can be achieved by increasing the validity of brake power certificate

	Slow Response Mechanism	**Fast Track Approval Process** • The design approval process by RDSO takes time depending upon the complexity of the design. This process needs to be fast-tracked. • Fast and quick response to requests on use of terminals, land lease, etc. will improve customer satisfaction
	High Maintenance Time of Rakes	**Allowing increased validity of Brake Power Certificate** There is a need to automate the inspection and maintenance process, which has largely been manual. In addition to investing in rolling stock, Indian Railways should focus on its efficient maintenance for faster turnaround time and timely supply of rakes. Accessing the technical feasibility to increase the validity of the brake power certificate can reduce the maintenance time and improve the availability of rolling stock without any additional investment. • According to the current policy of Closed Circuit Examination, for BCACBM rake, the Brake Power Certificate for the rakes has to be obtained after every 7,500 km or within 30 days, after a rake leaves the base location. After the completion of the specified distance or time (whichever happens earlier), the time taken for maintenance of the rakes by the Indian Railways is very high, thereby reducing the rake utilisation rate • In order to increase the rake utilisation rate, railways can assess the technical feasibility to increase the validity of the brake power certificate to 10,000 km or 60 days. It will increase the rake utilisation rate by a significant percent and reduce the cost of transportation of goods.
	Lack of Adequate Investment in Marketing	**Involvement of Private Sector in Operation, Infrastructure and Marketing** • Indian Railways should work with the private sector to develop an effective marketing strategy for freight discount schemes, value-added services offered by railways, and use of innovative digital solutions to improve information for the end customers, all towards enhancing freight volume
	Slow Speed of Freight Trains	**Maintaining the Speed of Freight Trains attained during the Covid-19 crisis** • Freight trains speed in India stood at 23.6 kmph in 2019, however, in 2020, it rose to 42.9 kmph. Higher speed of freight trains resulted in increased loading of goods.

Suboptimal Infrastructure	Sub-optimal Design of Wagons	**Introducing Commodity Specific Wagon Designs through Close Co-operation between RDSO and Private Sector** • Induction of commodity-specific wagons will help to increase the freight volume, for example: o Side-loading of two-wheelers in BCACBM rakes for faster loading and unloading of two-wheelers. This will increase freight volume from the two-wheeler segment. o Modify the design of BCACBM rakes to allow double stacking of SUVs in automobile sector
	Inadequate Terminal Infrastructure	**Partnership with Private sector for Development of Terminal Infrastructure** • Development of terminal infrastructure such as upgradation of approach roads to terminals for smooth loading and unloading of goods by entering into a joint venture (JV) with state governments and round the clock electricity supply for uninterrupted loading and unloading operations o For example: There is a lack of bulk cement infrastructure for movement by rail. Railways can tap into the growing bulk cement market by investing in terminal infrastructure for bulk cement handling with private sector participation • Increased mechanization to improve labour efficiency, such as carts and forklift trucks to unload cargo. • Fencing and cameras at the terminals and warehouses for better safety and security
	Lack of Intermodal infrastructure	**Partnership with Private Sector for Development of Warehouses, Good Sheds, and Multimodal Logistics Parks** • Increased investment on packaging and warehousing facilities • Development of all-weather storage facilities to avoid damage to goods. Upgradation of Good Sheds by improving basic infrastructure. • Development of multimodal logistics parks will facilitate smooth transition of freight across transportation modes
	Delays in targeted completion of DFC, a flagship project for freight movement	**Timely Completion of DFC** • The commencement of DFC's operations have missed multiple targets. A timely completion of the project is crucial to ease the congestion and expand rail freight operation. DFCCIL should focus on completing limited operations in a phased manner.

	Overutilization of Line Capacity	**Segregation of Freight and Passenger Traffic** • Segregation of freight and passenger traffic will enable better planning and optimum utilisation of the network, resulting in faster movement of goods. For example: o DFCs are expected to ease the congestion on the major terminals and improve freight traffic.
	Small Share of Non-Bulk Commodities	**Parcel Shipments and Use of Dwarf Containers** • With increase in e-commerce, India's market for small volume shipments is growing at a significant rate. Assurance of timely delivery and low volume consignments are the key characteristics of parcel shipments. There is an increased opportunity for Indian Railways in this segment with consolidation with the private sector • Greater use of dwarf containers especially for commodities with high price elasticity. For example, FMCG, pharmaceuticals, machinery parts and fruits and vegetables can be targeted to be transported in dwarf containers in the short term
Lack of Integrated Connectivity (First and Last Mile)	Issue of Multiple Handling	**Increased Availability of RoRo Rakes** • Suitable design of wagons for the roll-on-roll off rakes such that the loaded trucks can be loaded on flat wagons and then loaded off on roads easily. This will help in solving the issue of first and last-mile connectivity and will eliminate multiple handling. • Railways and RDSO could jointly work with Commercial Vehicle Manufacturers to check the feasibility of this option for commodity specific rakes

	Additional Cost due to Lack of Intermodal Infrastructure	**Multi Modal Logistics Parks at Strategic Locations, through Partnership with Private Sector** • Consolidation of wagonload and piecemeal commodities on Indian Railways through freight aggregation at goods sheds. Provision of seamless connectivity will reduce the risk of damage and save additional cost o For example: Railways can tap into smaller volume cement players through appropriate aggregation models such that the demand of the small players destined to a common location can be aggregated at a good shed located at a location convenient for all parties. • MMLPs can provide multi-modal freight handling facility comprising mechanized warehouses, specialized storage solutions like cold storage, facilities for mechanized material handling and inter-modal transfers like container terminals, bulk or break-bulk cargo terminals which will lower cost
	First and last-mile Connectivity	**Creating a Special Entity Under Railways for Handling Intermodal Logistics in Partnership with the Private Sector to Address First and Last-mile Issue** 

Challenge	Recommendation	Stakeholder Responsible	Actionable In		
			Short Term	Medium Term	Long Term
Operational Inefficiency	Proposing an Uber-like model for Cargo Wagons in Passenger Trains	Indian Railways and Private Sector			
	Partnering with Private Sector in Loading/Unloading, Warehouse Management, Station Operations and Digitization of Cargo Booking and Tracking System to Ensure a Faster Turnaround Time	Indian Railways and Private Sector			
	Allow multi-point unloading of BCACBM rakes and greater availability of mini rakes and two-point rakes	Indian Railways			
	Introducing More Dynamic Discount Schemes for Rail Freight Movement	Indian Railways			
	Close Coordination with Industry Players for Demand-Supply Based Rake Planning and Allocation	Indian Railways and Industry Players			
	Fast Track Approval Process	Indian Railways and RDSO			
	Allowing increased validity of Brake Power Certificate	Indian Railways			
	Involvement of Private Sector in Operation, Infrastructure and Marketing	Indian Railways and Private Players			
	Maintaining the Speed of Freight Trains attained during the Covid-19 crisis	Indian Railways			

Sub-optimal Infrastructure	Introducing Commodity Specific Wagon Designs through Close Co-operation between RDSO and Private Sector	Indian Railways, RDSO and Private Sector			
	Partnership with Private sector for Development of Terminal Infrastructure	Indian Railways and Private Sector			
	Partnership with Private Sector for Development of Warehouses, Good Sheds, and Multimodal Logistics Parks	Indian Railways and Private Sector			
	Timely Completion of DFC	Indian Railways and DFCCIL			
	Segregation of Freight and Passenger Traffic	Indian Railways			
	Parcel Shipments and Use of Dwarf Containers to Improve Share of Non-Bulk Commodities	Indian Railways and Private Sector			
Lack of Integrated Connectivity (First and Last Mile)	Increased availability of RoRo rakes	Indian Railways and RDSO			
	Multi Modal Logistics Parks at Strategic Locations, through Partnership with Private Sector	Indian Railways and Private Sector			
	Creating a Special Entity Under Railways for Handling Intermodal Logistics in Partnership with the Private Sector to Address First and Last-mile Issue	Indian Railways and Private Sector			

6.2.2 Sector Specific Reforms

In the following section sector specific reforms are detailed again based on the case studies in Chapter 5. Despite a rise in automobile transportation by rail in the last few years, the share of railways in automobile movement is significantly low. In the passenger vehicle segment, almost 95 percent of the transportation occurs via roads using trucks and trailers. For the logistics intensive cement industry, the rail coefficient has declined from 43 percent in 2013-14 to 35 percent in 2018-19. Similarly, the foodgrain sector has witnessed a decrease in rail share movement. Building infrastructure such as terminal and warehouses, improving connectivity, smooth loading and unloading, reduced transit time and higher speed of train along with private sector partnership can increase rail freight volume.

6.2.2.1 Automobile: Recommendations to Increase Share of Rail in Domestic Automobile Movement

	Challenge	Recommendation	Actionable
Infrastructure Support			
Connectivity	• In passenger vehicle segment design of BCACBM rakes doesn't allow the loading of SUVs in both decks. • In the two-wheeler segment, side loading of vehicles in BCACBM rakes is not possible. Two-wheelers have to be driven from one end to the other. • A BCACBM rake can carry about 3000 two-wheelers.	Demand for Sports Utility Vehicles (SUVs) is growing, and its share is expected to increase. Railways can tap this traffic by upgrading wagon height to taller wagons to allow double stacking of SUVs. The two-wheeler segment constitutes 80 percent of the automobile industry. More than 90 percent of the two-wheeler movement is by road. There is huge potential in this segment to shift the freight traffic to rail. Some of the suggestion by industry players include: • Allow sideloading of two-wheelers in the BCACBM rakes for faster loading/ unloading	Medium to Long Term

Multiple Handling and First Mile	The first mile by railways involves multiple handling, cost, and time. It takes 2-3 days from aggregating demand to moving cars in trucks to the nearest railway station	• Sidings in automobile plants will avoid multiple handling and first-mile problem. Efforts are needed to identify specific locations of automobile plants where railway sidings could be put in place, and having sidings inside automobile plants will avoid both multiple handling and first mile issues. • The industry has suggested the option to transport trailers, loaded with vehicles, through Railways. RDSO could jointly work with Commercial Vehicle Manufacturers to check if it is feasible to develop trailers, which can be coupled to the Tractor and the Railways for interchanging from road to rail and vice-versa	Medium to Long Term
Terminal Infrastructure and Auto Hubs	Lack of basic terminal infrastructure and security at Auto-Hubs. The slow process of getting approvals for upgrading Private Freight Terminals	• Upgradation of terminal and siding infrastructure and Auto Hubs with loading/ unloading infrastructure like movable ramps, trailers, all-time electricity, uniform flooring of approach roads, service facilities for the safety of vehicles, and dust-free parking space. • All of this can be attained Public Private Partnership	Short to Medium Term
Rake unavailability and lack of maintenance	Rake unavailability, poor maintenance, and low quality of rakes discourage the customers to use rail	Ensure good quality rake provision to the auto companies. Frequent quality checks to ensure the safety of vehicles during transit via rail	Short to Medium Term
Operational			
Lack of Assurance in Transit Times	Lack of Assurance in Transit Time makes it difficult for OEMs/ logistic companies to ensure timely delivery of vehicles to dealers/ consumers	Preparing realistic timetables and adherence to the schedules is essential to sustain the confidence. Improvement in Assured Transit Time during the Covid-19 pandemic has strengthened the confidence of Auto companies in Railways	Short to Medium Term

Freight Rationalisation	Rail is not economically viable and competitive to the road for shorter distances	To make railways competitive to the road for distances less than 1,000 km - railways should consider reducing freight rates of NMG and BCACBM rakes	Short to Medium Term
Demand Aggregation and Stabling charges	Cumulating bulk demand for the BCACBM rakes is challenging for companies. A penalty in the form of stabling charges is levied if loading/unloading exceeds 8 hours' time limit	Indian railways should consider increasing the loading/unloading time limit at the stations from 8 hours. The time limit should be based on the total number of cars at the station or should vary from lean demand and peak demand period	Short to Medium Term
Response to requests and queries	Delayed response to the requests, complaints, and queries of Auto companies	Fast and quick response to customers' requests on use of terminals, land lease, etc. Companies appreciate railways initiative to launch online portal and a single window concept for this purpose	Short Term
Policy Related			
AFTO policy	• The uptake of AFTO policy is slower than expected. Several factors like the insufficient number of rakes, high lead time of indent placement to rake availability discourage OEMs and 3PL to use rail. • Multi point unloading is permitted for rakes NMG, BCCNR, and BCACM	The AFTO policy has been appreciated by industry players. However, the suboptimal infrastructure and challenges by rail have resulted in low uptake of the policy. The fees for the AFTO policy can be revised further, as in addition to the fees (INR 3 crores), the companies have to invest in the rakes (INR 15 crores). A further revision in the AFTO fees by IR will help in attracting more companies to join the scheme. Allow multi-point unloading of BCACBM rakes	Short to Medium Term
Slow approval process	The design approval process by RDSO takes 1-3 years, depending upon the complexity of design and RDSO's capacity.	The rolling stock design and approval process should be simplified, and the process to get approvals for designs and implementation of wagons should also be relaxed by the RDSO	Medium Term

Exports	Infrastructure development for exports to neighboring countries	Development of infrastructures such as more loading terminals across the country facilitating auto exports via rail to neighboring countries such as Nepal, Bangladesh, and Sri Lanka. For example, Railways loaded 87 Mahindra Bolero pick-up vans from Navi Mumbai in Maharashtra and transported to Benapole in Bangladesh in October 2020.[84]	Medium Term

Source: Direct intreraction with stakeholders

6.2.2.2 Cement: Challenges and Recommendations to Increase Share of Rail in Domestic Cement Movement

	Challenge	Recommendation	Actionable
Infrastructure Support			
Design of Rakes	• Aggregation of demand to load a BCNHL rake of 4,000 tons of capacity is challenging during the lean season. Loading in these rakes using the available mechanization is also difficult as the height of the door is less than the wagon height	Allow mini rakes (with a capacity of ~2000 tons) and two-point rakes for the transit of smaller volumes to better serve the market throughout the year (based on industry demand). To increase rake utilization, allow multiple companies with a common destination to fill the rake load jointly. Loading is efficient if the mechanization is compatible with the wagon design	Short to Medium term
Terminal Sidings and Good Sheds	Lack of basic infrastructure at terminal sidings and Good Sheds	Investment in basic infrastructure at the terminal sidings and Good Sheds. Electricity and lighting for night time unloading and operate machinery, uniform approach roads to the terminals allowing higher capacity trucks to enter the terminal, availability of labour for night time unloading, clean platforms, and sanitation facility for the labour. Safety and security of storage of goods by installing cameras and deploying staff to look after the goods	Medium to Long term

84 Mahindra exports Bolero pickups to Bangladesh on Indian Railways network. 2020. https://www.autocarpro.in/news-national/mahindra-exports-bolero-pickups-to-bangladesh-on-indian-railways-network-77558

Rake Unavailability	Rake unavailability especially during peak season, impacts delivery time. The time between rake indent and availability varies from 3-4 days compared to less than one day for the road	Low supply of wagons and uncertainty for cement and clinker movement is one of the reasons causing a shift by industry players from rail to road. Improving rake availability based on industry demand, conducting industry dialogue during wagon planning stage, preparing a futuristic plan for transparent allocation of rakes (considering peak and lean season of the industry) will help in increasing cement freight	Short to Medium term
Bulk loading	Lack of bulk cement infrastructure for movement by rail. At present bulk cement is around 5% of the total cement industry	Railways offer various advantages for bulk cement movement - such as reduction in loss of cement, no seepage due to multiple handling or bag bursts. Bulk wagons can carry more cement. Railways can tap into the growing bulk cement market by investing in infrastructure (terminals and Good Sheds) for bulk cement handling	Medium to long term
Operational			
Round the clock unloading	Round the clock unloading is not permitted across all terminals	Allow round the clock unloading to improve wagon turnaround. Ensure staff availability to handle traffic at Good Sheds and terminals.	Short term
Demurrage and Wharfage Charges	Delay in unloading leads to penalties in the form of demurrage and wharfage charges	Operational efficiency can be improved by considering a phased reduction of demurrage and wharfage charges, especially when the delay can be attributed to the railway operations	Medium term
Lack of Mechanization and Labour Unions	Loading and Unloading of cement bags is a labour intensive and manual process. Non-mechanized unloading and the presence of labour unions increases cost and operating time for the industry	Mechanization of unloading process and non-unionized labour can improve the efficiency and productivity of labour. Use of carts and forklift trucks to unload the goods will help in faster unloading	Medium to Long term

Detention of Rakes	Detention of rakes at terminals increases transit time and congestion at terminals. Blockage of working capital of cement companies due to uncertainty in rake movement. Operations of companies are affected when the movement of raw materials stops due to rake detention	A regular check on the detention of trains outside signals or at stations adjacent to Goods Terminals, in shunting operations at roadside stations and enroute detentions	Short to Medium term
First and Last Mile Connectivity	Unorganized first and last mile services add up to the time and cost. Handling and last-mile services provided by small and unorganized players often results in inadequate manpower deployment and mechanization for goods handling	Handling and last-mile problem can be addressed if Railways focuses on establishing a separate transportation unit for handling and the connectivity services. An increase in cement and clinker production will increase rail freight movement.[85] Connecting cement clinkerization units to the railways will help in addressing the first-mile issue by rail.	Medium to Long term
Policy Related			
LTTC Policy	Strict eligibility criteria of 1 million tons of production for the LTTC contract is challenging for small and mid-sized firms	• Reducing the eligibility criteria for LTTC contract will help attract more cement firms (including small and mid-sized). • For example, a reduction in AFTO scheme fees from INR 5 cr to INR 3 cr helped in a small uptake in the number of participants from the Auto sector. The number of participants increased from 2 to 6 after the reduction in fees and other amendments in the policy	Short to Medium term

Source: Direct interaction with stakeholders

85 B., Saurabh. B., Palash. Gupta, D.B. Factors impacting railway freight traffic in India. 2016. https://www.ncaer.org/publication_details.php?pID=264&pID=264

6.2.2.3 Foodgrains: Challenges and Recommendations to Increase Share of Rail in Domestic Foodgrains Movement

	Challenge	Recommendation	Actionable
Connectivity	Lack of access to reach designated market/mandis, storage and post-harvest management	Indian Railways with public and private partnership should provide support to farmers to reach their nearby markets. Since railways have a higher penetration in rural areas, however, connectivity between farmers and organised mandis/market is an issue. As per the National Farmers Commission, the average distance of the market should be within 5 km. Introduction of mechanism wherein intermodal connectivity can be used for procurement of grains from the rural parts of the country. • Remove information Asymmetry to keep the price in check • Comprehensive agricultural logistic – providing integrated post-harvest management solution with value-added services to fill in the gaps	Short to Medium Term

Infrastructure	Lack of infrastructure such as warehouses and storage facilities	Indian Railways has a vast network and connects rural areas to urban areas. With such connectivity, it is the primary source for transportation of foodgrains from farm-gate to organised markets. Development of an integrated warehouse for storage of foodgrains with proper facilities and amenities at freight terminals is important. • There is an urgent need to build a viable load for carrier or transport. Aggregation centres are required which will serve as a loading and dispatch facility at village and block level. • Dry goods storage system is required for long term holding crops. This can be achieved through modernisation of existing infrastructure and improved inventory management	Medium Term
Operational	Congested line capacity and, terminal Infrastructure are not developed to meet the growing demand of the sector resulting in delays in transit time and increased wastage	Involvement of private players in an increased movement of Kisan special trains to transport perishable goods for dedicated routes and seasonal commodities • Increase wagon utilization level by inducting commodity specific wagons instead of a common pool of wagons	Short to Medium Term

Source: Direct interactions with stakeholders

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Annexures

Freight Volume Carried by India's Rail, Road and Air Transport (million tonne-km)

Year	Road	Rail	Air
1998	430,778	284,270	531
1999	467,000	308,040	531
2000	494,000	312,400	548
2001	515,000	333,200	515
2002	545,000	353,200	546
2003	595,000	381,200	580
2004	643,000	411,300	708
2005	728,300	439,596	774
2006	825,900	480,993	843
2007	933,700	521,370	968
2008	1,021,600	551,448	1234
2009	1,144,500	600,546	1235
2010	1,287,300	625,723	1631
2011	1,407,800	667,607	1703
2012	1,508,000	649,645	1579
2013	1,653,600	665,810	1734
2014	1,824,300	681,696	1851
2015	2,026,100	654,481	1834
2016	2,226,570	620,175	1894
2017	2,435,870	654,285	2407
2018	2,222,106	692,916	2704
2019	2,357,775	738,523	1938

Source: OECD and World Bank Database

Container Port Traffic in India (TEU:20 foot equivalent unit)

Year	Container Port Traffic (TEU)
2000	2,450,656
2001	2,764,757
2002	3,208,380
2003	3,916,814
2004	4,332,863
2005	4,982,092
2006	6,141,148
2007	7,398,211
2008	7,672,457
2009	8,014,487
2010	8,889,576
2011	9,893,786
2012	10,041,000
2013	10,632,000
2014	11,319,000
2015	11,883,000
2016	12,083,010
2017	15,429,000
2018	16,946,200
2019	17,053,200

Source: World Bank Database

Freight Carried by Railways (million tonne-km), 2019

Country	Freight Carried by Railways (million tonne-km)
USA	2,364,144
China	2,882,100
Russia	2,602,493
India	738,523

Source: World Bank Database

Freight carried by Air-Transport (million tonne-km) in 2019

Country	Freight Carried by Air transport (million tonne-km)
USA	42,498
China	25,395
Russia	6,621
India	1,938

Source: World Bank Database

Container port traffic (million TEUs) in 2019

Country	Container port traffic (million TEUs)
USA	55
China	242
Russia	5
India	17

Source: World Bank Database

Container Port Traffic in India (TEU:20 foot equivalent unit)

Year	Passenger Earnings (in crores)	Freight Earnings (in crores)
1950-51	98	139.3
1960-61	132	280.5
1970-71	296	600.7
1980-81	828	1,550.90
1990-91	3,145	8,247.00
2000-01	10,483	23,045.41
2008-09	21,866	51,749.34
2010-11	25,706	60,687.05
2011-12	28,246	67,743.62
2012-13	31,323	83,478.83
2013-14	36,532	91,570.85
2014-15	42,190	103,100.15
2015-16	44,283	106,940.55
2016-17	46,280	102,027.82
2017-18	48,643	113,523.53

Source: Indian Railways Yearbook

Line Capacity (units)

Year	Route (Kms)	Running Track (Kms.)
1950-51	53,596	59,315
1960-61	56,247	63,602
1970-71	59,790	71,669
1980-81	61,240	75,860
1990-91	62,367	78,607
2000-01	63,028	81,865
2008-09	64,015	86,937
2010-11	64,173	87,114
2011-12	64,266	89,801
2012-13	65,080	89,236
2013-14	65,426	89,919
2014-15	65,600	90,803
2015-16	66,252	92,084
2016-17	66,918	93,902
2017-18	66,935	94,270
2018-19	67,415	95,981

Source: Indian Railways Yearbook

Rolling Stock: Wagons (units)

Year	Wagons
1950-51	205,596
1960-61	307,907
1970-71	383,990
1980-81	400,946
1990-91	346,102
2000-01	222,193
2008-09	212,835
2010-11	229,997
2011-12	239,321
2012-13	244,818
2013-14	252,833
2014-15	254,018
2015-16	251,295
2016-17	2,77,992
2017-18	2,79,308
2018-19	2,89,185

Source: Indian Railways Yearbook

Rolling Stocks: Locomotives (Units)

Year	Locomotives (units)		
Year	Steam	Diesel	Electric
1950-51	8,120	17	72
1960-61	10,312	181	131
1970-71	9,387	1,169	602
1980-81	7,469	2,403	1,036
1990-91	2,915	3,759	1,743
2000-01	54	4,702	2,810
2008-09	43	4,963	3,586
2010-11	43	5,137	4,033
2011-12	43	5,197	4,309
2012-13	43	5,345	4,568
2013-14	43	5,633	4,823
2014-15	43	5,714	5,016
2015-16	39	5,869	5,214
2016-17	39	6,023	5,399
2017-18	39	6,086	5,639
2018-19	39	6,049	6,059

Source: Indian Railways Yearbook

Wagon Utilisation: Total carrying capacity (Million Tonnes)

Year	Wagon Utilisation: Total Carrying Capacity (Million Tonnes)
2012-13	13.4
2013-14	14.1
2014-15	14.3
2015-16	14.4
2016-17	16.0
2017-18	16.3
2018-19	17.0

Source: Indian Railways Yearbook

Average Rate Passenger and Freight and Fare to Freight Ratio

Year	Average rate per passenger-km. (in Rs.)	Average rate per TKM for Freight (in Rs.)	Passenger Rate to Freight Rate Ratio
1950-51	1.48	3.16	0.46835443
1960-61	1.71	3.87	0.441860465
1970-71	2.5	5.43	0.460405157
1980-81	3.97	10.5	0.378095238
1990-91	10.64	35	0.304
2000-01	22.94	73.78	0.31092437
2008-09	26.09	93.84	0.278026428
2010-11	26.30	96.99	0.271161975
2011-12	27.00	101.47	0.266088499
2012-13	28.50	128.50	0.221789883
2013-14	32.00	137.53	0.232676507
2014-15	36.80	151.24	0.243321873
2015-16	38.70	163.40	0.236842105
2016-17	40.30	164.51	0.244969911
2017-18	41.30	163.83	0.252090582
2018-19	44.10	166.00	0.265662651

Source: Indian Railways Yearbook

Average Freight train speed (km/hr)

Year	Average Freight train speed (km/hr)
1950-51	17.4
1960-61	16.1
1970-71	17.9
1980-81	19.7
1990-91	22.7
2000-01	24.1
2008-09	25.7
2010-11	25.6
2011-12	25
2012-13	25.5
2013-14	25.9
2014-15	23.8
2015-16	23.4
2016-17	23.7
2017-18	23.3
2018-19	23.2

Source: Indian Railways Yearbook

Operating Ratio (%)

Year	Operating Ratio (%)
1950-51	81
1960-61	78.75
1970-71	84.13
1980-81	96.07
1990-91	91.97
2000-01	98.34
2008-09	90.46
2010-11	94.59
2011-12	94.85
2012-13	90.19
2013-14	93.6
2014-15	91.3
2015-16	90.5
2016-17	96.5
2017-18	98.4
2018-19	97.3

Source: Indian Railways Yearbook

Passenger Traffic in Indian Railways

Year	No. of passengers originating (in millions)	Passenger kms. (in millions)
2007-08	6,524	769,956
2008-09	6,920	838,032
2009-10	7,246	903,465
2010-11	7,651	9,78,508
2011-12	8,224	10,46,522
2012-13	8,421	10,98,103

Year	No. of passengers originating (in millions)	Passenger kms. (in millions)
2013-14	8,397	11,40,412
2014-15	8,224	11,47,190
2015-16	8,107	11,43,039
2016-17	8,116	11,49,835
2017-18	8,286	11,77,699
2018-19	8,439	11,57,174

Source: Indian Railways Yearbook

Movement of bulk commodities by Indian Railways (Million Tonnes)

Commodity	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Coal	455.8	496.4	508.1	545.8	551.83	532.83
Food grains	46.4	49.0	55.1	55.5	45.73	44.86
Iron & Steel	35.2	35.3	39.0	42.8	44.79	52.41
Iron ore	104.7	111.4	124.3	112.8	116.94	137.55
Cement	107.7	105.9	109.8	109.8	105.35	103.29
POL (Mineral oils)	39.8	40.6	41.2	41.1	43.24	42.42
Fertilizers (Chemical manures)	52.7	46.2	44.7	47.4	52.23	48.34
Limestone and Dolomite	17.7	19.6	20.7	21.2	23.53	25.53
Stones (including gypsum) other than marble	13.0	11.8	11.6	15.0	15.04	14.78
Salt	5.1	4.8	4.7	5.0	5.02	4.97
Sugar	4.6	3.0	3.0	2.7	3.39	2.35
Other Commodities	86.55	84.11	89.63	96.2	94.42	96.82
Grand Total	**969**	**1008**	**1052**	**1095**	**1102**	**1106**

Source: Indian Railways Yearbook

Movement of bulk commodities by Indian Railways from 2011-12 to 2018-19 (%share)

Commodity	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Coal	47%	49%	48%	50%	50%	48%	48%	50%
Foodgrains	5%	5%	5%	5%	4%	4%	4%	3%
Iron & Steel	4%	4%	4%	4%	4%	5%	5%	4%
Iron ore	11%	11%	12%	10%	11%	12%	12%	11%
Cement	11%	11%	10%	10%	10%	9%	10%	10%
POL (Mineral oils)	4%	4%	4%	4%	4%	4%	4%	4%
Fertilizers (Chemical manures)	5%	5%	4%	4%	5%	4%	4%	4%
Limestone and Dolomite	2%	2%	2%	2%	2%	2%	2%	2%
Stones (including gypsum) other than marble	1%	1%	1%	1%	1%	1%	2%	2%
Salt	1%	0%	0%	0%	0%	0%	0%	0%
Sugar	0%	0%	0%	0%	0%	0%	0%	0%
Commodities other than above	9%	8%	9%	9%	9%	9%	9%	9%
Grand Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Indian Railways Yearbook

Rail Coefficient: Major Commodities carried by the Indian Railways as a Percentage of Total Production plus Imports

Year	Coal	Iron Ore	Cement	Foodgrains	Fertilizers	POI Products
2013-14	69	81	43	21	86	17
2014-15	66	80	40	22	85	17
2015-16	65	71	37	18	88	17
2016-17	63	69	37	16	87	15
2017-18	63	67	37	15	85	15
2018-19	63	63	35	14	86	15

Source: Indian Railways Yearbook

Passenger Vehicles Carried by Indian Railways of the Total Vehicle Production

Year	Number of Passenger vehicles carried by Indian Railways	% share
2013-14	28,000	1.2%
2014-15	58,000	1.7%
2015-16	100,000	2.9%
2016-17	120,000	3.3%
2017-18	150,000	3.7%

Source: Indian Railways Yearbook

Containers Carried by Indian Railways (million Tonnes)

Year	Domestic Containers	EXIM Containers
2013-14	11	33
2014-15	11	38
2015-16	9	37
2016-17	10	37
2017-18	11	42
2018-19	12	48

Source: Indian Railways Yearbook

Share of Domestic and EXIM containers in Total Container Traffic Carried by Indian Railways

Year	Domestic Containers	EXIM Containers
2013-14	25%	75%
2014-15	22%	78%
2015-16	20%	80%
2016-17	22%	78%
2017-18	21%	79%
2018-19	20%	80%

Source: Indian Railways Yearbook

Production of Food Grains (Million Tonnes)

Years	Food grain Production
2014-15	252.02
2015-16	251.54
2016-17	275.11
2017-18	285.01
2018-19 (4th AE)	284.95

Source: Indian Railways Yearbook

Percentage of Total Production Plus Imports of Food grain Carried by Indian Railways

Years	Percentage
2014-15	22.01
2015-16	18.13
2016-17	15.95
2017-18	15.26
2018-19 (P)	13.78

Source: Indian Railways Yearbook

Transit-time via Road and Rail plus Road (hours)

Route	Road	Rail and Road
Delhi-Chennai	90	150
Delhi-Guwahati	120	380
Chennai-Kolkata	60	160
Bengaluru-Kolkata	100	160
Hyderabad-Delhi	80	130
Delhi-Kolkata	80	130
Delhi-Bengaluru	90	150

Source: Transport Corporation of India, Edelweiss Research

Indian Railways : Line Capacity Utilisation

Railway	< 80%	80-00%	100-120%	120-150%	> 150%	OTOS*	Total
Central	34	9	11	12	7	1	74
East Coast	16	9	9	16	2	4	56
East Central	16	13	19	22	16	5	91
Eastern	22	22	41	1	–	3	89
North Central	11	3	7	22	2	1	46
North Eastern	12	6	12	6	6	–	42
North Frontier	18	10	4	14	3	11	60
Northern	70	26	29	23	10	4	162
North Western	39	7	6	3	1	4	60
South Central	20	32	23	8	9	–	92
South Eastern	24	13	14	17	1	2	71
South East	9	6	9	7	2	–	33
Southern	53	38	25	15	–	–	131
South Western	38	12	–	–	–	1	51
West Central	1	4	7	6	3	–	21
Western	32	18	17	21	4	48	140
Total	415	228	233	193	66	84	1219

Source: Indian Railways Whitepaper, 2015

Logistics cost as a Percentage of Revenue

Industry	Logistics cost as a percentage of Revenue
Automotive & Auto Component	3%
FMCG	8%
Textile	5%
Cement	20%
Pharmaceutical	3%

Source: India Logistics and Warehousing, Knight Frank India

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