STRATEGIES TO INCREASE RAILWAY'S SHARE IN FREIGHT TRANSPORT IN INDIA

Executive Summary

THE ENERGY AND RESOURCES INSTITUTE
Creating Innovative Solutions for a Sustainable Future

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JAYA VARMA SINHA

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Foreword

It is with great pleasure that I introduce this insightful report titled 'Strategies to Increase Railways' Share in Freight Transport in India' undertaken by The Energy and Resources Institute (TERI). The efficient and sustainable movement of freight is of paramount importance for Indian Railways (IR) as well as for Indian economy, and this study delves into key strategies to enhance the role of railways in this critical domain.

The report deep dives into three major areas of IR's freight operations. Firstly, strategies to improve the efficiency of terminals, including the development of a terminal monitoring toolkit. Second, assessment of freight marketing schemes of IR to enhance competitiveness in the market. Lastly, evaluation of IR's freight tariff policy.

I would like to extend my appreciation to TERI and the dedicated team involved in this research for their commendable efforts. Their engagement with multiple stakeholders, including Railways, private entities, labour body representatives, technology providers, and rolling stock providers, reflects the comprehensive approach taken to understand the freight transport ecosystem. I am confident that it will serve as a valuable resource for policymakers and industry expertscontributing to the nation's economic growth and environmental well-being.

Jaya Varma Sinha

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Message from the DG's desk

In the vast tapestry of India's transportation landscape, efficient movement of goods has always been an integral thread, interweaving economic development, connectivity, and sustainability. With the growth of the Indian economy, the need for a robust and efficient freight transportation system has never been more pressing.

Rapid development in the road and highways sector, coupled with the ease of movement it offers has shifted a majority of the freight traffic to road transport, resulting in a substantial increase in the supply chain emissions. As the road freight transport sector is largely dependent on diesel-based trucks, it contributes to around 40 per cent of road transport emissions. Railways, being the most energy-efficient transport system, can play an important role in tackling supply chain emissions.

Realising the importance of railways to enable sustainable supply chain systems, the Government has launched 'Gati Shakti Multimodal Cargo Transport Policy' in 2021 and 'Mission 3000MT by 2027' in 2022 to leverage the modal shift to railways for freight transport. However, infrastructural constraints, multiple handling of goods, non-flexible tariff structure, etc. are the key hurdles in realising the target.

While India is marching towards achieving net zero target by 2070, it is essential to emphasize the need forstable economic growth with environmental sustainability. This flagship report, 'Increasing Railway's Share in Freight Transport in India', drafted by TERI could be a guidance document for promoting a vibrant future where railways play an increasingly pivotal role in the transportation of goods across India, ensuring swift and sustainable progress. The report has three volumes deep diving into three crucial aspects for railway freight business – (a) Terminal Operation and Infrastructure, (b) Freight Marketing Policies, and (c) Freight Tariff Policies. The report further suggests plausible upgradations in policies as well as infrastructure to attract more traffic to railways.

I would like to thank Indian Railways for the support provided throughout the study duration, congratulate the Transport team for their in-depth research, and analysis for the study and charting out a futuristic roadmap.

We hope that this report serves as a compass, directing our collective efforts toward a brighter and more sustainable future for India's freight transportation sector.

Vibha Dhawan, Ph.D.
Director General, TERI

Preface

Under the Nationally Determined Contributions' (NDCs) target for 2030, India has committed to reduce the energy intensity of its GDP by 45% from year 2005 level. Although, India's transport sector accounts for less than 5 % of GDP, it accounts for more than 13% of carbon dioxide emission and more than 15% of total final consumption of energy. More than 90% of total emission from transport is on account of road transport, and freight transport via trucks is the single largest contributor to emissions from road transport. Trucks account for more than half of combined petrol and diesel consumption in the country – this has serious implications for India's energy security.

For meeting NDC target for India, railways would play a very crucial role. With nearly all important routes now electrified, railway's contribution to carbon emission is much lower than road. One of the important strategies for achieving NDC target has been envisaged as increasing railway's market share by attracting freight traffic to rail from road. Despite massive investment in expansion of railway network in last 10 years, railway's market share in freight transport has declined. The National Rail Plan envisions a reversal in declining rail share in domestic freight transport and targets to achieve 45% of freight share by 2030, which seems to be highly ambitious despite the fact that railways has an untapped potential towards achieving the NDC target. This study investigates the challenges in increasing railway's market share, particularly in three important areas namely, freight terminal management and policy, marketing policies and freight revenue and tariff policy.

TERI initiated this two-year study project in January 2021. On account of the challenges arising out of the pandemic it could be completed only in April 2023.

The broad areas chosen for study relate to both supply and demand sides. The first area focusses on terminal development and operations, taking a supply side approach to identify the issues constraining efficient terminal operations. The government's flagship project, 'Gati Shakti' launched in 2021 also emphasises on rapid development of freight and passenger terminals to ensure a seamless movement of passenger and goods across different modes of travel. The second focus area is freight marketing policies, where seven important policies were analysed for understanding the challenges in their implementation from demand side and suggesting remedial measures. The third focus area was freight tariff policies, and their implications for freight demand. These three focus areas are discussed in three volumes of the report.

It is worthwhile to mention here that during last three years from FY 2019 to FY 2022 Indian Railways has performed exceeding well, increasing revenue earning freight loading substantially by 302 million tonnes (MT) and freight transport output measured in billion tonne kilometres by 234 billion. This translates to saving of about 5.82 MT of CO_2 emission during the 3 years as the corresponding truck movement would have resulted in 7.91 MT of CO_2. Railway's carbon emission is roughly one fourth of corresponding emission of road in carriage of freight. This highlights the prominence of railways in India's NDC target and necessitates a modal shift to railways for carrying out domestic freight transportation.

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Acknowledgements

The Energy and Resources Institute (TERI) is immensely thankful to Rocky Mountain Institute (RMI), India for providing a great opportunity to work on the innovative subject of railway freight.

The project team acknowledges the contribution of former railway officers—Mr Mukesh Nigam, Mr Deepak Nath, Mr P B Sharma, and Mr G D Paul—towards reviewing and enriching the study with their valuable suggestions and deep insights of the sector, owing to their long and distinguished careers in railways. TERI expresses deep gratitude to the Railway Board Directorates (Traffic, Commercial, Freight Marketing, and Coaching) for their support and guidance throughout the study.

We would like to extend our appreciation for the various collaborators and industry representatives, who graciously shared their insights and ideas for bettering this study/ for achieving the objectives of this study. TERI would also like to take this opportunity to acknowledge the support of many stakeholders during this project; including zonal and divisional railway officials, station/goods superintendents and related staff, independent consultants, freight terminal operators, and other sector experts.

Lastly, we thank the editorial and design teams at TERI for their contribution in shaping this report to fruition.

List of **Abbreviations**

AFTO	Automobile freight train operator
BOG	Balance other goods
CAG	Comptroller and Auditor General
CAGR	Compound annual growth rate
DFC	Dedicated freight corridor
ERR	Empty return ratio
FFS	Freight forwarder scheme
FYP	Five year plan
GCT	Gati Shakti multimodal cargo terminal
GoI	Government of India
GPWIS	General purpose wagon investment scheme
HDN	High density network
HUN	Highly utilized network
INR	Indian Rupee
IR	Indian Railways
KMPH	Kilometre per hour
KR	Konkan Railway
LSFTO	Liberalized special freight train operator
LTTC	Long-term tariff contract
MoSPI	Ministry of Statistics and Programme Implementation
MT	Million tonne
NDCs	Nationally Determined Contributions
NRP	National Rail Plan
NTKM	Net tonne kilometre
OD	Origin-destination
OR	Operating ratio
PIFS	Pig iron and finished steel
PKM	Passenger kilometre
POL	Petroleum, oil, and lubricants
PSU	Public sector undertaking
RMSP	Raw material for steel plants
RoRo	Roll-on roll-off
RDSO	Research Designs and Standards Organisation
RSR	Rail-ship-rail
RTA	Rail Tariff Authority
SFTO	Special freight train operator
SPTO	Special parcel train operator
STS	Station to station
TEFD	Traditional empty flow direction

1 Introduction

Indian Railways (IR) is the fourth largest rail network in the world with 68,043 route kilometres in 2021–22. Between 1950–51 and 2021–22, IR has increased running track length by 1.7 times, from 51,315 kilometres to 1,02,831 kilometres (summary sheet 2021–22, IR). However, its continued dominance as the backbone of the economy has been waning over years, for both passenger and freight operations (Chaudhury, 2005). Rail share in freight transport has declined steadily from 85% in 1951, to 60% in 1991, and in 2022 it accounted for only 27–28% of total freight movement (GoI, 2022). Under its Nationally Determined Contributions (NDCs) target for 2030, India has committed to reduce the emission intensity of GDP by 45% from the 2005 level. The observed modal shift from a more environmentally friendly mode to polluting modes of transport may pose severe challenges to India's net-zero ambition as well as its efforts to decarbonise transport sector (GoI, 1980).

IR has formulated a National Rail Plan (NRP) (GoI, 2020) that envisions achieving rail share of 45% in freight transport by 2030–31. This requires augmenting its capacity to cater to the future increase in demand for infrastructure. There have been several micro-initiatives as well to attract more passengers to railways by upgrading terminals, introducing premium trains, improving average speed, provisioning of improved passenger amenities, etc. As an interim target towards the NRP goal, IR has envisioned freight loading of 3,000 million tonnes (MT) by 2027 (GoI, 2022).

In order to supplement the goal of achieving a 45% share of railways in freight transport, TERI undertook a detailed commodity-specific study, published in 2019. The report identifies the key factors that resulted in the declining railway shares and further identified six commodities that have the highest potential to shift to railways – automobiles, cement, steel, container, fly ash, and parcels. The study further suggested short to medium-term strategies to facilitate the transition. Building on the findings of the study, TERI undertook the present study focusing on three key pillars of rail freight business – terminal infrastructure, freight marketing policies, and freight tariff structure.

Objectives

This study aims to carry out a multi-dimensional analysis of the issues in rail freight movement, along with providing a few solutions in aiding IR to gain its lost share in domestic freight transport. There are three broad objectives of the study.

1. Analyse operational, commercial, and managerial constraints at freight terminals and suggest solutions for quick release of wagons. It develops a tool for quick identification of bottlenecks affecting freight movement and response there to.
2. Identify issues with with existing freight marketing policies and suggest possible improvements.
3. Assess existing tariff policies and suggest areas of improvements to making rail tariff

more competitive compared to other modes. It also highlights the importance of separation of regulating role from Railway Board to an independent regulator.

It is worth pointing out that while the first objective adopts a supply side approach, while the other two objectives adopt demand side approaches in identifying the issues and recommending the possible solutions.

Section 2 provides a snapshot of the performance of IR over two decades, spanning 2002–03 to 2021–22. Section 3 provides projections of freight demand on IR's network based on past trends. Section 4 concludes with the three objectives in details, key findings and recommendations under each of the three broad objectives.


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2 Performance Indicators of the Indian Railways

In this section key physical and financial performance indicators for both passenger and freight segments are analysed. After its independence, India adopted a centrally planned economic development approach (in the form of Five Year Plan or FYP), which was retired after the end of the 12th FYP. The two decades starting 2002–03 can be grouped in four five-year periods viz., 2002–03 to 2006–07 (10th FYP), 2007–08 to 2011–12 (11th FYP), 2012–13 to 2016–17 (12th FYP), and 2017–18 to 2021–22 (post-FYP phase).[1]

2.1 Physical Performance

2.1.1 Traffic Performance vis-à-vis GDP

The growth rate of passenger movement (passenger kilometre, PKM) as well as freight movement (net tonne kilometre, NTKM) took a hit during the 12th FYP as depicted in Table 1. The poor performance of IR during this FYP, despite a consistently high growth rate of the economy, indicates a gradual decoupling of GDP and traffic performance.

It is evident from Figure 1 that, starting 2012–13, the growth rates in rail traffic started to exhibit departures from GDP's growth.

Freight movement during the post-FYP phase (2017–18 to 2021–22) improved considerably. Thus, despite the pandemic, IR could reverse its declining trend in growth. Figure 2 provides the monthly trend in NTKM and tonnage during 2019–20, 2020–21, and 2021–22. A countrywide lockdown was imposed starting March 25, 2020 owing to the spread of the pandemic in India and was in effect till May 31, 2020. The lockdown phase was associated with drop in economic activities, power demand, as well as consumption; evident from the drop in NTKM and tonnage in April 2020. From June 1, 2020 the restrictions were gradually lifted in six phases that lasted till December 31, 2020 and economic activities and passenger movements restarted. Freight loading and NTKM reached pre-lockdown levels (March, 2023) by September, and have grown thereafter.

Growth in passenger movement has been declining steadily after reaching its peak in 2006–07 (Figure 1). This has led to a plateauing PKM since 2013–14 and peaking at 1178 billion in 2017–18 (Figure 3). Although, the passenger segment was severely affected by the pandemic, reaching an all-time low of 231 billion PKM in 2020–21, it has improved considerably to 590 billion in 2021–22 after the restrictions were gradually withdrawn.

Table 1: Growth rates of NTKM, PKM, and GDP during 2002–03 to 2021–22

Time Periods		CAGR (%)		
		NTKM	PKM	GDP
10th FYP	2002–03 to 2006–07	7.9	7.8	8.2
11th FYP	2007–08 to 2011–12	6.3	8.0	7.4
12th FYP	2012–13 to 2016–17	–2.7	1.2	7.3
Post-FYP phase	2017–18 to 2021–22	5.9	-15.9	2.6

CAGR– Compound annual growth rate.
Note: India discontinued the FYPs after the end of 12th plan. GDP is measured at constant 2011–12 prices
Source: TERI's estimates, based on data sourced from National Accounts Statistics, Ministry of Statistics and Programme Implementation (MoSPI); and Annual Statistical Statements, Indian Railways

[1] Post-FYP phase is a generic term used in this report to denote the years between 2017–18 and 2021–22, corresponding to the five years after the end of the practice of centrally planned economic development. In some of the figures the terminal year (2001–02) of the 9th FYP has also been included for comparability.

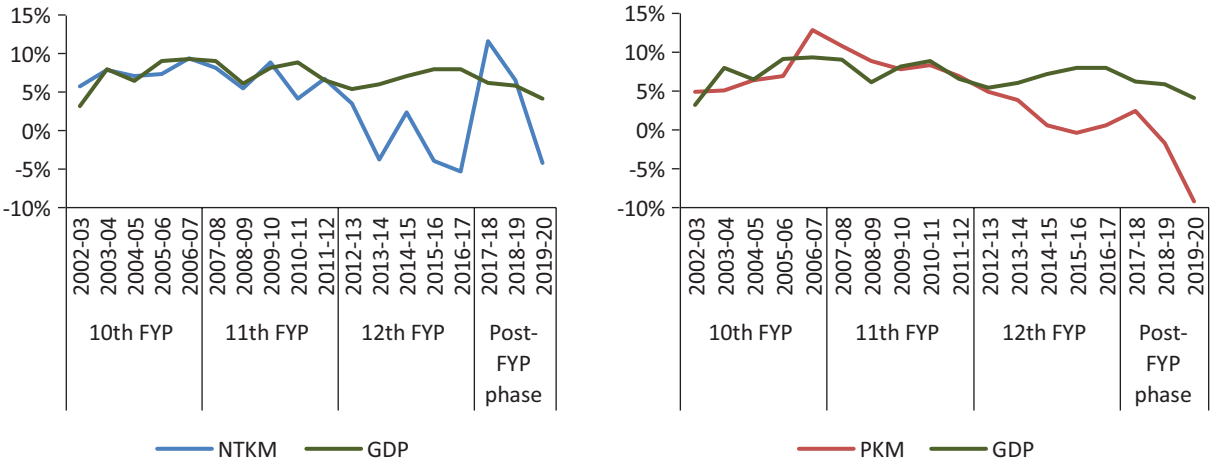

Figure 1: Annual growth rates of NTKM, PKM, and GDP

Note: 2020–21 and 2021–22 have been dropped due to the abnormalities introduced by COVID-19
Source: TERI's estimates, based on data sourced from National Accounts Statistics, MoSPI and Annual Statistical Statements, Indian Railways

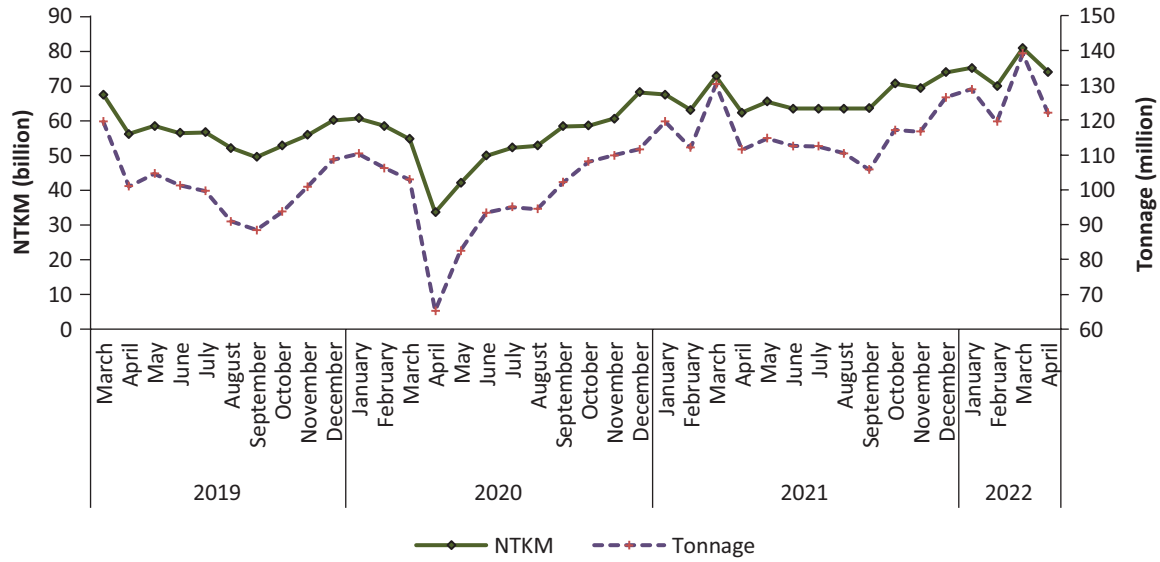

Figure 2: Monthly freight movement during 2019–20 and 2021–22
Source: Indian Railways

Figure 4 depicts the monthly trend in the number of passengers during 2019–20, 2020–21, and 2021–22. Lockdown restrictions during April and May resulted in no revenue earning passenger movements. Apart from this, passenger traffic dropped sharply in February and March as well, since people started becoming cautious about travel, due to the spreading pandemic in India. The pandemic has severely affected the passenger business of IR: it has so far reached around 68% of the passenger traffic even after two years of the pandemic (484 million in March 2022, compared to 715 million in January 2020).

Railway is evidently more environmentally friendly as a mode of transportation, but the slowdown of traffic growth—particularly failing to keep pace with economic activities, may have serious consequences for overall emission from transport activities.

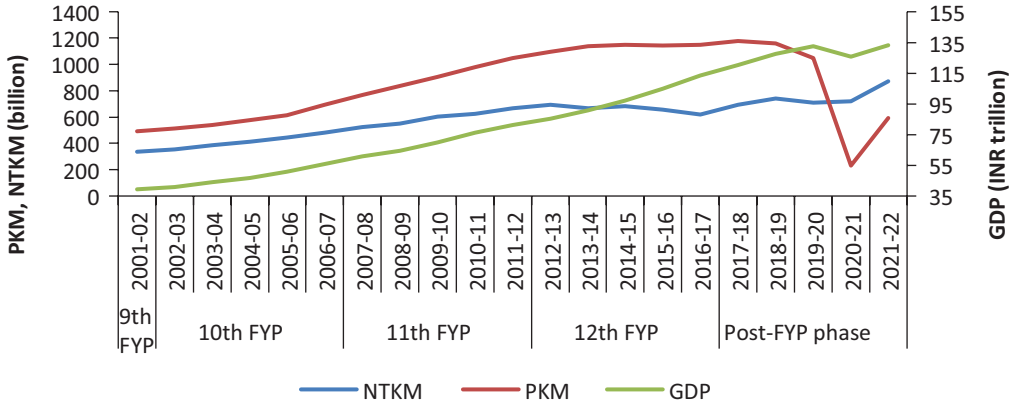

Figure 3: Movements in freight and passenger traffic and GDP
Source: National Accounts Statistics, MoSPI; and Annual Statistical Statements, Indian Railways

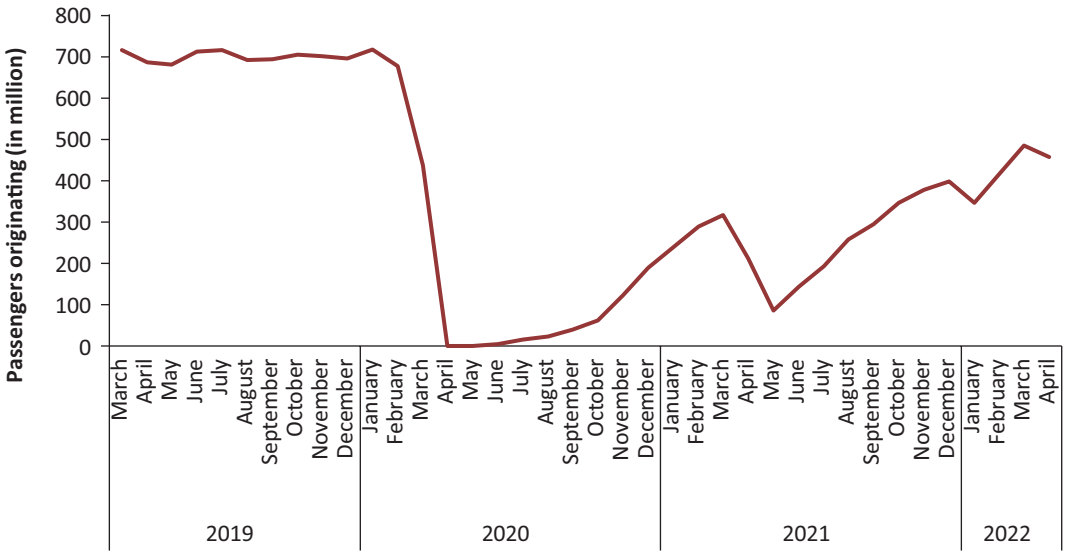

Figure 4: Monthly trend in passenger movement
Source: Indian Railways

2.1.2 Freight Traffic: Commodity-wise Analysis

IR has been successful in increasing freight loading on its network. In 2022–23 it crossed the milestone of 1,500 MT annual freight loading, registering a growth of 7% over the previous year (reaching 1,512 MT). However, the average lead has been declining as seen from Figure 5, particularly in last decade. Historically, with increasing industrialization, manufacturing and consumption centres started moving closer to each other causing a decline in lead. Further, economic liberalization and withdrawal of the uniform pricing system in cement and steel also changed freight movement patterns.

Different commodities exhibit different growth trajectories. There is a considerable variation in average lead and NTKM of different bulk commodities, as shown in Figure 6. For instance, during 2007–08 and 2021–22, average leads for coal, containers, and bulk other goods (BOG) have declined at -2% CAGR,

but on an average coal constitutes 47% of total loading, while the latter two contribute 12%. Average leads for food grains and fertilizers have increased. While cement and mineral oils show stable lead, coal shows the most prominent decline in lead during 2007–08 and 2021–22.

The declining trend observed (for all the commodities combined, in Figure 5) in the last two decades is mainly due to the declining lead observed for coal, accounting for 33–48% and 42–50% of NTKM and tonnage, respectively. It is concerning that despite the steady increase in its loading, coal exhibits

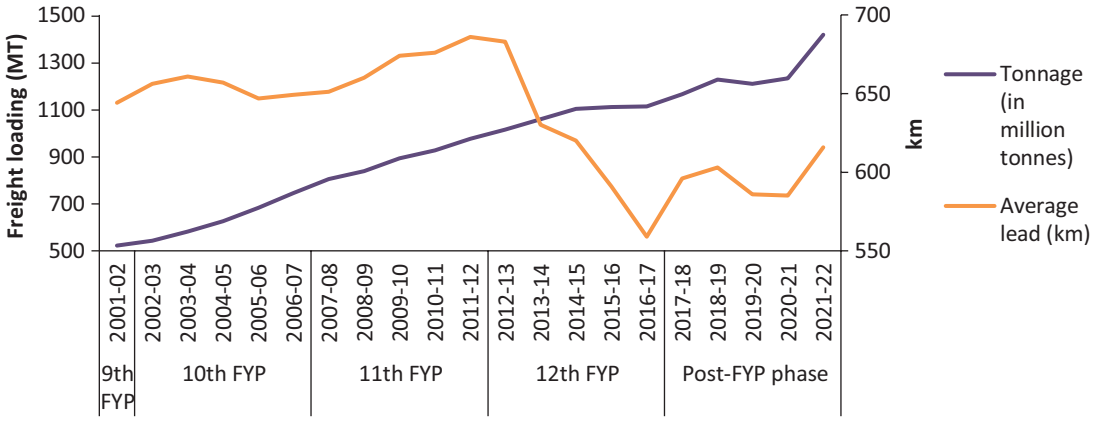

Figure 5: Freight traffic trends
Source: Annual Statistical Statements, Indian Railways

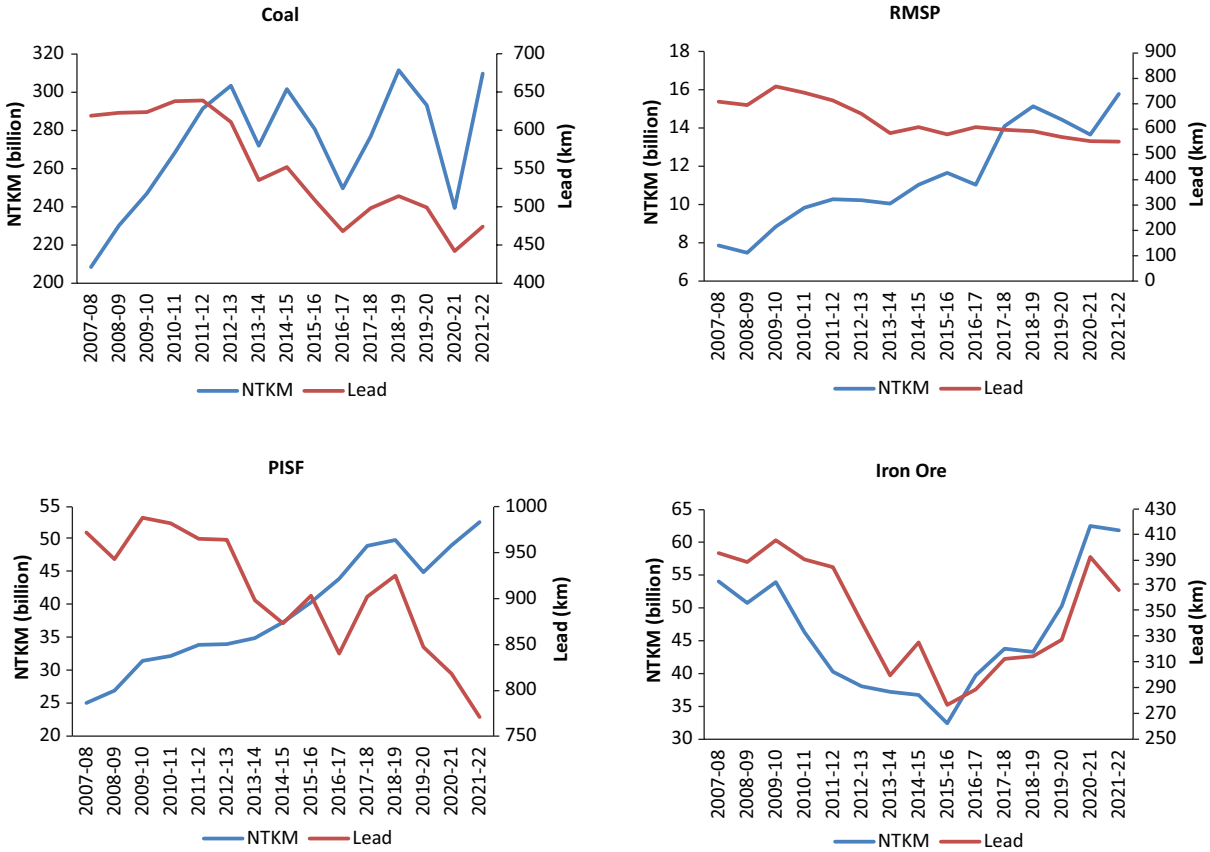

Figure 6: Commodity-wise trends: leads and NTKM

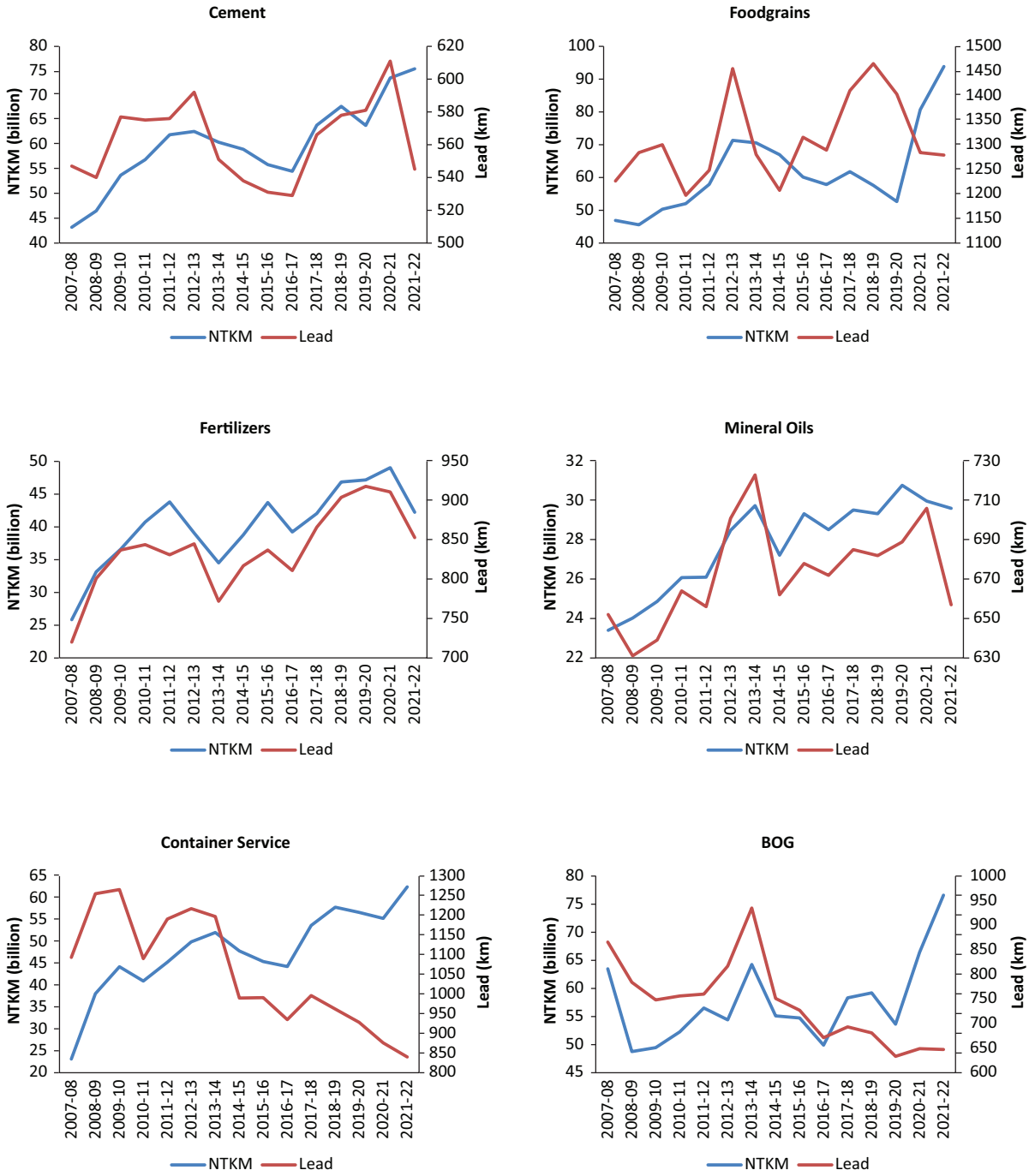

Figure 6: Commodity-wise trends: leads and NTKM

RMSP– Raw material for steel plants; PIFS– pig iron and finished steel; BOG– balance other goods
Notes: IR changed the classification of commodities starting 2007–08
Source: Annual Statistical Statements, Indian Railways

fluctuating movements in NTKM which introduces volatility in IR's revenue.

2.1.3 Current Status of Operational Parameters

Table 2 lists the decadal changes in several operational parameters for IR. The decade 2000–01 to 2010–11 has shown remarkable increase in freight loading (and NTKM) as well as in operational parameters like wagon utilization and wagon on run time. However, relatively smaller increases in speed, route length and wagon numbers were observed.

For the second decade, from 2010–11 to 2019–20, route length and wagon count has increased. The increase in freight loading is also noticeable, but comparatively lower than the growth achieved in the previous decade.[2]

It can be observed from columns 3 and 4 that in the decade starting 2010, despite an increase in number of wagons, wagon km per wagon day as well as wagon run have come down. Concurrently, wagon turnaround time has increased. These indicate underutilization of wagons in last decade. So, the wagons have potential to load more but there are issues with their proper deployment, or there is a demand shortfall of the available types of wagons. This requires a more in-depth study and is beyond the scope of present work.

2.2 Financial Performance

2.2.1 Operating Ratio and Revenue

IR is among the largest employers in the world employing 1.2 million workers (Summary Sheet 2021–22, IR) and has been associated with increasing overhead costs that reduces its competitiveness vis-à-vis other modes of transport. Increasing expenditure (with growing burden of overhead costs) and slowdown in revenue mobilization is reflected by the increasing trend in its operating ratio (OR). OR indicates the amount of money IR spends to generate revenue of INR 100. It is expressed as a percentage. There is a negative relationship between OR and financial performance, a higher OR indicates relatively worse financial performance.

Table 2: Operational parameters – comparing two decades

Parameters	2000-01	2010-11	2019-20	% change between 2 and 3	% change between 3 and 4
(1)	(2)	(3)	(4)	(5)	(6)
Route length (km)	63,028	64,460	67,956	2.27	5.42
Number of wagons	2,22,193	2,29,997	2,93,011	3.51	27.40
Freight loading (MT)	474	922	1,208	94.66	31.10
Freight NTKM (billion)	312	626	708	100.31	13.10
Average freight train speed (kmph)	25.4	27.2	23.6	7.09	-13.24
Wagon km per wagon day (broad gauge)	179	262	189	46.37	-27.98
Wagon turnaround in days (broad gauge)	7.5	5.0	5.3	-33.73	6.64
Hours run per day (hours) (wagon run)	7.0	9.6	8.0	36.68	-16.99

Source: Indian Railways Yearbooks

[2] 2020–21 was not considered as the end-point as the year was severely affected by COVID-19 pandemic and would have portrayed misleading decadal trends.

Financial performance based on OR can be classified under four categories as depicted in Table 3.

Table 3: OR and financial performance classification

OR Range (%)	Financial Performance Classification
< 70	Good
70 - < 80	Satisfactory
80 - <90	Concern
≥ 90	Serious concern

Source: TERI's classification

Historically, IR achieved best OR of 74.7% in 1963–64. The 10th FYP phase was a golden period for IR as it reduced the OR to 78.7% by 2006–07, from 96.6% in 2001–02. In recent years, IR achieved the lowest OR of 75.9% in 2007–08. But, since then the OR has been growing continually and has remained above 90% (Figure 7). Alarmingly, OR breached the 100% threshold in 2021–22.

Further, the Comptroller and Auditor General (CAG) of India has raised concern about the underestimation of OR by IR on multiple occasions. CAG (2021) for example indicates that for 2019–20 "…the OR of 98.36% shown by the Railways does not reflect the true financial performance of the Railways" because if the actual amount of pension expenditure appropriated to the Pension Fund was considered, the working expenses would have increased further, taking the OR to 114.35%. It is apparent from the trend of last 15 years that aspiring to keep OR below 90% (between 80 and 90%) has become the new normal for IR, and an OR between 80 and 90% seems to be considered 'satisfactory' by IR.

IR sources majority of its revenue from freight movement as its passenger segment is subsidized under the 'social service obligation' of the government. Freight earnings on average contributes to 70% of traffic revenue, though in 2020–21 IR sourced 88% of its revenue from freight. As seen in Figure 8, IR has managed to increase its earnings from traffic except for last three years (of which the last two years mark the COVID-19 pandemic), yet, traffic revenue growth rate has been declining. Revenue fell by 22% in 2020–21 compared to 2019–20 due to the ensuing pandemic, and rebounded in 2021–22, growing by 22%.

The cumulative revenue from freight operations during the 10th FYP was INR 2,583 billion and has grown in every subsequent phase, reaching INR 4,268 billion during the post-FYP phase. Revenue from passenger operations was INR 1,168 billion during the 10th FYP. It reached its peak at INR 1,711 billion during the 12th FYP, but fell considerably to

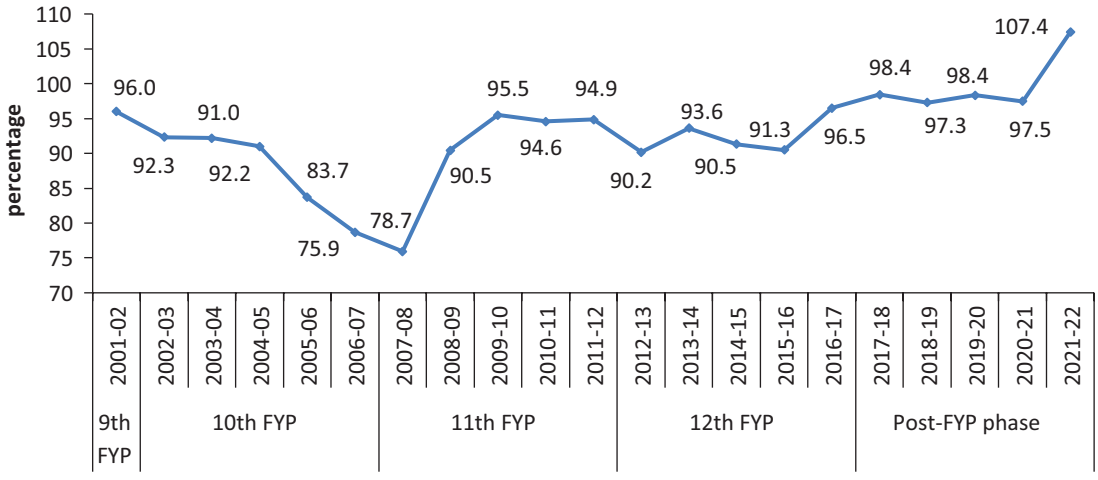

Figure 7: Operating ratio

Source: Annual Statistical Statements, Indian Railways

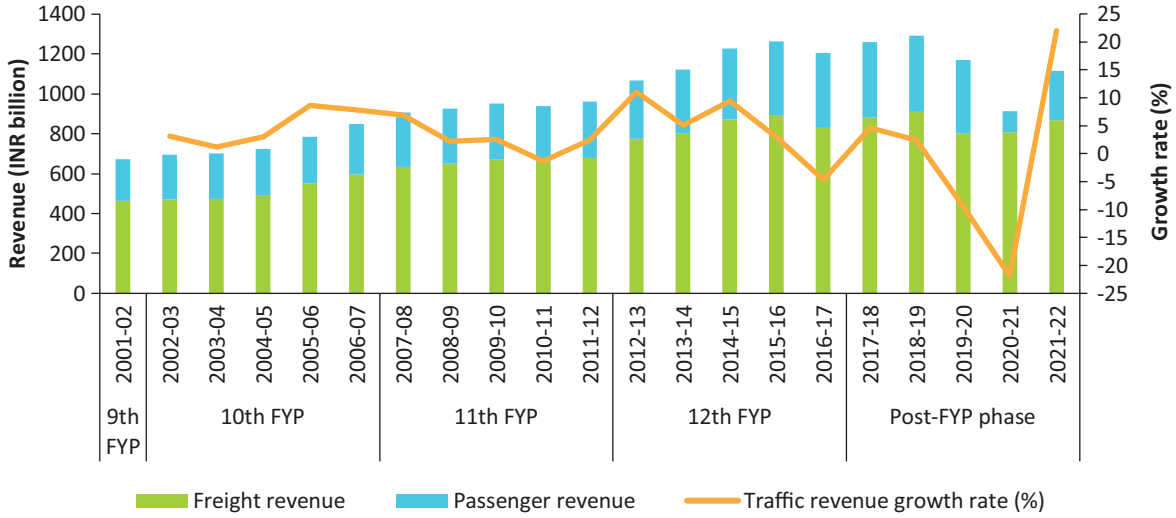

Figure 8: Trends in traffic revenue (at constant 2011–12 prices)
Source: Annual Statistical Statements, Indian Railways

INR 1,475 billion during post-FYP phase, owing to the pandemic. The impact of the pandemic on passenger operation of IR is visible from Figure 9.

The quinquennial growth in earnings from freight (in real terms) has slowed down considerably as indicated in Table 4. It is also concerning that the growth rates of NTKM and PKM were generally much higher than the growths in earnings.

It has been observed that despite the increase in freight rates at current prices, the average freight rates–adjusted for inflation–for all commodities except coal are showing a declining trend post 2015–16 (Figure 10).

Historically, IR has been sourcing its major share of freight revenue from coal transport. In 2002–03, coal contributed to 44% of IR's earnings from freight traffic.

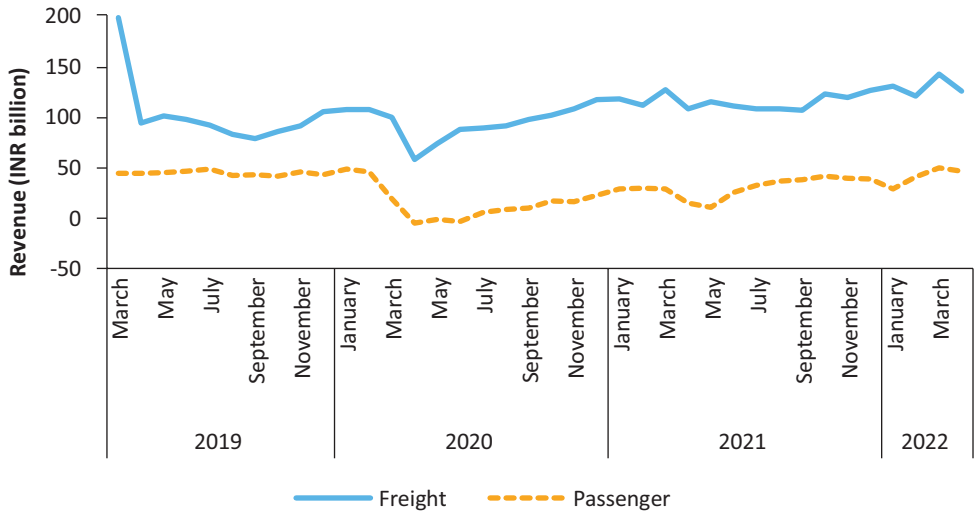

Figure 9: Trends in monthly revenue

Note: Negative passenger revenue was on account of outflow from IR on account of refunds against the cancellation of tickets
Source: Indian Railways

Table 4: Quinquennial CAGR of earnings and GDP

Time Periods		CAGR (%)		
		Freight Earnings	Passenger Earnings	GDP
10th Plan	2002–03 to 2006–07	6.2	2.7	8.2
11th Plan	2007–08 to 2011–12	1.6	1.1	7.4
12th Plan	2012–13 to 2016–17	1.6	6.6	7.3
Post-FYP phase	2017–18 to 2021–23	-0.3	-10.3	2.6

Note: Earnings are calculated at 2011–12 constant prices

Source: TERI's estimate

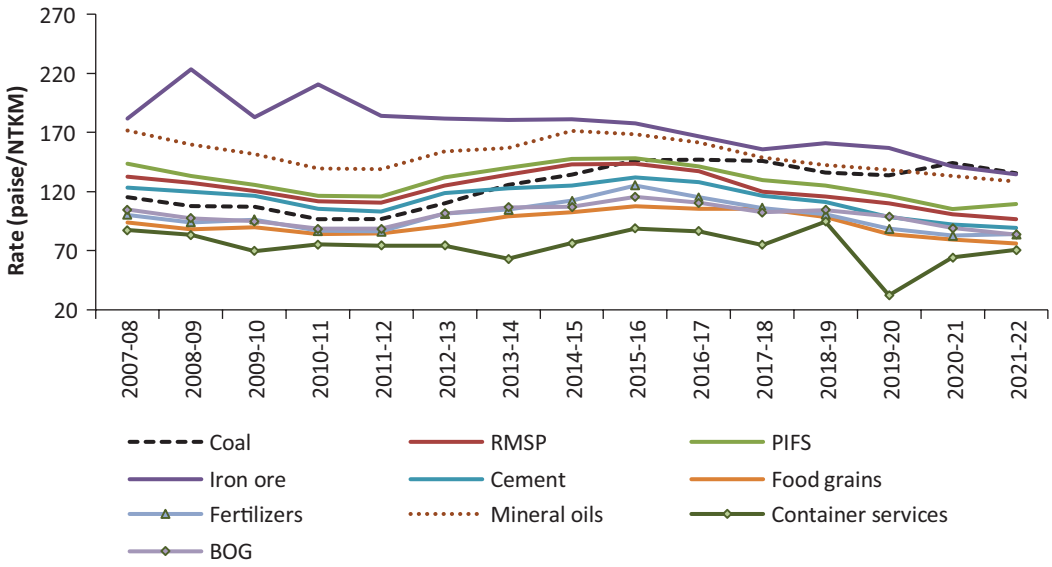

Figure 10: Trends in average freight rate (constant 2011–12 prices)
Source: TERI's estimate

It fell to 38% in 2007–08 and has grown thereafter. The peak in the last two decades was achieved in 2019–20 when it reached 49% share. In 2020–21, the share of coal in freight revenue fell to 43%, but increased to 47% in 2021–22 which can be associated with economic recovery.[3] The share of revenue from coal shipment to thermal power plants has been declining for quite some time, but still accounts for more than half of total revenue from coal.[4]

Growing (and high) dependency on coal shipments for revenue and a high share of freight operations, indicates the inability of IR to diversify its revenue sources for its freight operations. A part of it is linked to an 'implicit' obligation in giving preference to coal shipment (for thermal power stations and core sector industries) at the cost of other freight operations, thereby reducing the capacity of railways to carry other commodities. This may have serious implications for the overall revenue from freight operations in future, when the requirement of coal gradually diminishes with phasing out of coal based thermal power plants. The Ministry of Power, GoI in January 2023 has directed the use of 'Rail-Ship-Rail' (RSR) mode of coal transport for thermal power plants located in the states of Gujarat, Rajasthan,

[3] It is to be noted that 2020–21 marks the onset COVID-19 pandemic and the nationwide lockdown.
[4] Calculated using annual data on revenue earning and NTKM, available from Statement 13 of the Annual Statistical Statement (various issues), Indian Railways.

Maharashtra, and Punjab. This may further reduce the revenue generation from coal transport for IR albeit increasing the cost of electricity generation: through a higher freight cost and losses associated with longer multi-modal transportation.

2.2.2 Expenditure on Infrastructure

IR has provided a push for infrastructure upgradation in the form of accelerated electrification of tracks, gauge conversion, and doubling of tracks. These upgradation works play a key role in increasing efficiency by providing seamless haulage of trains.

In recent years, along with continued track renewal activities, high emphasis is being given on track electrification and line doubling (Figure 11). Electrification of the entire railway network is crucial not only from the energy perspective, but also because continuous electrification eases rake haulage by eliminating the need for change of locomotive in between the transit. Gauge conversion has also resulted in facilitation of seamless haulage. The expenditure for line doubling, new lines, electrification, and line renewals has been continuously increasing since 2014–15, and as majority of sections now have been converted to broad gauge; expenditure on gauge conversion is declining (Figure 11).

Of the entire rail network, 96% has been converted to broad gauge and 74% has been electrified by March 2022 (IR Yearbook 2021–22). The provision of double/multiple lines on busy sections has facilitated smooth passage of passenger as well as freight trains. The provision of new line has been on decline comparatively. To optimize further the operations, IR has envisioned line capacity upgradation works for 37,891 km under the 'Mission 3000 MT by 2027'.

Investment in traffic facilities and yard remodelling is extremely important but are relatively least cost intensive. However, based on the distribution of infrastructure expenditure (on line capacity works) as depicted in Figure 12, it can be said that these are not being paid the same kind of attention as before. Apart from being a very minuscule expenditure, their allocation percentage has been declining since 2008–09. There has been a growing focus on to doubling lines and route electrification, particularly in the post-FYP phase.

While a rake spends a vast majority of its time on tracks, substantial time is also spent at loading and unloading locations due to various constraints at freight terminals. It is high time that IR upgrades the capacities of freight terminals to optimize operations.

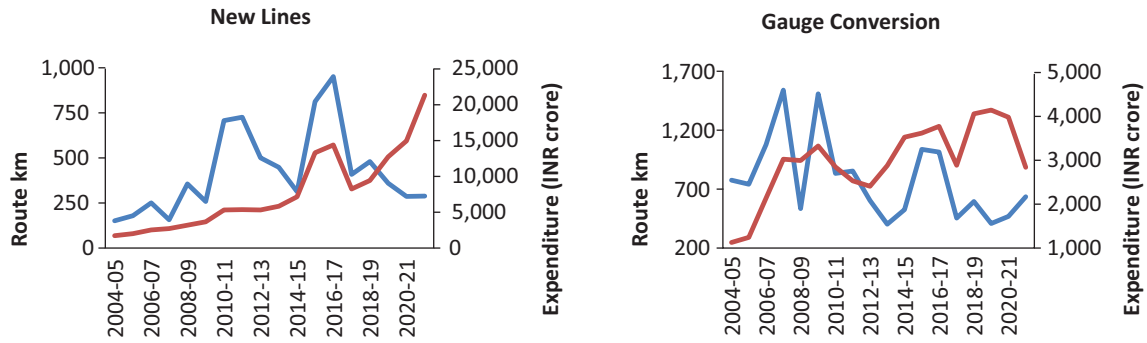

Figure 11: Annual capacity upgradation works
Source: Annual Statistical Statements, Indian Railways

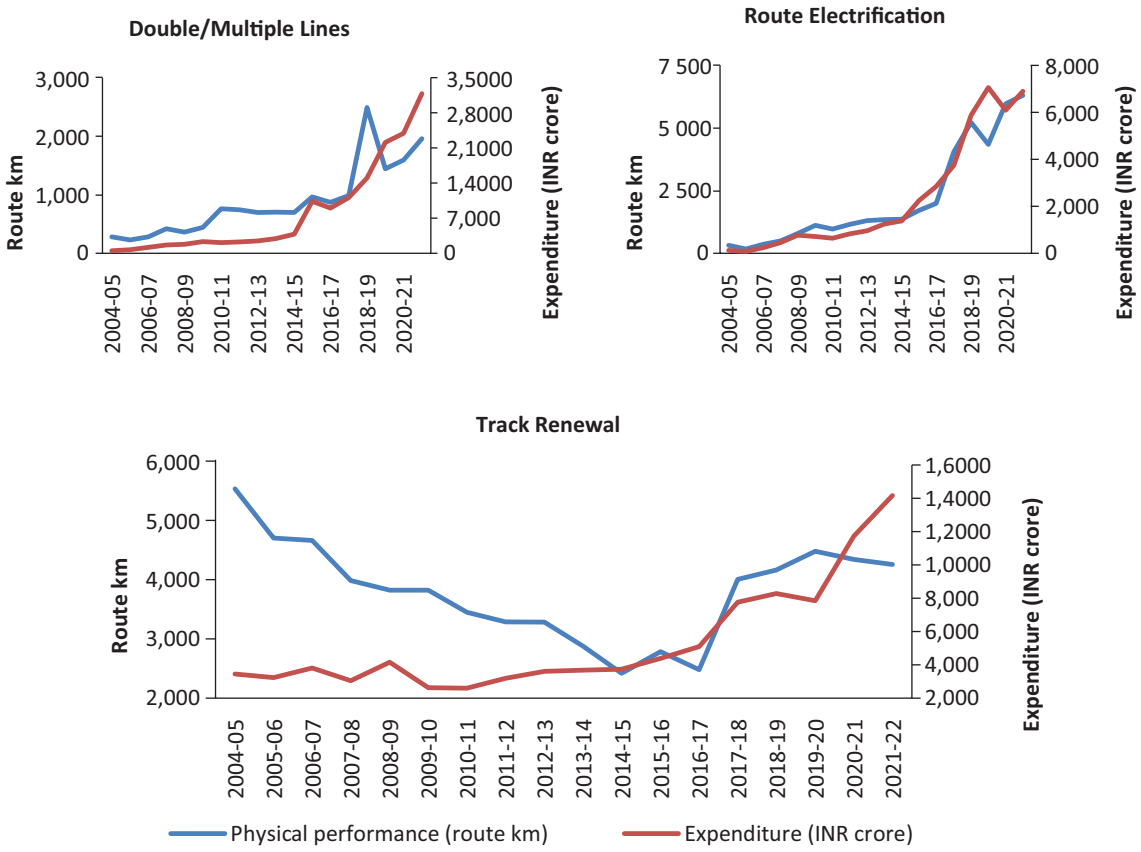

Figure 11: Annual capacity upgradation works
Source: Annual Statistical Statements, Indian Railways

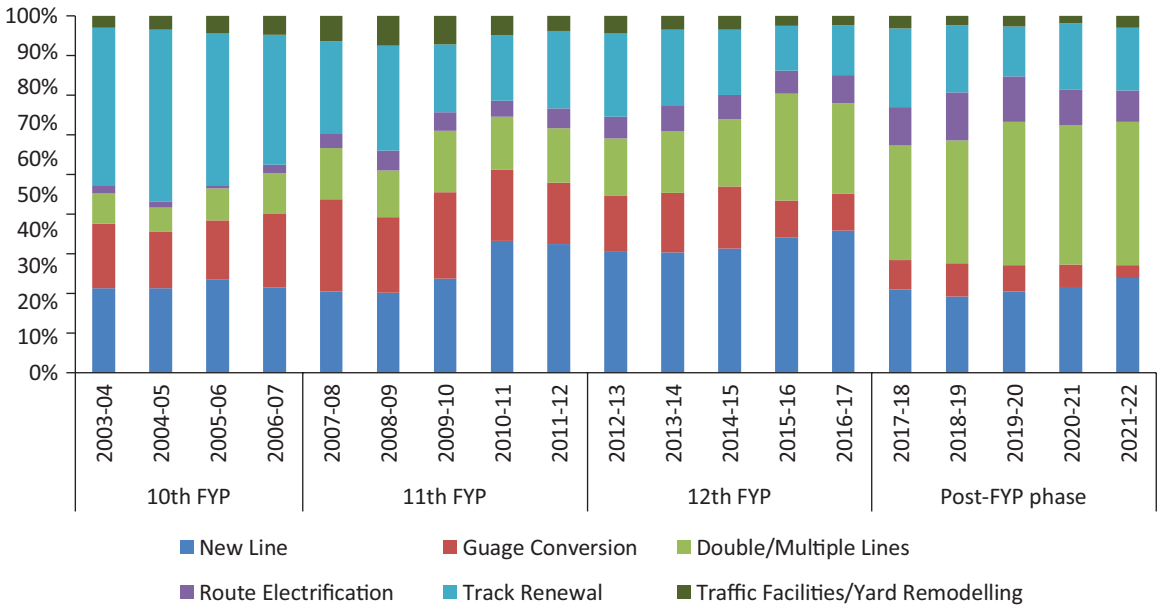

Figure 12: Percentage distribution of expenditure on infrastructure
Source: Annual Statistical Statements, Indian Railways

3 Freight Demand Projection on the Indian Railways

Total freight traffic in India is expected to grow at 7% per annum to reach over 15.6 trillion NTKM by 2050 from about 3 trillion NTKM in 2020 (GoI, 2022). The NRP target requires augmenting capacity to be able to handle annual freight loading of 3,600 million tonnes (MT) by 2030–31 and also to support an intermediate target of achieving 3,000 MT annual freight loading by 2027 (GoI, 2020).[5] This section provides projected annual freight loading and transport output (NTKM) for IR till 2030–31 to validate the feasibility of achieving the said targets based on past performance of IR over last three decades.

Figure 13 depicts the estimates of annual freight loading till 2030–31 along with the observed freight loading during 1990–91 to 2020–21. The projections are based on three different models from 2021–22 to 2030–31. Model1 estimates freight loading on the basis of a linear relationship between freight loading and GDP, both measured in logarithmic scale. Model2 estimates freight loading based on a linear relationship between freight loading and sectoral GDP (of agriculture, industry, and construction), both measured in logarithmic scale. Since 1970–71, IR achieved the highest compounded annual average growth rate (CAGR) of freight loading during 2000–01 and 2009–10, at 7%. As an optimistic scenario, Model3 uses 7% CAGR in its prediction. As depicted by Figure 13, the estimated annual freight loading fails to meet the set target.

Predictions based on the relationship between annual freight loading and economic activity, during 1990–91 and 2020–21, indicate (see Figure 13) that the annual freight loading on IR's network is likely to range between 2,007 MT and 2,113 MT,

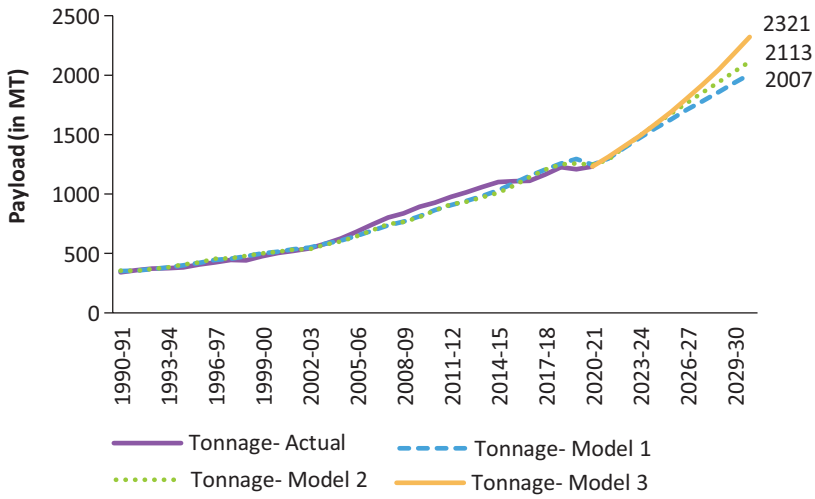

Figure 13: Freight loading projections–Indian Railways
Source: TERI's estimate

[5] GoI, 2022, pp. 1–2.

which is significantly less than the annual loading target of 3,600 MT. Even in the scenario of 7% CAGR (the maximum CAGR experienced by IR in last five decades) during 2020–21 and 2030–31, annual freight loading is projected to reach 2,321 MT by 2030–31. IR has achieved freight loading of 1,416 MT in the year 2021–22 (IR Yearbook 2021–22). To reach the target of 3,600 MT by 2030–31, freight loading by IR needs to grow annually (CAGR) by 11%, which is considerably higher than its past achievements. Between 2021–22 and 2022–23 IR in fact achieved 7% growth in its loading to reach 1,512 MT in 2022–23.

Similarly, the freight movement (in NTKM) on IR network can also be predicted and has been depicted in Figure 14.

Model 1 and Model 2 predictions are based on the relationships between NTKM and GDP and NTKM and sectoral GDP (of agriculture, industry, and construction), respectively, both in logarithmic scale. As an optimistic scenario, Model 3 uses 7% CAGR of NTKM (highest achieved by IR) in its prediction for 2020–21 till 2030–31. IR can almost double the freight movement by 2030–31 from 2020–21 level (Model 3) if it achieves a CAGR of 7% during 2020–21 and 2030–31. Assuming a CAGR of 11% during 2021–22 and 2030–31, IR can reach freight movement of 1,998 billion NTKM in 2030–31 from its present freight demand of 871 billion NTKM in 2021–22 (IR Yearbook 2021–22).

The above analysis indicates that market-forces alone will not be able to help IR in achieving an annual freight loading target of 3,600 MT by 2030–31, unless IR provides a significant upward push to the trend through policy interventions. IR needs to transform its business strategies that include a host of things: proactive marketing strategies; aggressive penetration in non-traditional transport market of non-bulk commodities; market-driven tariff policies; and prioritizing its investments in low-cost operational improvements like terminals that give immediate benefits, etc. Due to over-reliance (more than 70%) on coal, cement, iron ore, and steel for tonnage and revenue, improvements in future loading will be contingent upon the performance of these sectors.

In other words, for achieving the 3,600 MT annual freight loading target by 2030–31, IR requires an overhaul of the existing system to meet the prospective demand in view of stiff competition from other modes of transport. This also necessitates sustained efforts for rationalisation and liberalization of the freight market of IR, in tandem with modernization of the governing framework.

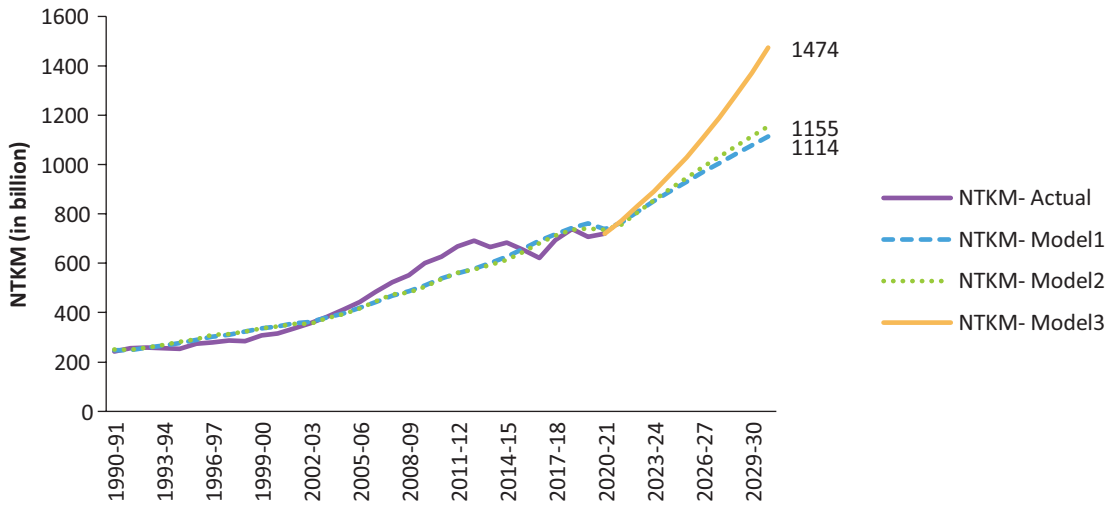

Figure 14: Freight movement (NTKM) projections– Indian Railways

Source: TERI estimate

4 Findings and Recommendations

The main objective of this three-volume report is to identify some of the challenges plaguing Indian Railways' (IR) growth potential in freight operation and recommend correctives. This section summarizes the key findings of the report and provides recommendations under the three focus areas viz., terminal operations and development, freight marketing policies, and rail freight tariff policies.

4.1 Terminal Development and Operations

The overall objective of the volume is to understand the capacity constraints experienced at the freight terminals as well as during freight movement. The key area of the study focuses on unloading terminals of IR. It aims to understand the infrastructural and operational constraints relating to freight terminals of IR. Further, it attempts to identify the issues and provide feasible solutions to optimize the freight terminal performance along with leveraging private investments for increasing terminal capacity.

4.1.1 Findings

- **Underutilized freight terminals**
  - The freight traffic on IR is facilitated by around 3,200 freight terminals across the country. Till 2022, IR had developed 2,001 goods sheds; 1,086 sidings; and 72 private terminals. Recently, 25 Gati Shakti Multimodal Cargo Terminals (GCT) were also sanctioned.
  - While sidings account for 34% of total freight terminals, 68% of freight traffic (both for loading and unloading) is handled by sidings. Goods sheds, having 63% share in terminals, account for only 21% traffic.
  - Rail freight terminals are capital intensive and an average one-line terminal can handle 15 rakes per month, translating to 180 rakes per year. Looking at the current throughput of railway freight terminals, only 47% of terminals handle more than 100 rakes per year, signifying the underutilization of capacity created.

It is interesting to note, 58% of sidings and only 33% of goods sheds handle more than 100 rakes per year; pointing at the operational inefficiency and viability of freight terminals.

- **Terminal development policies yet to reach their potential**
  - Starting from operation of goods sheds and policy for sidings, to GCTs, railways have introduced different business models to attract private players to invest and operate freight terminals. The high capital cost of infrastructure development, land availability, long and complex application/approval procedures, and small incentives have altered the involvement of private players in terminal operations.
  - As public sector undertakings (PSUs), mines, and large industries have constant high demand of freight transport, the Siding Policy is very well adopted. However, constraints with land availability and high capital cost have been the key issues. With the development of trucking industry, development of siding has experienced a decline.
  - The policy on Private Freight Terminal was amended time-to-time to attract more players and many revisions for application fees and other charges were made. However, complex application and approval procedure, poor revenue sharing model, and high capital cost resulted in poor adoption of the policy.

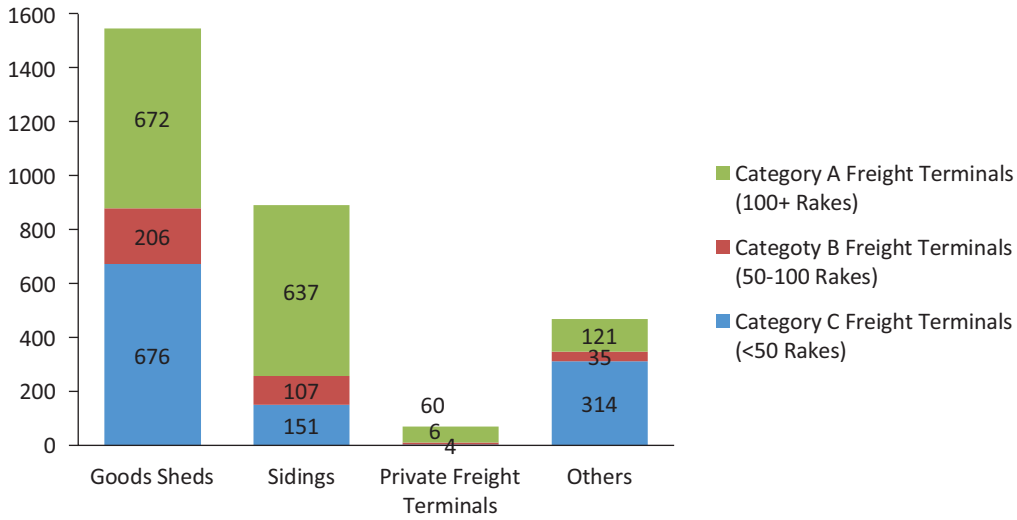

Figure 15: Freight terminal utilization
Source: IR, analysed by TERI

» Policy on Development of Goods Shed at Small/ Road Side Terminals is well taken, as the cost of developing rail infrastructure is eliminated. As the capital cost comes down, small players can also participate in the policy and contribute to the rail freight business. Longer agreement period may boost the policy uptake.

» GCT Policy is one of the most ambitious policies developed by IR. The Policy has mandated a fast application and approval procedure with reasonable charges. The policy also offers railway land on lease for terminal development. However, the clauses related to sharing of infrastructure with other users and transfer of ownership rights of infrastructure developed on railway land are of concern. Some incentives for terminals developed on private land may encourage more investment.

➢ **Freight train speeds come down by 45–50% due to stabling and detention enroute**

» High Density Network (HDN) and Highly Utilised Network (HDN) collectively account for 41% of the network, but they carry 81% of freight traffic. These routes also have very high passenger train movement, and as passenger trains are given preference over freight trains, turnaround time of freight trains has increased.

» As the freight trains are stabled or detained in-route for the passage of passenger trains, their average speed reduces to half. However, a Dedicated Freight Corridor (DFC) offers continuous average speed of 40 kmph and shorter transit time as no conflict of preference arises.

➢ **Freight trains suffer detention ranging 2–6 hours at junction stations**

» Junction stations are connected with three or more number of lines and facilitate exchange of a high number of trains. As passenger trains are timetabled and given first preference, freight trains wait at/before junction stations for want of path.

» As a case study, TERI analysed the average detention at key junctions on the Delhi-Howrah route. Deendayal Upadhyay, Kanpur Junction, and Gomoh have average detention times of 7.5, 7, and 6.5 hours, respectively. Prayagraj, Dhanbad, and Gaya experience an average detention of 2 hours.

» Higher detention time directly adds up to the turnaround time and decreases the efficiency.

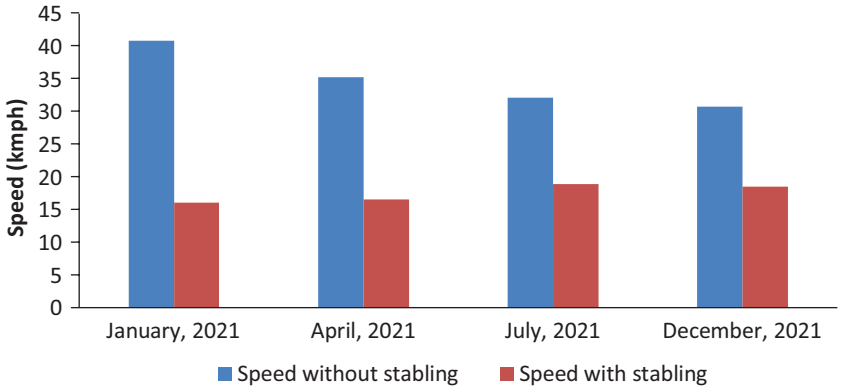

Figure 16: Average speed on IR network–with and without stabling
Source: IR, analysed by TERI

- **Rationalisation orders work as means of additional revenue generation, instead of optimizing haulage**
  - » Rationalisation can be explained as re-routing of freight traffic on the shortest route to a different route in order to avoid the over-utilized line sections. The key motive of rationalisation orders is to optimize line capacity utilization across the network of IR. Insufficient and heavily utilized line infrastructure, requirement of reversal, sharp curvatures, and high gradients are some of the key drivers of the rationalised routes.
  - » Most of the rationalisation orders have resulted in an increase in the travel distance by 30–60%, resulting in higher freight and higher transit time. In addition to that, the speeds offered by rationalised route are less than that of the shortest/conventional route for 50% of analysed routes.
  - » In many cases, even after the capacity upgradation work has been carried out, the routes are not de-rationalised; and the traffic continues to travel by the rationalised section. Instead of increasing the operational feasibility, the rationalisation orders may then induce a modal shift for certain routes and commodities. Out of 42 rationalised routes, 20 routes are in practice for more than 10 years.
  - » Rake movement on 31 identified origin-destination (OD) pairs was monitored for a period of 6 months (April–September 2022). For only 7% ODs, the entire rakes were carried via the rationalised routes. Moreover, for almost 50% ODs, no rakes were moved via the rationalised route.
  - » Here, the customer suffers with late delivery of goods along with monetary losses as freight is charged via the rationalised route.
- **High terminal detention time indicating inefficient terminal operations**
  - » Terminal detention time also plays a key role in increasing total turnaround time. Inefficient handling of goods at loading and unloading terminals often hampers the regular cycle of traffic movement and results in pending indents or restrictions.
  - » On an average rakes spend 14–17 hours at a freight terminal; optimizing the freight terminal operations will help optimizing the turnaround time.
  - » A number of different parameters like, indirect placement or placement in spurs, manual handling of goods, poor wharf and circulation area, lack of storage space and basic amenities, restrictions on vehicle movement, etc., contribute to longer terminal detention time. Such constrains not only impact

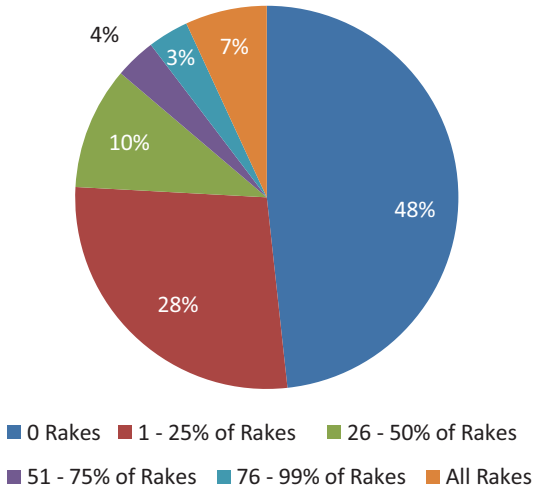

Figure 17: Share of rakes moved via the rationalised routes
Source: IR, analysed by TERI

performance of the railways, but also create negative perception among the shippers. Comprehensive planning and upgradation works are needed to ensure the efficient terminal operations.

➢ **High pending indents in loading zones**

» When the wagon demand raised by the shippers is not met, the number of wagons that remain to be serviced are termed as pending indents. Though IR is constantly investing in more rolling stock, indent demand is often not met within the desired time.

» Higher loading zones South East Central Railway, Eastern Railway, East Coast Railway, East Central Railway, and Central Railway have the highest number of pending indents. Commodities like coal, iron ore, cement, food grains, etc. have the highest number of pending indents.

» Shortage of wagons and poor wagon management result in high pending indents. Many times, poor loading mechanism and restrictions at unloading terminals also lead to high pending indents.

➢ **Poor unloading and evacuation of goods resulting in high restrictions**

» Restrictions denote the inefficiency of freight terminals. Though sidings handle two-thirds of the traffic, goods sheds account for two-thirds of restrictions; pointing towards scopes for capacity and infrastructure upgradation works at freight terminals.

» 80–85% of restrictions are because of 'poor release and heavy pipeline' denoting constrained terminal handling.

» Several reasons, depending on the terminal location and commodities handled, play role in a longer detention times/restrictions.

» Objective assessment of terminals needs to be undertaken to identify the key cause of high restrictions.

» Customer feedback system needs to be developed to understand key issues faced at terminals by them.

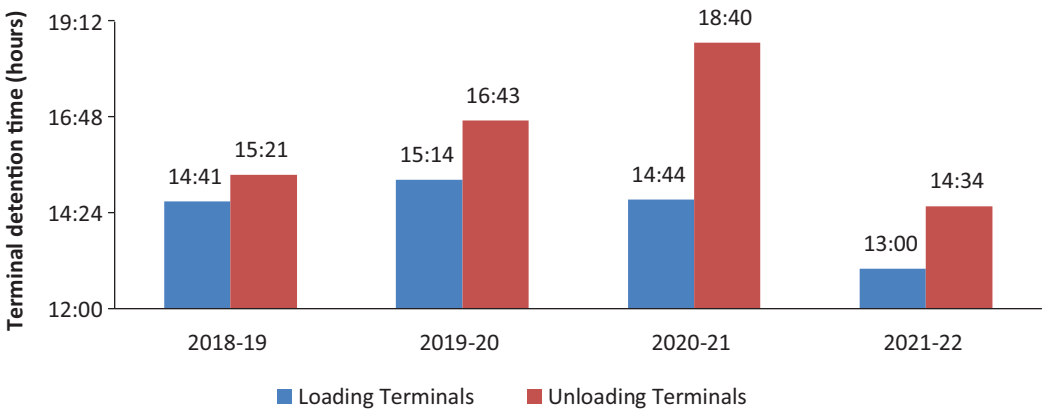

Figure 18: Terminal detention time
Source: IR, analysed by TERI

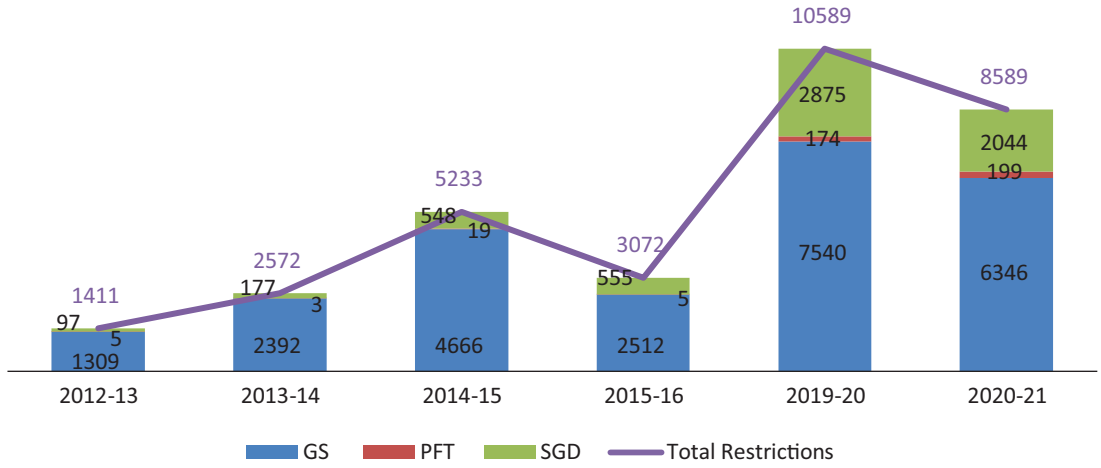

Figure 19: Restrictions on freight terminals
Source: IR, analysed by TERI

4.1.2 Recommendations

- **Cost sharing for terminal development**
  - » One of the key reasons for slower uptake of private sidings, private freight terminals, and GCTs is the high capital cost involved in freight terminal development. Developing a sharing mechanism for capital cost may result into wider adoption of such policies. For example, railways may take up the responsibility of providing rail super-structure and a private player may develop the terminal infrastructure similar to the earlier concept of assisted sidings. Since land is a very scarce resource now, wherever railway land is available, it should be leased to the private sector for development of sidings/terminals. As it has been observed that most of the goods traffic originates and terminates at sidings, proactive siding and terminal policies based on sharing of costs and risks will help the railways to expand its captive customer base where bulk customers are incentivized to develop their own facilities.
  - » Key industrial and production centres as well as logistics and parcel hubs, automobile hubs, etc., which have relatively smaller, but diverse traffic can be targeted for such development. Railways may extend the line infrastructure to such places and then assist the private sector to develop freight terminal catering to the freight transport needs of multiple units.
- **Focused attention on constraints at junction stations**
  - » The issue of in-route detention is prominent around the junction stations, as numerous passengers and freight trains have to pass the same junction. While a number of line capacity upgradation works have been listed under 'Mission 3000 MT by 2027', it is also crucial to pay attention to the issue of long detentions at junction stations. Providing bypass lines and railway over bridges could be few of the solutions. The important consideration should be for an uninterrupted movement of through freight trains. These are least cost options for capacity expansion but help in improving the transit times of goods trains in a big way. There is no unique solution applicable to all in-route junction stations as each of them is different in terms of land availability and physical features. However, a focused effort and remodelling of station need to be undertaken to resolve the issue regarding detentions at junctions at the earliest.
- **Careful relook at rationalisation orders**
  - » The empowerment of railways to rationalise routes was aimed at easing the operational

constraints of IR and providing efficient haulage. However, it has been seen that even after the line capacity is augmented on the shorter routes and the trains are operated by that route, the freight has continued to be charged by longer rationalised route.

» Almost all the rationalised routes offer longer transit time, along with higher freight as the customers are charged based on the distances according to rationalisation orders. Today, when railways face a stiff competition from road, rationalisation of routes has lost its relevance. Also, when a route is rationalised, there is no immediate need and incentive to augment capacity or resolve the constraints on the regular route.

» In almost all the cases, the trains are operated by the operationally feasible routes irrespective of the rationalisation of routes, but the freight is charged as per the rationalised route.

» It is important to have a fresh look on the desirability of rationalisation of routes. Railways should re-examine all the rationalisation orders afresh and keep only those which are unavoidable and all the goods are carried by that route.

» Between any two OD points, IR should introduce a concept of 'preferred route', by which the goods are carried and charged except in the extreme circumstances of interruption on the route and the goods are diverted by alternative routes temporarily. This will bring more transparency on carriage of goods and railways will be able recover its actual cost of carriage to a very large extent.

➢ **Focused attention on freight terminals**

» Most freight terminals on the IR network require infrastructure upgradation for efficient functioning. The key reason for a longer terminal detention time is poor infrastructure and inadequate handling capacity. The provision of all-weather robust wharf, circulation area, and approach road is a must for any freight terminal to work efficiently. The provision of an adequate and covered storage space as well as lighting, labour facilities, and merchant rooms should also be prioritized.

» Railways are not able to provide adequate funds for undertaking terminal infrastructure upgradation works due to competitive demands for resources for other developments. However, utilization of this meagre allocation of funds for terminal facility upgradation is unsatisfactory in the absence of focused attention. Shortage of funds as well as capacity to undertake terminal development works has led to various policies and schemes by IR to encourage private participation for development of freight terminals. Initially there was an encouraging response from the private sector, but it could not be sustained in the long-run necessitating revision of policies frequently.

» It is high time to pay focused attention on freight terminal operations and infrastructure, which could be achieved by leveraging required institutional arrangements. Under GCT Policy, at division level the units have been developed in certain divisions to supervise the infrastructure development work. Such units should also be entrusted with to find out the solutions to ensure efficient operation of terminals along with infrastructure upgradation within the divisions.

➢ **Exploring opportunities of mechanized handling**

» Manual handling of goods has many limitations and results in high terminal detention. The use of mechanized handling of goods will maximize the efficiency of the terminal to a great extent. Use of conveyor belts, fork lifts, etc., for bagged consignments and direct discharge wagons for bulk commodities should be promoted.

» The current wagon and wharf designs are not very suitable for mechanized handling. IR may undertake pilot projects in association with established handling organizations and freight

operators to design and built suitable systems to enable mechanized goods handling. The wagon design and corresponding terminal design development may be initiated for improving the terminal productivity and efficiency.

- **Operator-based system for goods handling**
  - » One of the key constraints for efficient terminal management is limited labour availability, control of labour unions, etc. Customers most of the time are helpless and have to pay demurrage due to limited labour supply.
  - » An operator-based goods handling system can be encouraged, where each terminal has a terminal operator who looks after the loading/unloading activities. The responsibility of loading/unloading goods to/from the rake will rest with operator, and in cases of demurrage, the operator will be held responsible for paying the same. Such a system will have a better hold over labours and terminal operations will be optimized. There will be also an incentive for him to mechanize the handling operation. A suitable policy for appointing terminal operators for terminals which deal with more than 15 rakes a month may be prescribed.
- **Streamlining institutional structure for terminal development**
  - » Currently the divisions are responsible for terminal operation, but have neither the financial resources nor the capacity to develop infrastructure at terminals. The allocation of funds for terminal development is far below requirement. For major works they need to have the sanction of zonal railways and Railway Board. On account of poor facilities, GoI has sanctioned INR 6,715 crores for IR in 2023–24, on account of improvements in traffic facilities: yard remodelling and other works.
  - » It is suggested that the divisions should be properly strengthened to sanction their own terminal development works and complete the work as per requirement. They should be also empowered by enabling policies to involve private sector in terminal development and management.
- **Terminal rating system**
  - » Each terminal on the IR system faces unique issues and requires a customized approach for their resolution. Periodic maintenance works are also required to ensure the quality of infrastructure.
  - » Developing a web-based system to periodically rate terminals on the comprehensive list of parameters (infrastructure condition, terminal detention, demurrage, wharfage, etc.) will help to identify the key terminals and constraints to focus for upgradation. An objective system will help to quickly identify the crucial issues and will help the decision-makers to plan works and finances well in advance.
  - » Along with a terminal rating system, customer satisfaction surveys can be rolled out to understand their perception and needs for terminal infrastructure and operation.

4.2 Freight Marketing Policies

IR has been concerned about declining rail share in freight transport and launched various schemes from time to time. Depending upon the response from the customers; railways have made amendments in these policies. These marketing policies have had varying degree of success. The objectives of this study are two-fold. First, it analyses the freight performance of IR and the measures taken by them to divert freight business particularly from road. Second, it examines seven freight marketing policies; most of them initiated in last two decades, to identify gaps and challenges suggest policy recommendations for making them more attractive to achieve the objective for which they have been envisaged. The following marketing policies have been examined in detail:

- **Freight Forwarder Scheme (FFS)**: FFS enables the aggregation and transport of BOGs via railways, aiming at expanding the commodity basket of IR.

- **Roll-on roll-off (RoRo) Policy**: RoRo service is a special facility for the operator to carry loaded trucks on the wagons from the origin to the destination by rail. This service helps in maintaining door-to-door convenience as provided by the road sector and at the same time saving fuel in main-haul carriage and avoid road congestion.
- **Automobile Freight Train Operator (AFTO) Policy**: The scheme focuses on attracting the automobile traffic in collaboration with third party logistic service providers.
- **Long-term Tariff Contract (LTTC) Policy**: The main objective of the scheme was to ensure a long-term relationship with large shippers which were suitably rewarded for enhanced rail movement year after year. Currently this scheme has been kept in abeyance and is under revision.
- **Demurrage Policy**: The demurrage is a charge that is levied for detention of wagons beyond a permissible time for loading and unloading operations. Recent modifications in the demurrage rules have raised stiffer penalties for detention of wagons with practically no chance of relief in form of its full or partial waiver and thus a great irritant to the shippers.
- **General Purpose Wagon Investment Scheme (GPWIS)**: In this scheme the large shippers are encouraged to either own or lease the wagon for their use. The scheme ensures reliable service to consumers and guarantees a steady supply of railway wagons, which is crucial for the smooth operations.
- **Liberalized Automatic Freight Rebate Scheme for traffic loaded in Traditional Empty Flow Directions (TEFD)**: The TEFD policy is designed to incentivize loaded traffic on the routes on which IR is already incurring the cost of running empty rakes to garner additional revenue.

4.2.1 Findings

4.2.1.1 Common issues

» **Inadequate terminal facilities:** Railway goods sheds and terminals lack basic infrastructure facilities such as road connectivity, maintenance, and basic amenities like water, electricity, and security. Most of the terminals are located in congested and dense areas of the city, where the movement of heavy trucks are restricted during daytime. Lack of periodic investment in maintenance of infrastructure is common on the entire rail network.

As the goods after unloading cannot be moved out swiftly there is a need for warehouses nearby that helps the shippers greatly. Some of the goods sheds have rail-side warehouses built under a special scheme but expansion of such facilities by involving private sector has not made much progress for want of difficulty in getting railway land for this purpose. The limited availability and higher cost of private land becomes prohibitively expensive for building warehouses nearby.

This issue is very much relevant to logistics operators under FFS and AFTO. Railways are generally reluctant to provide stacking of cars at railway yards/premises during loading and unloading operations resulting in increased costs. Lack or inadequate approach roads at loading and unloading stations adversely impact particularly RoRo operation.

The limitations in terminal facilities often result in levy of demurrage charges that become unintended source of revenue for railways but a great irritant to the shippers which may lead to flight of business from them. Manual handling inefficiencies, little relief from demurrage charges even in adverse weather conditions, and insufficient manpower leading to delay in handing operation and subsequent levy of demurrage charges are some of the factors affecting shippers adversely. The delayed evacuation and lack of storage further discourage the shippers from patronizing railways.

- **Wagon design issues**: IR is generally reluctant to provide special type of wagons for carriage of a commodity and encourage such shippers and operators who require special wagons to own or lease them. With multiple product differentiation

across different commodities, it is important to have a specially designed wagons for carriage of a particular product.

AFTOs use NMG and BCACBM type rakes with different carrying capacity. While NMG rakes can accommodate 125 small cars, BCACBM rakes carry approximately 300 vehicles. Lack of higher capacity rolling stock results in significant tonnage loss per trip. IR is exploring a new wagon design with greater capacity to accommodate sports utility vehicles (SUVs) on the lower deck and sedans/compact cars on the upper deck. But, economic viability of introducing such wagons depend on availability of traffic. Maintenance and return of rolling stock from repair sheds pose challenges for operators. Inadequate lashing mechanism in wagons compromises vehicle safety during transit loading, forcing consignors to prefer road transport.

The floor of BRN wagons used for RoRo operation is not strong enough to carry a loaded truck. Additionally, the gap between a loaded truck and the sides of the wagon carrying it is very small, as a result there is a chance of tearing of tyres particularly when the truck is overloaded. Loading and unloading of trucks on these wagons is again cumbersome due to limited width of the wagon, causing detention to wagons at the terminal.

One of the major concerns of the shippers of bagged commodities, like cement, fertilizer and food grains, etc. is the use of BCNHL wagon which is taller than a BCN wagon. This lead to difficulty in manual loading and unloading and inferior utilization of the wagons.

- **Inadequate wagon supply, design issues, and cost of wagons**: As mentioned earlier, railways prefer the shippers and operators to either own or lease specially designed wagons instead of procuring and owning themselves. This is perhaps due to limited use of such wagons as compared to universal type of wagons that can be used all the time for carriage of different commodities. Procuring and owning wagons by shippers and operators is an additional cost for them particularly when the compensation in the form of rebate in freight is not considered adequate. An additional burden is also for stabling them when not in use for which they have to pay railways stabling charges. The maintenance cost is also borne by the shippers. Also, the private operators and investors often pay significantly more and face inordinate delays in delivery of wagons than railways due to greater negotiation power of IR. The various schemes launched by railways by shippers and operators in last three decades met with limited success.

  AFTOs often face challenges in having enough cars to load a full BCACBM rake. In such a case, use of NMG rakes is preferred but their limited availability cause delays and subsequent diversion to road. Similarly BRN wagons are mostly utilised for carriage of steel products and not available for RoRo operation. Shortage of special wagons with no assurance of availability and requirement of advanced booking is a major issue in attracting new commodities like automobiles, fly ash, trucks for RoRo operation, etc.

  Shortage of wagons is also of felt for bagged commodities particularly in busy season. Some areas and commodity clusters face a perennial shortage of wagons due to high demand and low availability of wagons. GPWIS does not always guarantee timely supply of wagons despite the assurance about the availability.

- **Increased transit time:** Despite an inherent advantage of higher speed, transit time by railways is comparatively higher than the road sector on many routes. It becomes a major discouraging factor for FFS responsible for aggregating low volume but medium/high value commodities, particularly when terminal delays are also added at loading and unloading points. Lack of time-tabled and guaranteed transit time for automobile traffic, and greater end-to-end transit time due to multiple loading/unloading operations vis-à-vis road transport ebbs the shipper's confidence on AFTO policy. Delay in generating vehicle invoices, which typically range from 2 to 10 days, further

prolongs transit time, resulting in potential loss of business. Delay in delivery and lack of time-tabled schedule for domestic container trains were major factors of its sluggish performance.

Uncertainty of placement of rakes during night time at the goods sheds where entry of trucks is prohibited during day causes additional transit delays. RoRo operation on Western dedicated freight corridor could not succeed due to restriction of truck movement at Rewari and railway's inability to place the rake during night when truck movement was permitted.

- **Overall cost of transportation by rail:** It has been generally observed that road rates are higher than rail rates, but considering additional costs in handling of goods at terminals and first and last-mile connectivity, road transport becomes comparable or cheaper in certain regions. This makes FFS less attractive. RoRo services do not generate higher revenue, tonnage, and NTKM as compared to traditional bulk commodities. Current higher freight rates for RoRo services have been justified to ensure comparable revenue realization as in respect of traditional bulk commodities. However, it ended up making RoRo services costlier for shippers than road. The charges for RoRo services are INR 2.5 per tonne per km in IR where Konkan Railway (KR) charges less than half of it at INR 1.1. Further, customers under RoRo policy are charged on a full-truck basis (30 tonnes) which is not attractive for shippers carrying less than 30 tonnes of freight, as they pay the full amount (30 tonnes) instead of the actual payload. It may not be advisable to carry RoRo services on the sections where the capacity utilization is near saturation point or beyond it.

  Rail freight rates under AFTO Policy have remained unchanged since 2013, while road rates have been dynamic, primarily based on fuel prices. The additional first and last-mile cost in respect of rail transport along with terminal handling and miscellaneous costs increase overall expenses for consignors. AFTO Policy requires the AFTOs to procure 4% spare wagons, for which they are required to pay stabling charges to railways. Unless, the AFTO develops his own railway yard for stabling spare wagons/ rakes it has to incur additional stabling charges enhancing rail transportation cost and reducing its competitiveness with road.

- **Frequent changes in the policies:** Frequent revisions in policies like FFS, RoRo, AFTO, TEFD, GPWIS, etc. (changes in routes, validity, charges, etc.) by railways lead to challenges in adaptation and inconsistent implementation across different regions. It foments a perception of instability and lack of a clear long-term vision, which eventually affects consumers' confidence in the services. For effective and stable railway functionality, it is essential to strike a balance between necessary adaptations and stability, allowing sufficient time for evaluation and addressing potential challenges in implementation.

4.2.1.2 Specific issues and observations

- **RoRo Policy:** Railways are reluctant to operate RoRo service departmentally. Finding a suitable private partner who can invest in terminal facilities and operate RoRo service is a challenge for want of not very well-designed policy which is not at all profitable for the private operator. For example, RoRo operation between Kolad and Boisar in Maharshtra started in January, 2017 but failed to attract transporters due to lack of fixed time schedule and availability of RoRo train once in every 24 hours leading to long wait time. When RoRo project was initially taken up by KR, terminal facilities were developed by them with no involvement of any private operator and the service was operated departmentally.

  Post 2022 policy revision, IR introduced a distance-based telescopic rate for RoRo services. However, it did not help much as truck operators don't find cost advantages in the relatively rigid pricing policy followed for RoRo operation.

- **AFTO Policy:** There are two other issues affecting AFTO Policy. First, lack of security during transit discourages transporters from choosing rail

for high-value commodities like automobiles; railways do not take responsibility for security during transit. Vandalism and pilferages during transit, especially of detachable parts, occur due to inadequate supervision during loading/ unloading and transit. This discourages the vehicle manufacturers and the operators from using railways for transportation of automobiles. Second, lack of RFID readers installed throughout the routes renders the presence of RFID tags on automobile wagons ineffective for tracking purposes.

- **LTTC Policy:** Three major issues plagued the operation of the LTTC Policy. First, it required a minimum guaranteed gross freight revenue increment of 5% each year, over previous year's traffic, which was an infeasible expectation as for any industry, growth in production is not always guaranteed and is linked with market conditions; rendering such a policy unattractive for these customers. Second, consistent slow processing of concessions posed significant challenges for customers as the LTTC policy did not offer freight rebate during the processing of RR. Third, despite being empowered the zonal railways were not exerting their powers as directed by the Policy, mainly due to the fear of scrutiny from providing unequal concessions to various customers. Currently the Policy is under revision.
- **Demurrage Policy:** Apart from the inadequate terminal facilities, there are four other issues with the Demurrage Policy. First, lack of a proactive approach where the shipper is treated an adversary and relying on punitive measures by imposition of stiff penalties on operators and shippers with practically no redressal mechanism is a major irritant. The absence of a code of healthy practices by trade and labour unions hampers the trouble-free loading and unloading operations. Second, the 2022 policy revision has introduced significant changes to the demurrage waiver process and impose stricter penalties on customers, discouraging them from choosing railways as a mode of freight transportation. Third, penal demurrage rates, significantly higher than regular rates, are imposed when the free unloading time expires at terminals often due to slow operations or high demand. As a result, the shippers/ operators prefer road over freight transportation needs. Fourth, demurrage accumulates as in certain regions labour operations cease before sunset due to safety concerns, while in others, labour unions restrict working hours until 8 pm. This is owing to limited lighting and inadequate facilities that deter overnight work.
- **GPWIS:** The freight rebates under the GPWIS are capped due to which investors cannot earn more rebates by greater utilization of their wagons. Thus, it is important that the cap on freight rebate includes all expenses incurred by investors.
- **TEFD Policy:** The TEFD policy is designed to incentivize loaded traffic on the routes on which IR is already incurring the cost of running empty rakes. The streams of empty flow are decided on the operating conditions and have been monitored and altered by the railways from time-to-time to keep track of the traffic and revenue with the changing trends.

  On the basis of these observations, the following inferences can be drawn:
  - The overall proportion of empty run has increased between 2008–09 and 2021–22.
  - The best overall ERR performance of IR was observed during 2010–11 when ERR was lowest at 36.67%, as against 40.53% during 2021–22.
  - Performance of IR varied considerably over time and across wagon types
  - Freight loading on IR is majorly done in BOXN, BCN, BCNHL, BRN, and BOBRN wagons, whose ERR has also increased during 2008 and 2022.
  - Container wagons have shown considerable improvement in the ERR over the period (48.22% in 2008–09 to 4.76% in 2021–22). A major reason can be attributed to the fact that container wagons offer versatility in carrying different types of commodities and this highlights the need for IR to increase the

use of containers to garner more traffic in the domestic sector.

4.2.2 Recommendations

4.2.1.1 Common recommendations

- **Improvements to terminal facilities:** To improve efficiency, railways should provide terminal facilities, taking responsibility for loading/ unloading/storage of goods instead of relying solely on consignors/ consignees. Railway land should be leased at nominal rates for warehouses/ storage spaces, encouraging mechanization as well. Alternative locations for goods sheds in city areas with limited space and restricted truck movement should be explored in consultation with stakeholders. IR should develop approach roads to reduce turnaround and transit times, and invest in all-weather roads, specified entry/exit points, ramps, and lighting for RoRo operation. Spare-capacity goods and passenger terminals can be used for RoRo.

  Implementing automobile-specific loading and unloading technology is vital for efficient terminal processes and cost savings under AFTO. However, utilizing mobile ramps requires constructing level-crossings on both ends of the 635 m rake-length for a 30 m section. To minimize demurrage, dedicated storage spaces should be provided at terminals for stacking goods after unloading. Emphasizing stacking areas is crucial for efficient clearance and minimizing damage. Additionally, introducing mechanization at terminals can significantly reduce loading/unloading time and overall turnaround time. Amenities such as illumination, labour shed, drinking water, toilet facilities, etc., should be provided at all terminals and private sidings.

  - Ensuring timely delivery: Certainty of timely delivery is a key factor for customers. Expanding capacity and implementing better monitoring can enable railways to offer guaranteed delivery, improving their credibility and inspiring customer confidence. Reducing transit time in railways for truck transportation under RoRo policy requires higher average train speeds during the main haul movement. Introducing RoRo services on routes with spare capacity would facilitate this (also generating revenue in low-earning areas, and reducing emission and congestion from road), and improvements in end-to-end connectivity will further strengthen the competitive advantage offered by road sector. The main haul mode, with time-table trains highlighting departure and arrival times, provides a sense of reliability and encourages customers to choose rail transport for freight movement.

- **Ensuring cost parity with competing modes:** RoRo tariff should be competitive with respect to alternative commodities, to eliminate possibility of preferential treatment of other commodities over RoRo from a commercial viability perspective. It should align with road sector rates to attract new customers and ensure cost recovery. A fixed-rate based on distance, applicable for 2–3 years, and a haulage charge approach similar to containers and automobiles would provide stability to customers.

  To make rail a compelling choice for customers, competitive rates compared to the road sector are crucial, particularly for making the AFTO Policy attractive. While railway rates are competitive for longer distances (1,800 to 2,500 km), they are less competitive for shorter distances. Offering concessions for lower distance slabs would help capture more traffic. Demurrage charges add to the cost of transportation despite not being the customer's fault, and act as irritant. The Demurrage Policy should be tackled in a systematic manner wherein a prime organization/third party is placed at the terminal and is responsible for all terminal-related activities; including coordination with customers. Elimination of demurrage charges can be considered by augmenting of line capacity and stacking facilities at terminals.

- **Wagon design and ensuring timely supply of wagons:** IR should also ensure adequate supply of NMG and BRN wagons for smoother AFTO and RoRo operations. Through a wagon leasing approach, IR can consider leasing new RoRo

wagons to customers for a long-term period, ensuring a guaranteed supply of wagons. This approach incentivizes truck operators to shift from road to rail transport.

Due to lower bargaining power than IR, private players pay higher price for wagon procurement than IR, thus, the playing field needs to be levelled in terms of wagon pricing.

Under GPWIS, the greater interest has been shown by the industries and shippers who generally experience shortage of wagons as per their demand. Many industrial clusters face a general shortage of wagons for loading particularly in the busy seasons for variety of operational reasons. A collaborative approach between railways and industries facing shortage of wagons by designing close circuit movements between the production and consumption areas may be a better solution for resolving this problem and check the flight of business from rail to road.

To reduce costs, enabling policies should be formulated to encourage private investments in exploring new wagon designs for RoRo operations, automobile and other motor vehicles, fly ash etc. which are amenable to carriage by rail. For RoRo operation, emphasis should be on seamless loading/unloading, eliminating unfit wagons, and minimizing wear and tear on trucks. For AFTO Policy, RSDO is developing a taller wagon (height: 4,875 mm) to accommodate SUVs (up to 1,850 mm) on upper and lower decks. However, selected routes with higher OHE wires, no tunnels, and higher overhead bridges would be required for movement of such wagons. It is crucial for IR to explore beyond production and consumption hubs and determine suitable routes and modify infrastructure accordingly. Pilot runs on key routes like Delhi-Chennai or Delhi-Bengaluru should be considered for expansion.

4.2.1.3 Other recommendations

- **RoRo Policy:** Demand analysis and truck movement between specific origin-destination pairs should precede the selection of RoRo routes. Wagon availability should not be a constraint for running time-tabled trains. With market-driven haulage charges and better service availability, RoRo services on the routes where spare capacity for running additional trains is available RoRo service may be a game changer.
- RoRo service can be successful only on the routes where adequate capacity is available for movement of additional trains. Even on short or medium distance segments where adequate capacity is available truck operators can be incentivized to participate in RoRo services with competitive rates and suitable terminal facilities that help in quick loading and unloading.

  Railways should assess the need for intermediaries and utilize digital platforms like FOIS for documentation and payments, ensuring transparency. On-ground tasks should be handled by railways' marketing organization, responsible for identifying feasible RoRo sections, establishing market contacts, and attracting traffic to rail transport.
- **AFTO Policy:** Diverting automobile traffic to railways from road helps in both energy saving and carbon emission reduction. Railways have still not reached full potential of automobile transport. It is important to assist the operators for setting up proper terminals, utilizing railway land if necessary and providing examination facilities at the operator's terminal to reduce travel time. Railways should explore mechanisms to reduce handling costs and offer competitive haulage rates to attract customers and consider price adjustments over time.

  Timely and guaranteed delivery, security during handling of vehicles at terminals as well as during transit and tracking of the consignment enroute to plan logistics issues are considered essential to increase railway's share in automobile transport.
- **LTTC Policy:** Discontinued in 2020, the Policy is being revised to include parameters like freight rate stability and ensure wagon availability through stakeholder consultation. The expectation of constant annual growth could be restructured or redesigned; based on identification and previous

trends of the affected commodities. Railways can think of restructuring this constant annual growth by keeping previous year's revenue earning or physical quantity as a benchmark.

An alternative approach could be to establish contracts based on a specified "rail coefficient" for each commodity. By identifying these commodities and considering commodity-specific wagon designs or inviting investments for optimal utilization, railways can ensure efficient transportation. Conducting market analysis to predict growth percentages would help in informed decision-making in this regard. In a proactive approach the industry may be allowed to commit a certain business over a benchmark determined based on past performance and production plan in the beginning of the year, and incentives and disincentives can be built in a mutually agreed plan for the year.

- **GPWIS:** IR can consider reducing the rebate from the current rate of 10% but not capping it with the wagon's capital cost as in other schemes (e.g., LSFTO, AFTO). This will be a win-win situation for both parties.

4.3 Rail Freight Tariff Policies

There are four broad objectives of this volume. First, it investigates the present freight tariff policies of IR and identifies problems within the policies. Second, it estimates the price responsiveness of the bulk commodities to infer about the impact of freight rate changes on demand. Third, it analyses the issues with the station to station (STS) rate policy which is under the domain of the zonal railways. Lastly, based on past recommendations of different committees this report suggests changes in the existing regulatory approach for increasing private participation and better assessment of tariff structure of IR.

4.3.1 Findings

- **Uniform rates do not allow flexibility in price setting:** There are multiple rate classes and distance-slabs in the rate structure of IR, however, there is no regional variation in the rates as IR charges uniform rates across the country. However, road freight rates are dynamic and has regional variations. A unified and fixed rate notified by IR can always be undercut by the road sector with possible traffic diversion towards itself. By not allowing flexible rates based on different regions (and routes), railways not only lose out on traffic in areas where truck rates are low, but also on revenue where truck rates are higher.
- **Cross-subsidization distorting market:** There is cross-subsidization across various commodity groups. Commodities classified at higher classes are made to pay not only their appropriate share of general costs, but in addition; that share of the joint costs which the low rated commodities cannot afford to bear. Such cross-subsidization creates serious distortion in the market and reduces cost competitiveness of IR's freight business, particularly container operations. Further, there is cross-subsidization of passenger operation from freight business, which results in sub-optimal prices being charged on freight transport.
- **Fully distributed cost pricing is inefficient:** The fully distributed (average) cost-based approach for IR includes the fixed common and joint costs which are distributed over all traffic. Under this approach, the routes with excess capacity are charged more leading to lesser utilization, whereas routes with excess utilization are charged lower, leading to greater congestion. The inclusion of fixed costs in pricing leads to higher freight tariffs as compared to other sectors.[6] A lack of a standard market-based pricing system, as practiced on railways now, may lead to diversion of freight business to other transport modes offering a competitive rate, which further increases the fixed cost burden for remaining traffic.

  Other transport modes, especially road, have a dynamic price-setting approach. Trucking costs change almost daily in reaction to market forces. In contrast, fixation of freight rates for

[6] Pricing also depends on several other factors such as political agendas/promises, health emergencies (e.g., the COVID-19 outbreak), etc.

IR is centralized, with power to alter rates lying exclusively with the Central Government that is Railway Board as per the Railway Act, 1989. Thus, changes to tariff rates are less responsive to prevailing market conditions.

- **Distance slab-based pricing and rationalised routes act as irritants:** IR practices slab-based system of pricing in which the shortest distance between the OD pair is considered to charge for carriage of goods. However, the shortest route may not always be the preferred route for the operator's operational interest. IR is empowered to declare a longer rationalised route and undertake a periodic exercise for 'route rationalisation' under which it prescribes charging of goods through a longer route instead of the shortest available route between two OD points. The slab-based system and the route selection process (either by shortest or by the rationalised routes, wherever in existence) in tariff act as irritant for the customer, especially when railways may not compulsorily carry goods by rationalised route. In operational interest, it may carry goods by any route and may not be bound by the charge route.

  In a competitive market where road transport offers faster and shorter connectivity between two OD points, rationalisation of routes (with greater freight cost) may result in outflow of traffic to road, wherever possible.

- **Falling rail share of price inelastic bulk commodities:** A shipper needs to be charged in accordance with the price elasticity of demand for the commodity, as otherwise it would result in a shift in the shipper's modal choice for transport. Price elasticity of demand is the measure of responsiveness of the commodity to change in prices. An elastic commodity has a higher incentive to shift to other modes due to an unfavourable tariff change. Increasing the tariffs of such commodities can result in substantial revenue loss for the railways. Table 5 lists the estimated price elasticities of bulk commodities.

Table 5: Price (average freight rate) elasticity of freight demand (in NTKM)

Commodity	Elasticity
Coal	-0.697
Cement	-0.416
Fertilizers	-0.376
Food grains	-0.348
Pig iron and finished steel	-0.270
POL	-0.166

Note: Elasticities obtained by regressing NTKM on freight rates (at constant 2011–12 prices) and GDP of agriculture, industry, and construction, all in natural logarithm, accounting for autocorrelation (Prais-Winsten method)
Source: TERI's Estimate

The share of railways in the freight movement of bulk commodities (except for fertilizers) has declined over time. However, Table 5 indicates that the bulk commodities are price inelastic: less sensitive to price changes. Clearly then, price is not alone responsible for the observed decline in market share of IR in shipment of bulk commodities.

Shippers often raise issues of timely availability of rakes, stabling, route-diversion, damages to the consignments, etc. These factors pose serious challenges to their business and may play important roles in demand for shipment via railways.

- **Non-recognition of the speed of service:** Time saved is equivalent to money being earned for both the supplier and the user of transport services; especially with technological advancements and the globalization of trade. Speedy delivery of goods has now become an element of productivity and integral to the service, especially when railways have lost majority of its traffic to road and air owing to this very reason. While speedy delivery increases the cost of service provided, it adds to the value of service component of the pricing principle. IR does not recognize speed/quality of service as an integral component in its freight tariff fixation, which impacts the service delivery.

- **Unstable growth in freight revenue:** Revenue growth from freight traffic has been highly volatile for IR between 2007–08 and 2020–21. Container operation and food grains exhibit the highest variability: standard deviations being 34.8% and 17.1%, respectively. Whereas, the revenue growth rate for mineral oils shows the least variability: standard deviation of 7.1%. There is a declining revenue growth trend observed for cement and fertilizers. The trend has been similar, excluding the last two years (affected by COVID-19).

  It is imperative that IR devises its freight policies in a way that it generates a steady growth in its freight revenue. In the backdrop of declining share of the railways in shipment of bulk commodities, increasing the movement of container traffic and shipment of other commodities are important for financial viability of freight operation. This is also pointed out by the National Rail Plan, particularly tapping the long-haul containerized and other commodities shipment through: (i) supporting ecosystem development, (ii) better and wide-spread network of terminal infrastructure, (iii) adoption of newer container designs (for example dwarf containers), and (iv) assurance of fast delivery (GoI, 2020).

- **Under-utilization of STS rate policy:** The Station to Station (STS) rate policy allows the zonal railways to exercise decentralized tariff setting (through concessions) to attract more freight traffic for railways. The prime objective of the policy is to increase the overall NTKM of a station/ cluster for a particular commodity. This policy also ensures that the existing traffic operating from the stations in the vicinity of the proposed station in the scheme does not get diverted to it in view of lower tariff offered by the station. The STS rate policy, except for very few zones, has hardly been utilized efficiently to attract more traffic. Till November 2020, out of the 16 zones no STS rate policy has been utilized by: East Central Railway, Northern Railway, Northeast Frontier Railway, North Western Railway, South Eastern Railway, and Western Railway.

  Despite the statutory power given to the zonal railways, Railway Board frequently issues guidelines and notifications on STS rate policies. Such interference from Railway Board and lack of trust between the Ministry of Railways and the zones inculcate risk-averse behaviour of the executives at the zonal level. As a result, the STS rate policy is underutilized with only around half of the proposals being approved and a quarter of the proposals as pending.

  Removal of road rates as a determining factor for granting concessions under the scheme in a subsequent circular has eroded the competitive pricing model that could otherwise be adopted for commodities whose rail coefficient has declined in the past years.

- **Lack of a regulator:** Several attempts have been made in the past to attract private players in IR through: (i) different wagon investment schemes, (ii) liberalization of container policy, (iii) special freight train operator scheme (SFTO), (iv) automobile freight train operator scheme (AFTO), (v) special parcel train operator scheme (SPTO), (vi) allowing private freight terminals, and (vii) construction and opening of the dedicated freight corridor(s). However, these policies have not been fruitful so far due to the lack of trust between private sector and IR, in the absence of an independent regulator. This leads to several issues such as: (i) delayed and vague guidelines, (ii) tedious procedures set by IR, (iii) absence of a level-playing field and preferential treatment of public sector undertakings (PSUs), (iv) poor implementation of policies such as SFTO, SPTO at zonal and divisional levels, and (v) excessively high pricing for policies such as AFTO (GoI, 2015).

  Presently, due to no separation in the regulatory, policymaking, and operator roles of Railway Board, setting of freight tariff is not linked to market principles and there is lack of trust by private stakeholders. Allegations of favourable treatment of CONCOR and adhoc changes in policies have raised concerns about the interest of Railway Board in promoting market (GoI, 2015). There

have also been concerns about transparency of the guiding principles for changes in policies (GoI, 2015). Though several committees in the past–Rakesh Mohan Committee, Sam Pitroda Committee, and Bibek Debroy Committee–suggested delinking the regulatory role either through constituting an attached office, or as a statutory body, little has been done in this regard. In two successive decisions, the cabinet approved formation of a Rail Tariff Authority (in 2014) and a Rail Development Authority (in 2017), but none of these have been institutionalised till date.

- **Learnings from international experiences with railway reform:** Based on the railway reform experiences from the US, the UK, Russia and China, the following inferences can be drawn:
  - Phasing out of passenger cross-subsidization from freight operation is essential for addressing financial viability of freight operations.
  - Move towards a market-driven freight tariff policy (at least allowing need based departure from any institutionally determined freight tariff) can be considered.
  - Contract-based pricing for each commodity (as followed in the US) can bring flexibility in freight rate structure where such dynamic rates can be linked to the demand, competitive rates, distance, etc.
  - Differential pricing model (as followed in the US and the UK) as opposed to a fully distributed cost model can improve the efficiency in freight pricing. Charging the shippers exactly according to the variable costs and distributing the fixed cost by the principle of 'ability to pay' ensures that fixed costs are covered by railways and no excess pricing for a shipper to force them look for other competing modes (e.g., road transport).
  - Need for independent regulator to develop market confidence and attract private players (the UK).

4.3.2 Recommendations

- **Bringing flexibility in pricing through re-introduction of 'maxima-minima' rates:** Reintroducing the concept of maxima-minima rates in some commodities to begin with where railways face stiff competition from road, will bring dynamism in consonance with market requirements. The cost of carriage has to be accounted for when determining the competition limit within the maxima-minima framework. The minimum rate needs to be fixed to ensure that railways do not reduce its charges below this rate in competition. Initially, this rate can be based on average cost of haulage in the country, which could be modified to inculcate the marginal cost of transportation post accounting reforms. The maxima in the rating structure can be determined on the basis of 'what the market can bear' principle, taking into account the market conditions.

  Such rates can be set by an independent tariff regulatory authority in the long run, as and when it becomes functional. Meanwhile, Railway Board can amend its rate fixation policies to incorporate the maxima-minima policy in their pricing mechanism. In view of regional variations in rates offered by road transport, it would be prudent if Railway Board delegates the powers to fix rates within the maxima-minima band to the zonal railways, while it defines the maxima-minima. With implementation of the said maxima-minima rating system, all incentive/concession policies need to be eliminated. Efficient management of the zonal railways can be determined by their operation close to the maxima rate and the reversal of the freight traffic they entail from road to rail.
- **Elimination of cross-subsidization:** The passenger segment of IR's operation needs to be financially viable and market-driven with any subsidization to the marginalized from the Union Budget itself–maybe under a separate targeted

subsidization scheme, under appropriate ministries (like the phase 1 reform in Russia). Such delinking of social obligation from the commercial operation will rationalise the freight rates (see Paranjape, 1986; Briginshaw, 2013). It can also be done from the budgetary resources of state governments, or at the municipal level: particularly for the suburban passenger rail system.

- **Alternative pricing models:** The marginal cost approach to pricing can be implemented initially in the underutilized/unutilized sectors of the IR, to cover at least the cost of operations where the railways are operating on a loss. Costing in IR must include costs incurred to: construct and maintain the infrastructure, pay for the energy and fuel (including the associated labour), and provide and maintain the vehicles. Thus, freight charges – especially with regard to track access charges – need to at least cover the stated factors to reduce the operating losses to a minimum. A simple mechanism can be to provide concessions to the under-utilized routes by the extent of the percentage of overhead costs in total cost of IR.

  As an alternative, class 100 rates (or the rates pertaining to the re-assessed break-even class) can be charged on these sectors for all commodities above class 100. This will ensure that IR does not operate on profit margin in these sectors and is able to attract more traffic towards these. However, such a policy will not have any impact on class 100 commodities.

  Another alternative can be the 'differential pricing' model followed in the USA and the UK, under which tariff is set excluding the capital cost of investment and only considering: (i) operating costs (including labour, fuel) and (ii) repair and maintenance costs. Such prices can be taken as a minimum ensuring that at least the operational costs of movement of freight are covered. Over and above these costs, the consumers can be charged according their ability to pay, to cover as much capital costs as feasible.

- **Simplification of rate structure:** The freight pricing policy should be simple, with only a few conditionality so that it can be easily adopted. Since the main purpose is to maximize the share of railways, focus should be on carrying a major portion of the produce that increases the overall share of railways. As a simplification measure, IR may consider subsuming different charges (e.g. siding and shunting, terminal charges, seasonal charges) in freight pricing itself thereby including all charges–from placement for loading to placement for unloading–into freight pricing. IR may also consider charging based on a combination of preferred route between OD points and the actual distance, instead of the present system of shortest and rationalised routes in combination with a slab-based system.
- **Introduction of a satisfaction index to assess the importance of non-price factors:** Despite the inelastic nature of bulk commodities IR is losing its share in movement of these commodities. Railways can conduct detailed market research from selected customers of different commodities on their preferences over freight rates and different factors and construct a composite 'Satisfaction Index' to measure the performance of Railways in freight transportation. This will aid IR to assess the main reasons behind its declining freight share, despite inelastic demand for bulk commodities. In this regard, factors such as: (i) timely availability of rakes; (ii) reliability and timely delivery (assured service); (iii) safe and damage-free transit for cargo; (iv) early settlement of claims; (v) rates offered by competitive modes of transport; and (vi) good connectivity between the source and destination; can be considered.
- **Increasing competitiveness:** The freight rate structure needs to be more flexible and responsive to the market changes. In the present competitive market, the rates quoted by IR should be determined by variable costs, rates of competitive modes of transport (especially road),

total cost to the users, and the quality of service provided. Speedy delivery of goods has now become an element of productivity with railways losing a large portion its traffic owing to this very reason. The 'economic value of time' saved can be incorporated in the charging principle of the freight tariffs, especially for transhipment services and shorter routes. There is a scope for improvement specifically with regards to the value/quality of service component, by improving train speed, amenities, and ease of doing business, etc.

A commodity-specific pricing policy, based on suitable OD pairs, market demand analysis, and forecasting can further assist in making rail tariffs more competitive. A comparative study of total cost to the user (including freight charges, packing, handling, and local carriage costs) for movement of goods can be conducted.

- **Diversification of the commodity basket:** Railways are more suitable for transport of bulk commodities for long-haul along with regular flows of low to medium-value density goods between fixed OD points (NITI Aayog, *et al.*, 2021). Additionally, there are commodities like motor vehicles, containers, and other non-bulk goods, that can be aggregated into trainloads. Railways can cater to these specialized segments and capitalize on the potential demand of fast-moving consumer goods sector, expanding its commodity basket. For aggregate and small goods, alternate modes like road can be complementary in the objective to achieve an efficient inter-modal transport system, along with schemes like Joint Parcel Product that can be useful if carefully implemented.

  An unexpected decline in the transportation demand (and revenue mobilization) for bulk commodities due to: availability of alternate modes like pipeline and roads; market disturbances; and construction of pit-head and port-based thermal power plants, needs to be offset by increasing the share of containers and 'other goods' in the freight basket of IR.

- **Setting up of a regulatory authority:** In line with the decision taken by the Cabinet in 2014, to establish an independent RTA, a statutory regulator through amendments of the Railways Act, 1989 with a separate budget needs to be established. This will ensure that its functioning is independent and unbiased. Given the distortions in the present freight rate structure of IR, it is essential to establish a regulator to at least regulate the freight operation by: (i) analysis of market conditions and competitions from other modes of transport, and (ii) rationalising the pricing system (encompassing issues such as, reassessment of the break-even class, marginal cost pricing, re-introduction of maxima-minima rates, and route-based pricing). As a first step, a tariff regulator as an attached office to the Ministry of Railways can be established, with gradual shift to a statutory (independent) regulator in the future.

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This report is part of a larger study 'Strategies to Increase Railway's Share in Freight Transportation in India'. The study has identified and discussed three key aspects concerning the growth of the freight business: Terminal Development and Operations, Freight Marketing Policies, and Rail Freight Tariff Policies.

Rest of the reports, policy briefs, and opinion pieces can be accessed using the given link/QR code: https://www.teriin.org/project/strategies-increase-railways-share-freight-transportation

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