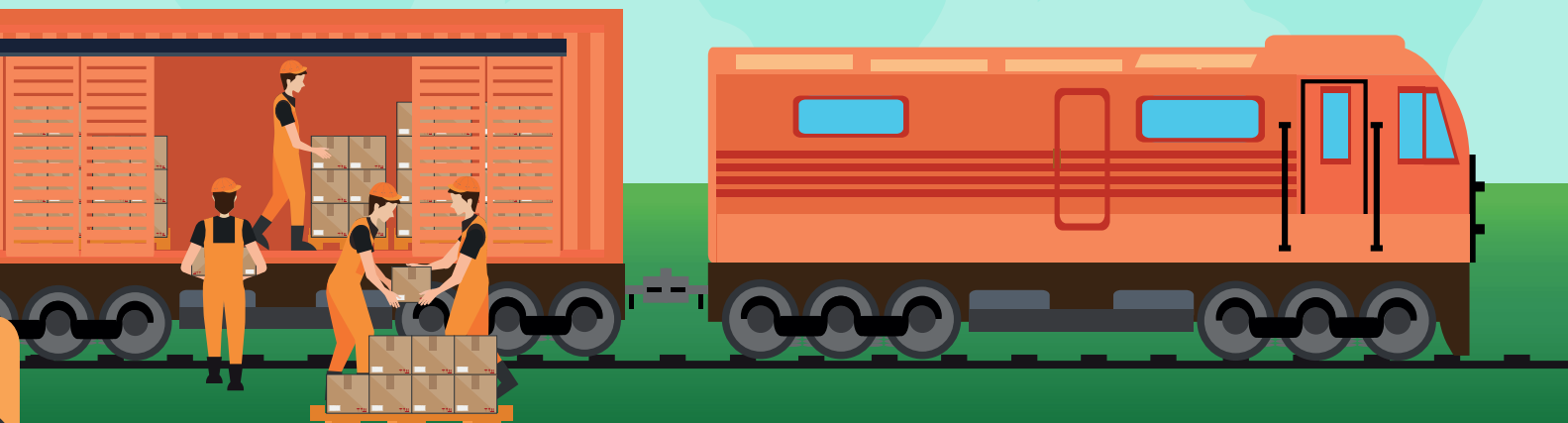


MOVING TOWARDS A LOW-CARBON TRANSPORT FUTURE:

Increasing Rail Share In Freight
Transport In India

EXECUTIVE SUMMARY



© The Energy and Resources Institute 2019

T E R I, February 2019

Moving Towards A Low-Carbon Transport Future: Increasing Rail Share in Freight Transport in India

New Delhi: The Energy and Resources Institute.

About Shakti: Shakti Sustainable Energy Foundation works to strengthen the energy security of India by aiding the design and implementation of policies that support energy efficiency, renewable energy and sustainable mobility.

Disclaimer: The views/analysis expressed in this report/document do not necessarily reflect the views of Shakti Sustainable Energy Foundation. The Foundation also does not guarantee the accuracy of any data included in this publication nor does it accept any responsibility for the consequences of its use.

*The reports produced as part of this study are for private circulation.

Introduction

The nature of freight transport in India has been undergoing significant changes over the course of the last few decades. Not only have the volumes of freight transport increased exponentially, given a rapidly growing economy, there have also been changes in the way the movement of these goods take place. The declining share of freight transport on railways has been capitalized by the road transport sector which has, in the last couple of decades, become the dominant freight transport mode in the country. This trend not only has implications on the economic growth trajectory of country, but also on the levels of energy and emissions from the sector. Being the most environmentally benign mode of land transport, it is critical for the country to retain, and increase the share of railways.

Many factors are responsible for this declining trend of freight transport, which have been documented time and again in several national level reports and documents such as the Indian Railways Vision 2020, National Transport Policy Development Committee (NTDPC) reports, Bibek Debroy Committee Report, etc. However, there is no dedicated White Paper or Report which focuses on the specific measures or specific commodities that would help the Railways in aggressively increasing its shares in overall national freight mobility. The much more fragmented, yet flexible, road based freight transport sector has been much more responsive to such changing trends in traffic types and volumes and has captured most of this new and increasing demands.

This research work aims to study in detail and get an understanding of such factors which have resulted in the declining Railway shares. A thorough understanding of such factors would help in ascertaining specific measures which might be required for the Railways to first stall the declining shares, and then improve its share in the overall freight traffic.

Declining share of IR

The contribution of transport sector in an economy's growth is undisputed. Indian Railways has always played a vital role in India's growth narrative. However, there has been rising dominance of the road sector in the freight transportation segment. The share of railways in total freight carried, in terms of net tonne kilometres (NTKM)¹,

¹ Total freight traffic include that of road and railways

has been declining over the years. As per the estimates, based on the findings of the Ministry of Road Transport and Highways (MoRTH) and the Indian Railways, the share of railways has declined from 39% in 2002-03 to 27% in 2014-15² (refer Figure 1).

This is largely on account of increased investment in improving road infrastructure as well as the declining cost of road transportation. Economic Survey, 2017-18 highlighted this major constraint of increasing competitiveness (tariff) from other modes of transport, mainly road that has resulted in IR's slowdown in freight traffic³. Other reasons include severe capacity constraints on trunk routes, non-flexible policies, limited financial resources to maintain or develop massive infrastructure, and the lack of commercial and marketing initiatives to attract traffic. The perception of industry about Indian Railways has always been that of a transporter with a 'take it or leave it' approach. Having said this, it is also observed that railways has more or less been able to cater to the captive customers, however, it has fallen short of capturing new customers/commodities despite several efforts such as the launch of container segment and opening up the same to private operators.

Since the effect of investment in physical infrastructure comes with a lag on account of gestation period, the decline in railway freight traffic is expected to extend in the coming years as well, at least till the two on-going Dedicated Freight Corridor (DFC) projects are fully functional and other capacity augmentation projects are realized.

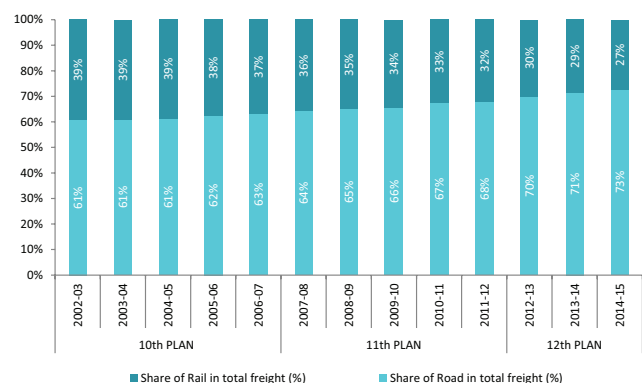


Figure 1: Share of Railways vis-à-vis Road in freight transportation in India

Source: Ministry of Road Transport and Highways and Indian Railways

² Estimates for 2015-16 onwards has not been released by the MoRTH

³ https://mofapp.nic.in/economicsurvey/economicsurvey/pdf/120-150_Chapter_08_Economic_Survey_2017-18.pdf (last accessed in December 2018)



Going in future, Indian Railways has set a target for its freight business. The Railways aim to carry 2,400 million tonnes by 2025⁴, which would require a compound annual growth rate of 8.5% from 2017 till 2025. Even with the commissioning of mega projects, Indian Railways face an uphill task of attracting new customers and retaining the existing ones to achieve the target.

Freight performance of Indian Railways

In a scenario where freight segment is the ‘bread and butter’ of the Indian Railways, it is important to look at the overall freight performance of over the years. TERI analyses the growth in IR’s traffic during last three five year plan vis-à-vis economic growth (in terms of gross domestic product [GDP]) as well as targeted and actual performance in terms of freight loadings.

NTKM performance vis-à-vis GDP

The 10th Five Year Plan Period (2002-07) was one of the most successful years for Indian Railways in terms of transportation output for freight movement – net tonne km (NTKM). Indian Railways ‘exceeded most of the targets set for the 10th Five Year Plan⁵. Such outcome was achieved by the Railway Board by adopting supply side strategy of running faster, longer and heavier trains; and demand side strategy of dynamic and differential pricing (Mehrotra, 2009).

For the freight movement, the decision was taken to increase the load ability of wagons on select routes by 15% during mid-2000. The tariff rates were also tweaked based on the market competition and the kind of services rendered by IR for certain commodities also improved. As a result, significant improvement in loading was reported for commodities, such as coal, iron ore, cement, and containers.

The transportation output growth during the 11th Five Year Plan tapered, where the achievement was lower than the target (refer Figure 2). For instance, IR reported 640 billion tonne km (btkm) of freight traffic during 2011-12 as compared to the revised target of 674 btkm, a shortfall of 5%⁶.

⁴ [http://www.indianrailways.gov.in/Reform-Perform-Transform%202022_v10%20\(2\).pdf](http://www.indianrailways.gov.in/Reform-Perform-Transform%202022_v10%20(2).pdf) (last accessed in January 2019)

⁵ <http://www.indianrailways.gov.in/railwayboard/uploads/directorate/infra/downloads/ReportoftheWorkingGroupfortheXIfiveyearPlan.pdf> (last accessed in January 2019)

⁶ http://planningcommission.gov.in/plans/planrel/fiveyr/12th/pdf/12fyp_vol2.pdf (last accessed in January 2019)

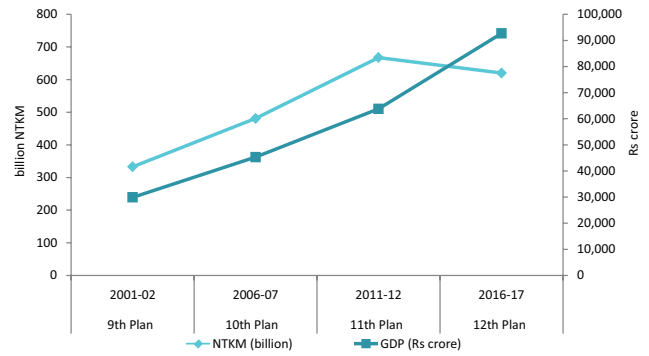


Figure 2: Growth of IR's freight traffic and India's GDP

Note: Data for terminal years of Five Year Plans; Source: Indian Railways and RBI

The rate of growth of NTKM witnessed rapid decline during the 12th Plan period. This is in contrast to the higher rate of growth during the previous two plan periods (10th and 11th). It is to be noted that higher NTKM growth during 10th Plan was on the back of IR's deliberate effort of loading higher volume and running longer trains. Growth in traffic during 11th Plan was despite the economic slowdown on account of global financial crisis.

On the other hand, the rate of growth of the GDP remained on a higher side throughout the three plan periods. This indicates towards a trend of de-coupling of GDP and IR's traffic growth rates. One of the reasons explaining such trend could be the declining lead of rail traffic (figure 2), despite growing originating tonnage of Indian Railways. With the fact that Indian Railways has always been a bulk transporter moving goods over long distances, the declined in NTKM is nonetheless worrisome. There could be various factors leading to the rail traffic decline in the last few years, even though GDP remained on the higher side, including infrastructural constraints, inability to cater to changing customer needs, etc.

Table 1: Growth rate of NTKM and GDP during the last three Five Year Plan periods (CAGR %)

	CAGR_NTKM	CAGR_GDP
10th Plan	8.0%	8.6%
11th Plan	6.4%	7.3%
12th Plan	-1.2%	7.3%

Source: Indian Railways and Reserve Bank of India⁷

⁷ Please note that comparison on the basis of growth rates (CAGR over the five year plans) overcomes the data challenge related to the change in base year from 2004-05 to 2011-12



Targets and actual freight loadings during last three Five Year Plans (10th, 11th, and 12th)

A look at the targets set during the Five Year Plans and the actual achievements for freight traffic indicates that performance under the 10th Plan was higher as compared to the following two plans. The period under 10th Plan is also termed as the years of transformation where Indian Railways relied upon the strategy of fully utilizing its assets. In addition, Indian Railways focussed on 'coordination and cooperation requiring functional and spatial synergy as well as complementarities among various kinds of policy interventions' in an effort to increase traffic loading. Taking an example from IR's freight basket, steel traffic was declining and going to the road transporters for quite a long time. This was despite the reduction in freight class from 230 to 180. The committee of the major freight customers, which was constituted in 2005, pointed out that logistics depend on factors other than tariff rates such as multiple handling, door-to-door service and restriction on full rake load. The Indian Railways, thereafter, offered customers to move 'half-rake' load as well as allowed unloading at multiple stations. These measures reaped benefit and resulted in reversal in rail coefficient for not only steel but also for other commodities (Mehrotra, 2009).

The Indian Railways witnessed serious shortfall in targeted NTKM during the 12th Plan. There could be various reasons explaining the shortfall, from capacity constraint to over ambitious target for the 12th Plan for Indian Railways (see Figure 3).

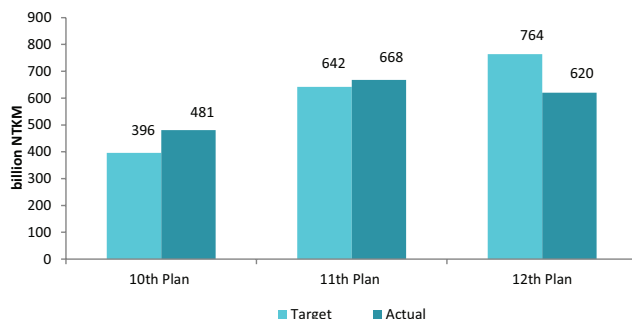


Figure 3: Targets and achievements of Freight traffic during the last three Five Year Plans

Source: Indian Railways

The two components of NTKM are tonnage and lead. As discussed earlier, it is seen that even though tonnage has

continuously increased the lead has been on the decline, with a net effect of decline in NTKM during the 12th Plan. While the originating tonnage increased at a CAGR of 7%, 4% and 2% during the 10th, 11th and 12th Five Year Plans, the average lead increased at a CAGR of -1%, 1% and -3% during the respective plan periods. The average lead came down from 644 km in 2012-13 to 559 km in 2016-17, while originating tonnage increased from 1,014 million tonnes to 1,109 million tonnes during the same period. Countries like the US and Russia, with large geographic areas like India, have much higher average lead travelled by rail. For instance, every shipment moved an average lead of over 1,300 km⁸ by rail in US railroad. Like India, China is also experiencing decline in average transport distance of freight trains, however at a much slower rate than India⁹.

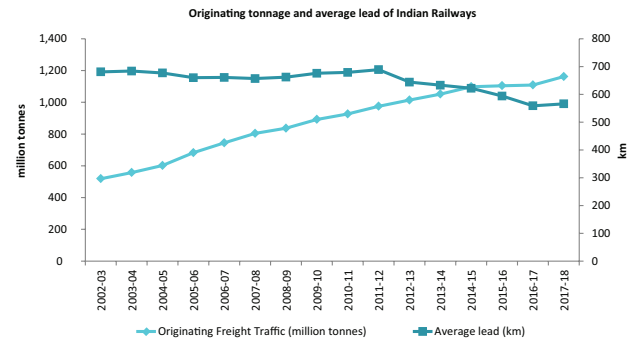


Figure 4: IR's originating tonnage and average lead trend from 2002-03 till 2017-18

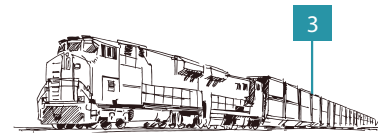
Source: Indian Railways

Commodity-wise analysis

While the Railways have been losing its share in the overall freight transport pie, the railway shares in the movement of different commodities have been different. For commodities such as coal and iron-ore, which are the mainstay of the Railway business, the shares of transport on railways have been gradually declining over the last few years. Coal traffic, in terms of NTKM, has declined from 270 billion NTKM in 2013-14 to 263 billion NTKM during 2017-18, while its share in total traffic carried by railways declined marginally from 41.4% to 40% during the same period. Similar is the trend for foodgrain and iron ore. In the case of other commodities such as cement and petroleum products (POL), the railways have been losing shares.

⁸ <https://www.bts.gov/bts-publications/freight-facts-and-figures/freight-facts-figures-2017-chapter-2-freight-moved>

⁹ <http://data.stats.gov.cn/english/easyquery.htm?cn=C01> (assessed on August 14, 2018)



Other than these bulk commodities, which have historically moved on Railways, commodities such as containers, automobiles, break-bulk and other white goods have seen limited movement on rail. However, demands for most of these commodities can be met on railways, and given that the demands for these commodities are expected to increase in the future, it is important to identify strategies for capturing their shares on rail.

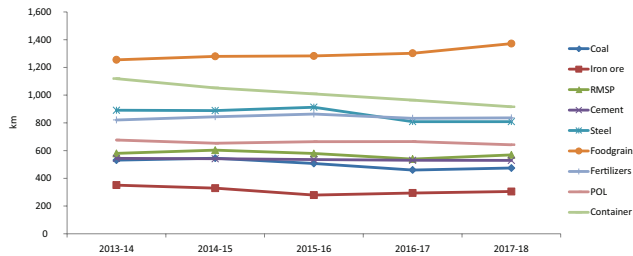


Figure 5: Average lead trend of key commodities carried by Indian Railways
Source: Indian Railways

The decline in overall average lead of rail freight has been discussed earlier. However, different bulk commodities have witnessed different trajectories for average lead over the last five years. For instance, average lead of foodgrains and fertilizers, which accounted for 10% in the total originating tonnage, increased at a CAGR of 1.8% and 0.4% between 2013-14 and 2017-18. Other commodities, follows a downward path with highest decline in average lead reported in the movement of coal, iron ore, steel, and containers.

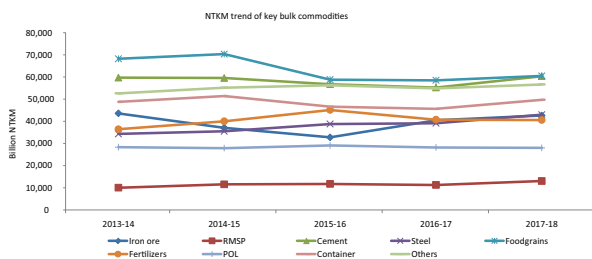


Figure 6: Traffic trend of key bulk materials carried by Indian Railways (2013-14 to 2017-18)

RMSP: Raw material for steel plants; **POL:** petroleum-oil-lubricants; **Source:** Indian Railways

Infrastructure development by IR

Performance during the last three FYPs (in terms of physical and investment)

The achievements with regard to development of key infrastructure by the Indian Railways during the last

three five year plans have been mixed. Construction of new lines surpassed the target only during the 11th Plan, gauge conversion surpassed the target only during 10th Plan, and doubling surpassed the target only during 11th Plan. Notably, the 12th Plan period witnessed severe shortfall in targets set for new line construction, gauge conversion, and doubling. It is observed that investment for infrastructure development increased significantly during the 12th Plan period, the result for which is expected to be realized in the coming years on account of high gestation period of these projects¹⁰.

New Line

With 10% over achievement in constructing new lines in the 11th Plan, the target for the 12th Plan was set ambitiously high. IR has, however, been unable to achieve the targets under the last Five Year Plan (refer Figure 7). Investment witnessed a rapid jump since 2015, the result

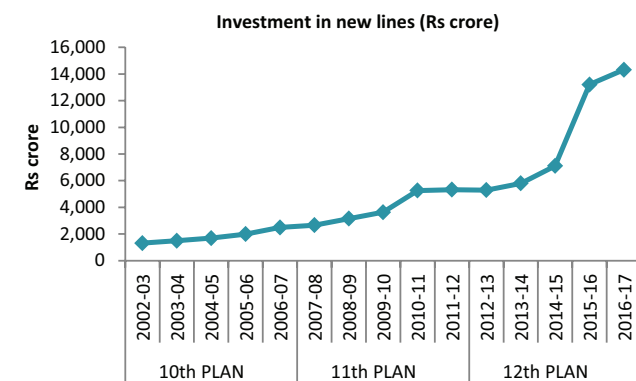
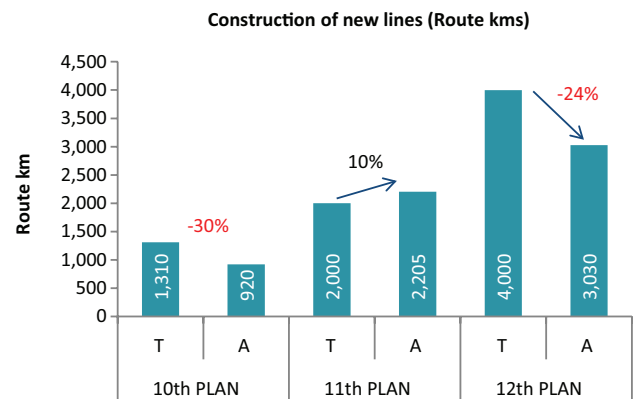


Figure 7: Construction and investment in New Lines (route km, Rs crore)
T: Target; **A:** Achievement

Source: Planning Commission, Standing Committee report on Railways (2014-15), Working Group for the 11th Five Year Plan (2006-07); and IR Year Books of respective years.

¹⁰ Note: Figures related to investment in various infrastructure development are given in Appendix 1



of which is expected in the next 4–5 years. The compound annual growth rate (CAGR) of investment related to new lines for the 10th, 11th, and 12th plans are 27%, -4%, and 12%, respectively.

Gauge Conversion

Gauge conversion has missed its target during the last two Five Year Plans. The investment allocated towards gauge conversion has also fluctuated over the years. The CAGR of investment related to gauge conversion for the 10th, 11th, and 12th plans are 27%, -4%, and 12%, respectively (refer Figure 8). There are about 3,500 route km of metre gauge and 2,200 route km of narrow gauge in IR's rail network¹¹ which would eventually be converted to broad gauge in the future (2016-17). The priority for conversion of gauge is dependent upon traffic growth on a particular stretch.

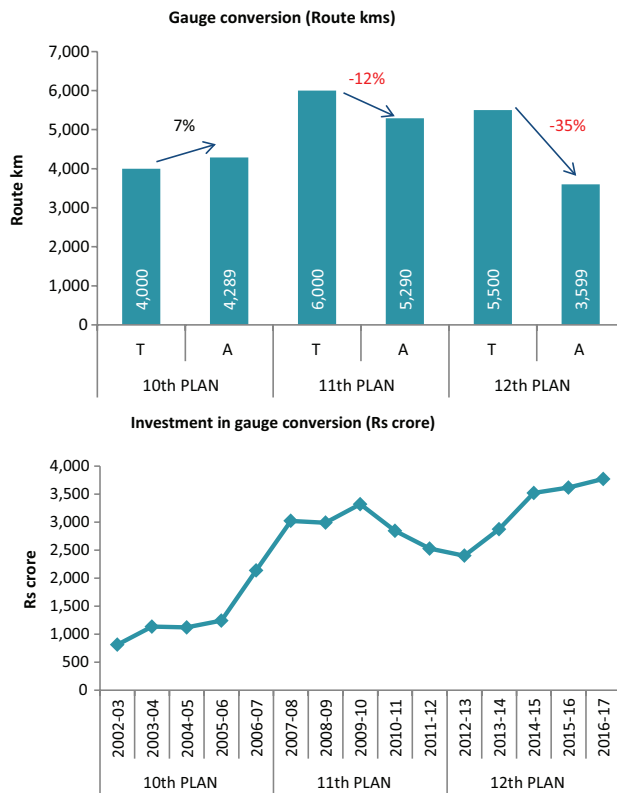


Figure 8: Construction work and investment related to Gauge Conversion (route km, Rs crore)

Source: Year Books, Indian Railways

Doubling

Doubling work has been given emphasis since 2015, with quantum jump in investment. During the 10th, 11th, and 12th

Plan periods, CAGR in investment were reported at 20%, 8% and 39% respectively (refer Figure 9). Consistently higher investment level for doubling works is likely to ease the congestion situation on the IR network.

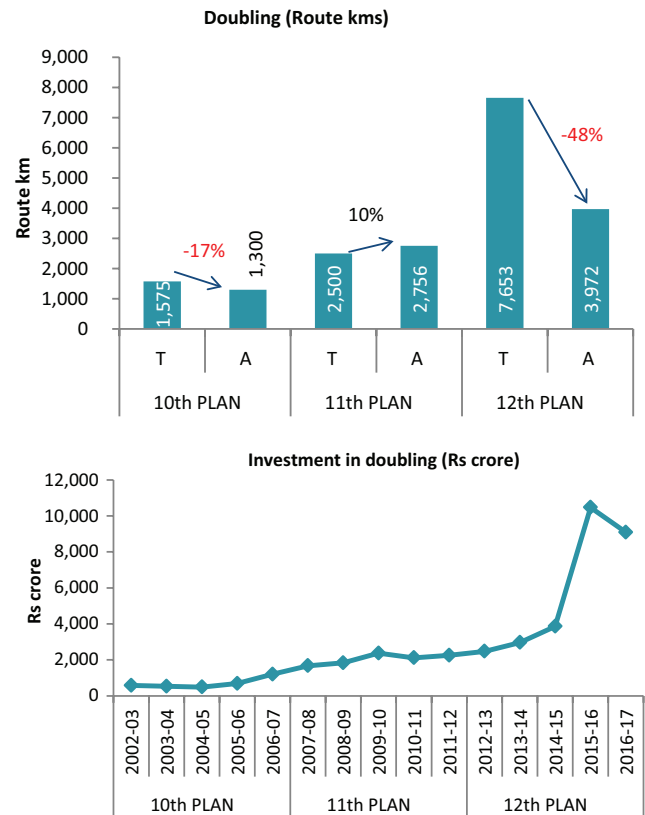


Figure 9: Construction and investment related to Doubling work (route km, Rs crore)

Source: Year Books, Indian Railways

Electrification

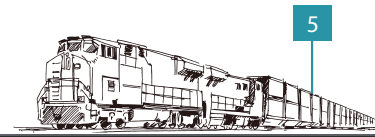
Electrification remains a major area of improvement in IR's infrastructure development plan. The pace of electrification has considerably increased in the last 4-5 years backed by increased fund allocation. IR plans to electrify 90% of the total railway routes in the years to come¹². The CAGR of investment related to electrification for the 10th, 11th, and 12th Plans are -1%, 16%, and 31%, respectively (refer Figure 10).

Other Key Infrastructure Developments

Besides new line, doubling, gauge conversion, electrification, track renewal, etc., the Indian Railways

¹¹ http://www.indianrailways.gov.in/railwayboard/uploads/directorate/stat_econ/IRSP_2016-17/Facts_Figure/17.pdf

¹² Mission 41k document released by Indian Railways in 2017



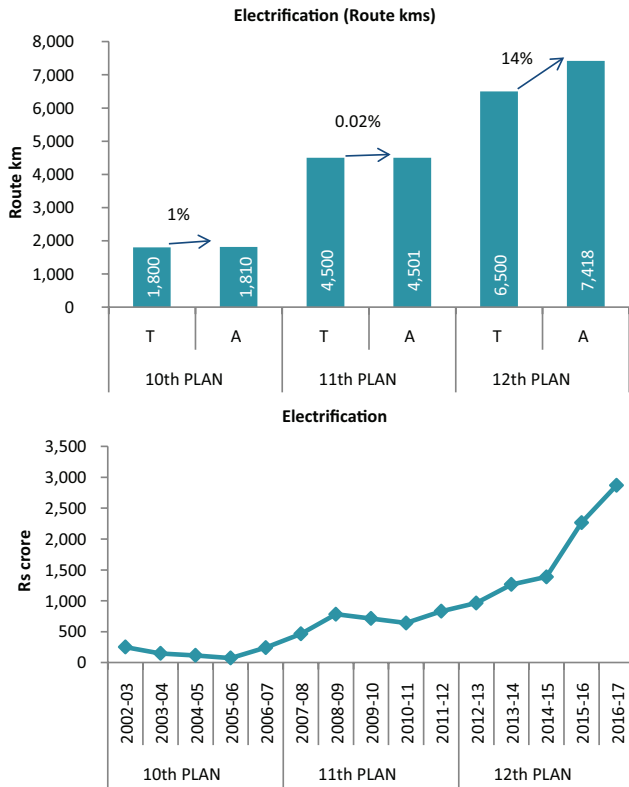


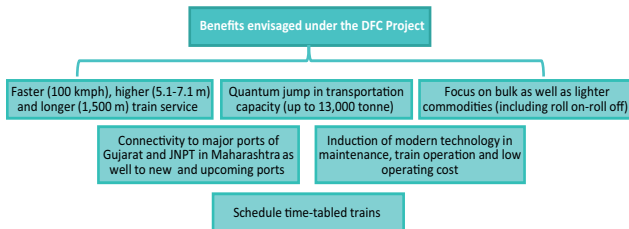
Figure 10: Work and investment related to Electrification (route km, Rs crore)

Source: Year Books, Indian Railways

has been engaged in mega projects to augment its capacity to handle freight. Some of these have been discussed here.

Dedicated Freight Corridor project

- DFC project was conceived in 2004-05 and the Dedicated Freight Corridor Corporation of India Ltd (DFCCIL) was set up in October 2006 to undertake the project. The Ministry of Railways has a 100% equity stake in the special purpose vehicle.
- With an investment of over Rs 81,459 crore, DFC is one of the biggest ongoing infrastructure projects in the country¹³.
- The DFC project is expected to be fully commissioned by 2020-21.



¹³ http://www.dfccil.gov.in/dfccil_app/Project_Funding

Eastern Corridor - EDFC

- The 1,856 km Eastern Dedicated Freight Corridor (EDFC) is being developed between Ludhiana in Punjab to Dankuni in West Bengal at an estimated cost of Rs 30,358 crore¹⁴. The key funding agency for the corridor is the World Bank, contributing a total of Rs 13,625 crore¹⁵, (45% of the total cost of EDFC).
- Projected to cater to several traffic streams – coal for the power plants in Uttar Pradesh, Delhi, Haryana,

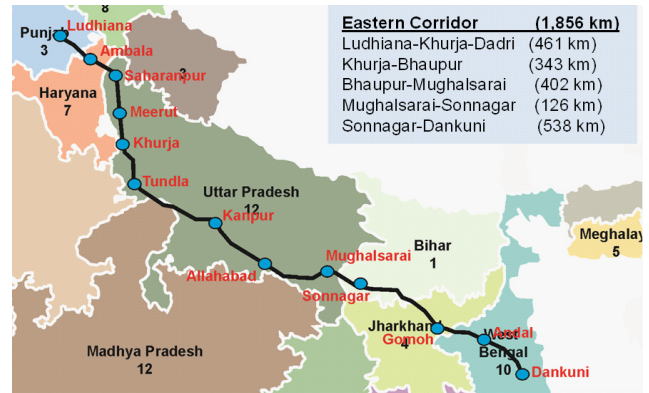


Figure 11: Route map of Eastern DFC

Source: DFCCIL

Punjab, and Rajasthan. Other key commodities projected to be transported on this corridor include finished steel, foodgrains, cement, fertilizer and limestone, and general goods.

Western Corridor - WDFC

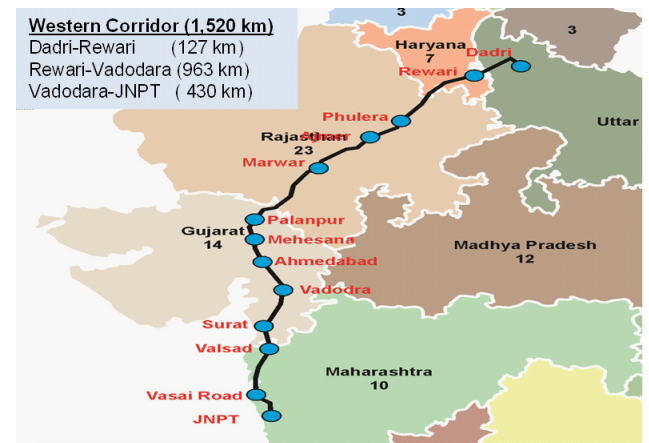


Figure 12: Route map of Western DFC

Source: DFCCIL

¹⁴ <http://164.100.47.190/loksabhaquestions/annex/15/AU1357.pdf>

¹⁵ <http://164.100.47.194/Loksabha/Questions/QResult15.aspx?qref=2363&Isno= 16>



- The 1,520 km Western Dedicated Freight Corridor (WDFC) is being developed between JNPT and Dadri at an estimated cost of Rs 51,101 crore¹⁶. The key funding agency for the corridor is the Japan International Cooperation Agency (JICA), contributing a total of about Rs 38,772 crore (76% of the total cost of WDFC).
- The traffic will mainly comprise containers from JNPT and the ports of Mumbai, Pipavav, Mundra, and Kandla. Besides containers, other commodities moving on the Western DFC will be petroleum-oil-lubricant (PoL) products, fertilizer, food grains, salt, coal, iron, steel, and cement.

¹⁶ <http://164.100.47.190/loksabhaquestions/annex/15/AU1357.pdf>

IR's marketing initiatives

IR has undertaken several initiatives, with regard to freight marketing policy as well as infrastructure development, to enhance its capability and attract freight onto railways. These have been discussed, in brief, in this section.

Policy initiatives

In the last 10 years, IR has undertaken several policy initiatives to boost private participation in increasing share of railways in freight transportations. These have been listed in Table 2.

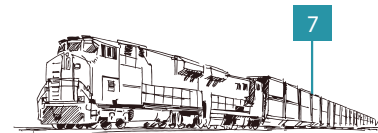
Table 2: Key freight-related marketing policies undertaken by the Indian Railways

Area	Policy	Details
Terminals	Private Freight Terminal (PFT) policy	The PFT policy was launched in 2010 and later revised in 2015. The aim of the policy is to attract private investment in setting up of freight terminals. ¹⁷
Rolling stock	Wagon Leasing Scheme (WLS)	The WLS was launched in 2008, which was revised in 2014. The aim of the policy is to 'develop strong leasing market by encouraging third party leasing of wagons.'
	Liberalised Wagon Investment Scheme (LWIS)	The LWIS policy was launched in 2008, which was revised last year in July 2018 ¹⁸ . It allows private players to invest to procure special purpose wagons and high capacity wagons to operate on specific routes/circuits. These wagons are not merged with wagon pool of IR.
	General Purpose Wagon Investment Scheme (GPWIS)	The policy was introduced in April 2018 to encourage private investment in general purpose wagons like BOX, BCN, BOXN, etc. IR has not covered special purpose wagons under this scheme.
Train operation	Special Freight Train Operator (SFTO) policy	IR launched the SFTO policy in 2010, and revised it in 2014. ¹⁹ It aims to provide opportunity to private operators to offer rail services through owned rakes.
	Special Parcel Train Operator (SPTO) scheme	It was launched by IR in 2014 to increase parcel loading on to its trains through private participation. The policy allows private parties to procure rolling stock, including general service parcel vans, refrigerated vans, etc., and operate it as special parcel trains.
	Automobile Freight Train Operator (AFTO) policy	The AFTO was launched in 2010 and was revised in 2014. The policy provides opportunity to the private logistics companies/transporters to run freight trains catering to the automobile sector. The operator can induct new higher capacity wagons, provided it meets the conditions set by IR's Research Design and Standard Organization (RDSO).
Logistics facility	Development of Automobile & Ancillary Hub	In parallel to the AFTO policy in 2010, the Railways also launched "Development of Automobile and Ancillary Hub" policy to facilitate end to end logistics for automobiles. The aim of the policy is to provide opportunities to automobile manufacturers to do bulk transportation by rail and do secondary distribution to consuming centres in the immediate catchment areas from such hubs.

¹⁷ http://www.indianrailways.gov.in/railwayboard/uploads/directorate/traffic_comm/Master_Circulars/MC_PFT_020115.pdf

¹⁸ http://www.indianrailways.gov.in/railwayboard/uploads/directorate/traffic_comm/downloads/Freight_Marketing_2018/Liberalized_02072018.pdf

¹⁹ http://www.indianrailways.gov.in/railwayboard/uploads/directorate/traffic_comm/Master_Circulars/sfto001_221214.pdf

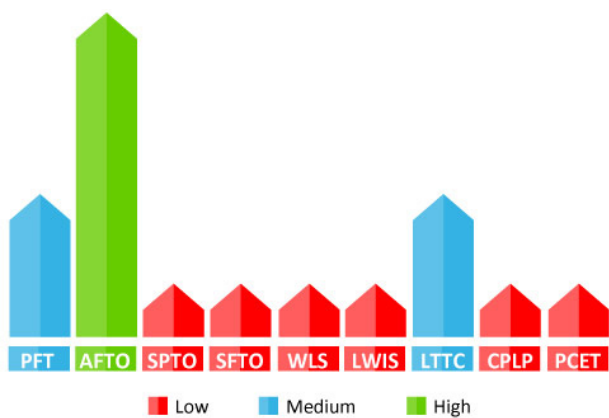


Area	Policy	Details
Tariff-related scheme	Long-term Tariff Contract (LTTC) scheme	The LTTC scheme was introduced by IR in 2017. Through this, both the parties agree to a pre-determined price escalation principle, where cement companies can avail freight rebate on incremental loading/revenue.
Parcel business	Comprehensive Parcel Leasing Policy (CPLP)	The policy with regard to parcel space leasing was brought in by the Indian Railways in March 2006. Indian Railways launched the modified CPLP in April 2014. The objective is to increase private/lease holder participation in carrying parcels by Indian Railways.
	Parcel Cargo Express Train (PCET) policy	PCET policy was introduced in 2007. It set out the set of rules for the operation of leased trains for parcel movement.

Source: Indian Railways

One of the key issues raised by the stakeholders is the absence of consistency in policies of the Indian Railways. As seen in the table, there have been several rounds of revisions related to policies and schemes launched by the Indian Railways. Besides, numerous amendments are notified post release of IR schemes. For instance, eight amendments have been made under the modified Comprehensive Parcel Leasing Policy, which was introduced in April 2014. Before this, the original CPLP was amended 19 times between 2006 and 2013²⁰. Similar experience has also been reported with regard to the LWIS, which witnessed five amendments between 2012 and 2014. These signify the need to hold consultative rounds with all the stakeholders before finalizing any scheme or policy.

Impact meter of IR’s schemes



During the period of policy implementation, several issues arise which the Indian Railways try to resolve by bringing in amendments to the policy. One of the key recommendations, which also emerged from the discussions TERI had with various groups of stakeholders, is the need to make customer-centric policies. Rounds of deliberations with non-railway

parties need to be undertaken before finalizing the policies, so as to reduce the number of amendments required later and to maintain consistency of policies.

Financial Performance of Indian Railways

Investment in Indian Railways

Indian Railways is mostly dependent on a freight segment for funding their day-to-day requirements as well as infrastructure augmentation (refer Figure 13). This is based on the fact that freight accounts for about two-thirds of the inflow of funds. Key challenge of Indian Railways – meeting social obligation through cross subsidization of passenger movement – is cited as one of the main reasons for poor financial performance of the organization.

There are three key sources—budgetary allocation, extra budgetary resources like market borrowing, and internal resource generation mainly through traffic income. A trend analysis of the sources of revenue for the Indian Railways is as follows:

- There is a rapidly increasing dependence on extra budgetary resources like market borrowing due to lower share of internal resources in total fund required for infrastructure expansion, which is not sustainable in the long run.
- The spike in the internal resources during 2014-15 in Figure 15 is on account of increase in passenger and freight tariff rates in June 2014. However, there has been a continuous decline in internal generation of resources.

²⁰ http://www.indianrailways.gov.in/railwayboard/uploads/directorate/traffic_comm/Freight-Mktg-2k13/FM_18.pdf



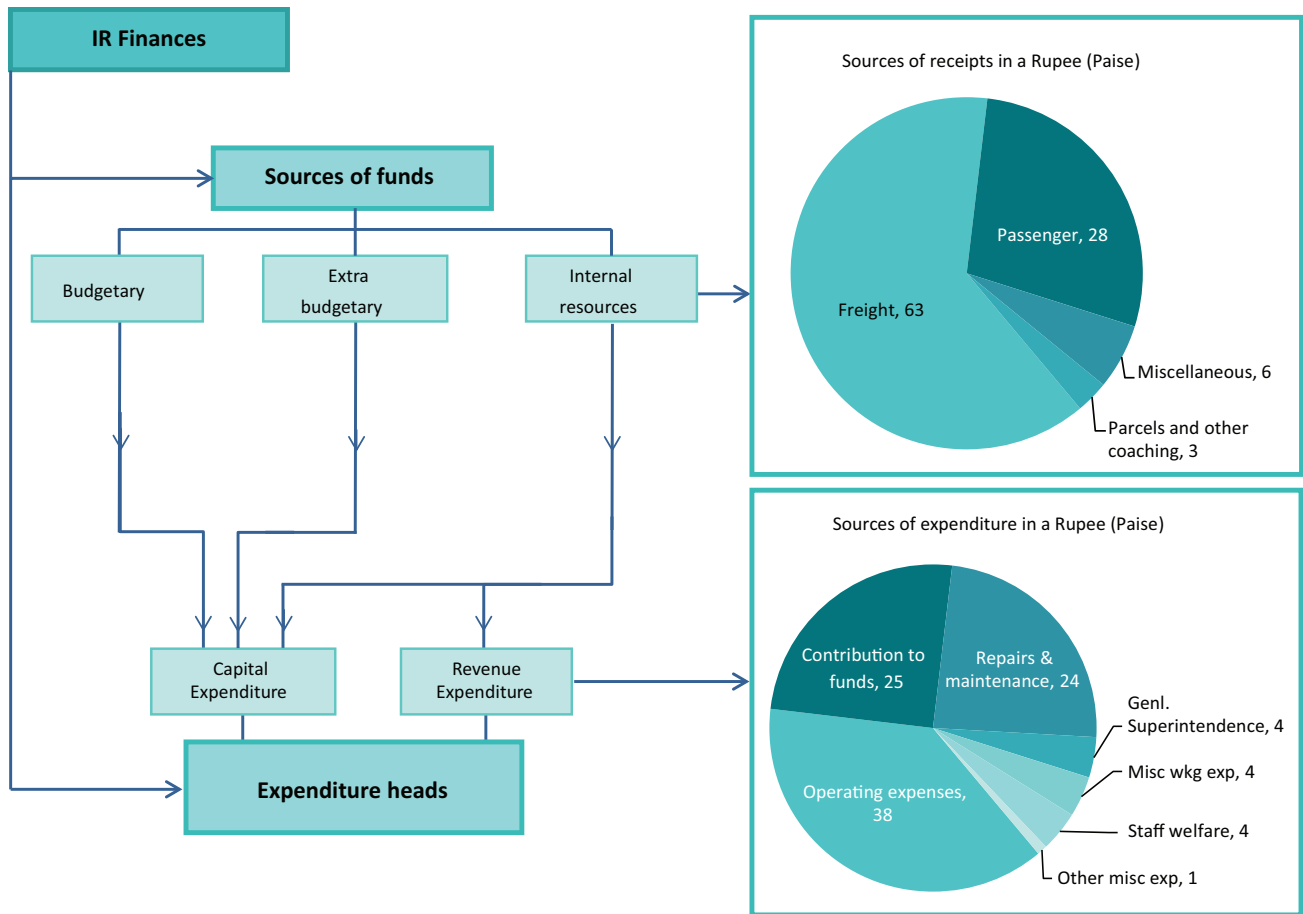


Figure 13: Sources of revenue and expenditure heads of Indian Railways
Note: Revenue and expenditure shares are for 2016-17; **Source:** Indian Railways

○ Budgetary support has also consistently increased in the last 5-6 years.

Operating ratio

The financial position of rising expenditure and lower growth

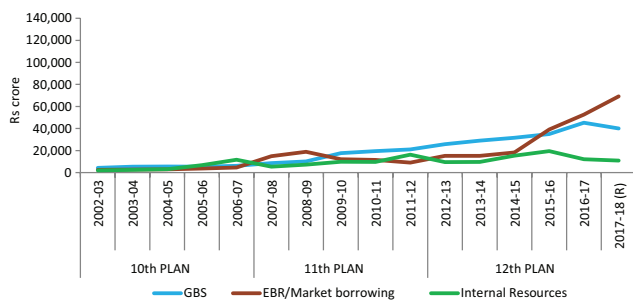


Figure 14: IR's expenditure sources over the last three Five Year Plans
Source: Budget documents, Indian Railway

in revenues makes it difficult for the Indian Railways to manage its capacity expansion initiatives. 'The operating ratio, which should be between 80-85%'²¹, was reported at 96.5% in 2016-17. Operating ratio is defined as the amount spent

to earn every Rs 100. IR's operating ratio has consistently remained above 90 since 2008-09 (Refer figure 16).

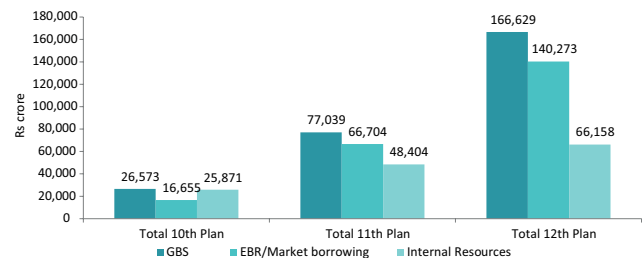
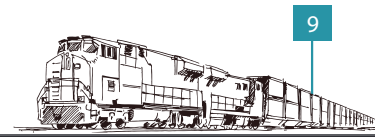


Figure 15: Total investment in Railways under three five year plans
Source: Budget documents, Indian Railways

Committees to Determine the Cause of Market Share Decline

Indian Railways has conducted several studies to examine the causes of decline in its market share and to take remedial action for arresting the downward trend.

²¹ http://planningcommission.nic.in/plans/planrel/12appdrft/approach_12plan.pdf



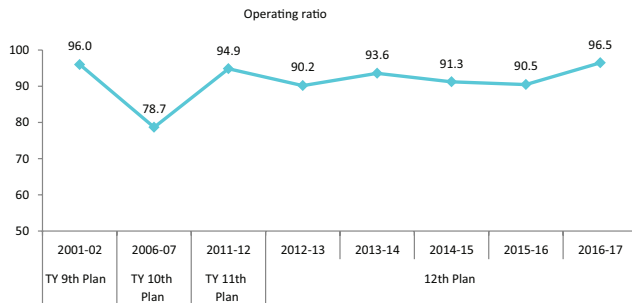


Figure 16: IR's operating ratio trend
Source: Indian Railways

In the last 20 years or so, there have been several committee reports capturing the capital structure, restructuring as well as modernization of Indian Railways. These discuss in detail the challenges faced by Indian Railways as well as the steps and strategies that should be undertaken to overcome such challenges.

The Ministry of Railways commissioned RITES Limited to undertake a study on 'Decline in Railways' Share of Total Land Traffic', which was submitted in 1997. The primary objective of the study was to understand the reasons behind the declining share of railways in total freight movement and suggest measures to reverse the declining share. One of the key conclusions of the study was that Indian Railways was unable to carry 'traffic on demand', which resulted in movement of such commodities via roadways. RITES also came up with Total Transport Study, 2007-08, which estimated the share of railways in total transport, focussing on freight movement. The report also highlighted the share of railways in various commodities.

Around the same time, report of the Working Group on Railway Programmes for The Eleventh Five Year Plan (2007-12) was released which listed recommendations on key issues related to business strategy, passenger business, pricing, costing, tariff policy and social burden, infrastructure policy and safety.

In 2009, Indian Railways came up with a Vision 2020 document, which set up ambitious goals related to capacity creation and traffic growth. It talked about 'Reinventing freight business' and regaining the eroded market share of railways in the freight movement from 35% (2009) to at least 50% by 2020²². The target was planned to be achieved through creation of adequate carrying capacity, achieving cost-effectiveness, improving quality of service and providing new value-added services on a customized basis. In the current scenario, however, these targets are far from being achieved.

²² <http://www.railsafety.co.in/downloads/railways-vision-document-2020.pdf>

The National Transport Development Policy Committee (NTDPC), 2014, endorsed a primary role for railways in freight transport and recommended a massive investment in capacity enhancement. It also talked about the low fare-freight ratio (indicating cross subsidization of passenger segment by charging higher tariff rates for freight) for Indian Railways as compared to some foreign rail systems like China and France.

The report of the Committee for Mobilization of Resources for Major Railway Projects and Restructuring of Railway Ministry and Railway Board (2015), chaired by Bibek Debroy, has aptly put the issue faced by Indian Railways as 'a wide gap between the supply side improvements and the demand side expectations'²³.

Summarising the issues highlighted in these reports, factors such as inadequate rail infrastructure, changing patterns of commodity wise demand for transport, increasing rail transport costs, lack of transit time guarantee, etc., have all resulted in a decline in the IR's share in freight transportation. A shortcoming on behalf of the railways in meeting changing customer needs and rising up to meeting the competition from other transport modes like roadways and other operational and organizational issues of the Railways have been cited in the above mentioned committee reports as major impediments in incentivizing movement of freight traffic on the Railways. These together have led to a perception issue for the railways, for which customers with limited demands have often shied away from using the Railways. While all these documents and reports have made useful suggestions on the possible measures that would help the Railways get back some of its shares, there is no dedicated white paper or report which focusses on the specific measures that would help the Railways in aggressively increasing its share in overall national freight mobility. On the other hand, the much more fragmented, yet flexible, road-based

"Railway is on the path of gradual recovery but it still has to be kept in the ICU as it needs to be strong enough."—Mr Suresh Prabhu, Former Minister, Ministry of Railways (July 2017)

"If I had not increased rail fare, believe me, the Indian Railways would have come to a grinding halt. It was headed for the ICU, and I have pulled it out." – Mr Dinesh Trivedi, Former Minister, Ministry of Railways (March 2012) (The Minister had to resign and fare hike was partially rolled back)

²³ http://www.indianrailways.gov.in/railwayboard/uploads/directorate/HLSRC/FINAL_FILE_Final.pdf (accessed on August 14, 2018)



freight transport sector has been much more responsive to such changing trends in traffic types and volumes and has captured most of these new and increasing demands.

Key Challenges faced by IR

Based on the interactions with the industry stakeholders as well as reports submitted by various committees mentioned earlier, broad challenges or impediments to faster growth of freight traffic moved by rail have been listed below. These have been discussed in detail in respective commodity-specific reports.

Infrastructural constraints: Delay in provision of adequate infrastructure and sharing of lines by passenger and freight trains have resulted in significant shift of traffic from rail to road. IR's line capacity, terminal infrastructure, and rolling stock asset have not grown as per the demand of the logistics sector. TERI analyzes these impediments below.

- **Line capacity:** As per IR's White Paper (2015), 40% of all 1,219 sections across zones were running at line capacity of 100% or above. Majority of the Zonal Railways are in the range of optimal and higher than optimal utilisation of line capacity. Further, 65% of the 247 high-density sections are running at a line capacity of 100% or above. Indian Railways' initiative to ease capacity, namely DFC projects, is expected to considerably improve its capabilities in carrying higher traffic, particularly freight.

- **Terminal infrastructure and operation:** Basic infrastructure facilities required for smooth and efficient operation of terminals and sidings are missing or not functioning. Lack of modern equipment, mechanization, maintenance of fixed assets, security and safety issues, and poor access/approach road condition are some of the concerns raised by the stakeholders. There are issues related to terminal policy of IR with difficulty faced by interested private players in acquiring land to develop green-field terminals. Indian Railways need to put in place long term perspective plan for terminal infrastructure backed by adequate policy tool to (1) encourage private participation in the operation and management of terminals, and (2) optimum utilization of terminal resources.

Higher transit time: One of the primary and determining factors of modal choice for freight transportation is time-component of logistics. IR has under-performed in providing timely delivery of services, which is one of the reasons for shift of short lead bulk traffic (cement, steel products, containers, etc.) or in some cases long lead traffic (like automobile, parcels, etc.) to roadways. For commodities like automobile and parcel trains, where IR has assured/guaranteed transit time, it has under-performed miserably.

Table 3: Line Capacity Status of High Density Network on IR (No. of sections)

Zonal Rail	<80%	80-100%	100-120%	120-150%	>150%	Total sections
CR	12	4	7	12	5	40
ECoR	5	–	6	8	1	20
ECR	1	5	4	3	3	16
ER	–	3	7	–	–	10
NCR	–	1	5	19	1	26
NER	1	3	6	1	3	14
NFR	–	3	–	5	1	9
NR	3	4	5	7	2	21
SCR	–	14	2	2	2	20
SER	2	2	6	6	–	16
SECR	–	–	3	5	1	9
SR	5	8	4	–	–	17
WCR	1	–	2	2	2	7
WR	–	9	2	9	2	22
Total	30	56	59	79	23	247

Source: White Paper, Indian Railways (February 2015)



Infrastructural constraints as well as priority of ‘moving people’ have resulted in lower average speed of freight trains. The average speed of goods train, which improved during the 10th and 11th Five Year Plan periods, declined during the 12th Plan period. As per IR’s Annual Statistical Summary, the average speed of goods train dropped at a CAGR of 1.8% from 25.5 km per hour in 2012-13 to 23.7 km per hour in 2017-18 (refer Figure 17). The CAGR of average speed of goods trains during 10th and 11th Plan were 0.2% and -0.4%, respectively.

Price competitiveness of IR: When compared its biggest competitor – road transport, IR’s tariff rates are on the higher side. As per IR’s White Paper (2015), *the high density networks of the Indian Railways are facing acute capacity constraints coupled with a low passenger fares thereby leading to increases in freight tariffs to cross subsidize passenger revenues.* The uncompetitive freight charges associated with Indian Railways are regularly sighted by stakeholders as a key reason why significant amounts of freight have moved away from railways. Further, improvement in road infrastructure and faster transit through roadways have enabled road transporters to operator at lower cost and offer competitive rates as compared to railways.

Lack of marketing approach to tap ‘traffic on-demand’: Indian Railways has essentially followed the ‘take-it or leave-it’ approach of freight transportation. IR has to adopt customer centric approach to (1) increase loading of existing/bulk commodities, and (2) diversify its freight basket. In recent times, IR has undertaken several measures (special wagon schemes, commodity-specific operator schemes, terminal-related policies, etc.) to cater to the specific needs of the consignors; however, it has under-performed in almost all areas. Regular dialogue with the stakeholders to understand their requirements and challenges should be initiated by the Indian Railways.

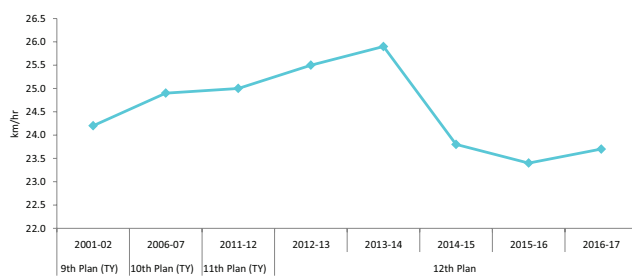


Figure 17: Average speed of goods train during last three Five Year Plan periods (km/hour)

TY: Terminal year; Source: Indian Railways

Findings of the study

Commodity-wise

This study undertaken by TERI focuses on six commodities. These are Cement, Automobile, Containers, Steel, Fly ash and Parcels. The aim of this study is to identify the underlying factors which have resulted in such declining railway shares, but also draw up specific implementable strategies for the Railways to get back some of its declining shares. In addition, the study would identify the barriers or hurdles which might exist in the present nature of operations and organization of the Railways which might be limiting the growth of the Railways.

CEMENT

It is not only the final product cement and intermediate product clinker for which this sector requires transportation. The sector also generates transport demand for its input raw materials such as coal, gypsum, fly ash, and slag. Of these, the share of commodities other than clinker is very low. Among the major commodities (cement and clinker), the share of cement declined from 78% in 2013–14 to 67% in 2017–18, while that of clinker increased significantly from 22% to 33% during the same period, due to coming up of grinding units around consumption centres.

In terms of the volumes of traffic loaded, there was a declining trend for cement and clinker from April 2013 till March 2016. Post this, the loading for both the commodities increased. For cement, however, the loading increased during 2016–17 and then declined again during 2017–18. The rise in NTKM during 2017-18 could be explained by IR’s effort to reach out to its captive customers with the scheme of long term tariff contract (LTTC).

Constraints impeding cement loading

Despite rail being naturally suited to move cement, road-transport modes have been quick to adapt to changes in the requirements of the Indian cement industry and have been able to respond to the ever-changing needs of the industry given their inherent flexibility of operations and reducing capital costs. Railways, on the other hand, has been relatively slower in catching up with industry changes, and have, under many circumstances, become uncompetitive in the movement of cement.



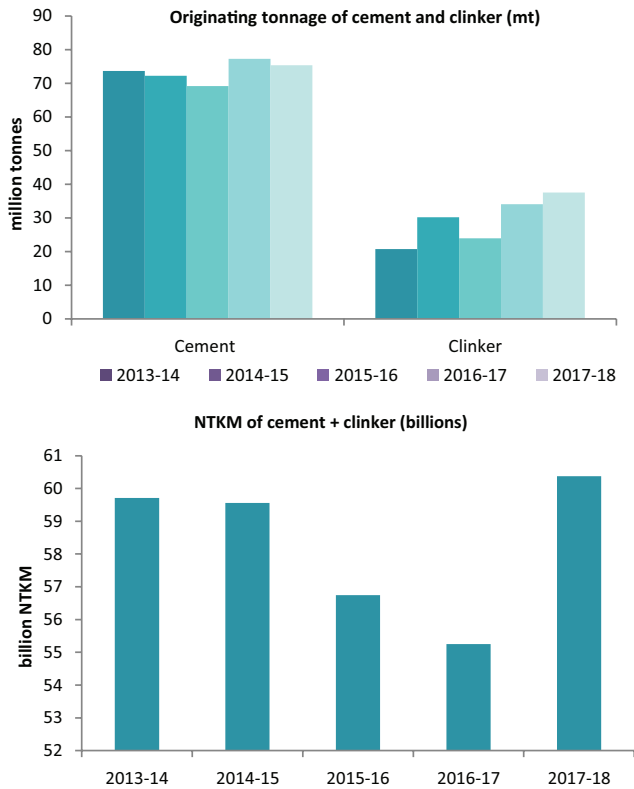


Figure 18: Rail dispatches of cement and clinker (2013–14 and 2017–18)

Source: Indian Railways and CRIS

Key areas of concerns in moving cement

Availability of wagons is a perennial issue, which could be resolved through investment in specialized wagons

There are certain route restrictions, which hinders smooth operations for cement transportation

Terminal related issues are major impediments for loading/unloading and last first mile-last mile activities

Road transport has also been very cost competitive as compared to railways. This is also escalated by the fact that number of handlings increase while moving through rail. The overall rail transport cost for moving commodities also depends upon the last mile–first mile costs, ease of loading/unloading at terminals and warehouses (terminal costs), and availability of workforce at terminals/originating point. Another component which plays a significant part in the choice of mode is the damage caused during transit or during handling at terminals. This brings us to the issue of poor condition of

terminals and sidings for handling cement. It has been cited that the terminals, in addition to the access points, are poorly designed, equipped and managed to handle cement in the current scenario.

One of the critical issues is that the cement industry has not responded positively to the increasing use of the high-capacity BCNHL wagons. The reasons cited include: BCNHL wagons, owing to their design dimensions, are taller than the BCN wagons, making it difficult to fill them up to the top by manual processes; and the volume of cement demanded at the destination is often less than a rake load, making it difficult for the plant to optimally use these high-capacity BCNHL rakes.

As a proactive step to gain cement traffic, IR collaborated with the industry and introduced a dedicated policy on long-term tariff contracts (LTTC) in March 2017. Of late, difficulties and a certain degree of confusion have emerged with regard to this scheme, which need to be resolved to keep the momentum of increased traffic going.

Another long term issue is related to connectivity to the cement plants. Of the 209 large cement plants studied by TERI, around 170 are connected to the rail network, and these account for over 75% of the total cement production (Railway Board, 2016).

Strategies to increase rail loading

Based on the inputs from the stakeholders, TERI has compiled a list of recommendations under key headings. These have been discussed below.

Terminal Infrastructure

- Quality and standards of sidings – maintenance and upkeep of siding infrastructure, including platform, surface clearing/cleaning, lighting, etc.
- Terminal access facilities like adequate parking bays, wider roads, etc. to be provided
- Assessment of suitability of sidings with rolling stock handled
- Customizing the terminals based on the nature of commodities handled
- Private freight terminals for specifically handling cement could be explored
- Developing well equipped sidings to handle bulk cement



Terminal Operations

- Mechanization of cement handling – loading and unloading at rail sidings/terminals
- Set minimum performance standards while contracting out services
- Put in place monitoring systems to evaluate performance

Rolling stock

- Need to start undertaking a more proactive role in maintaining wagons
- BCN should regain focus – BCN HL is negatively impacting business
- Possibility of bulk cement movement would significantly reduce costs
- Need to start planning to use of rail-road compatible bulk transport modes
- Start designing rolling stock based on need – and optimized designs

Pricing

- Consider handling charges, route congestion, time of delivery for pricing
- Pricing strategies should look at the industry holistically – inputs, raw material, intermediates, final products
- Locational and route specific pricing strategies should be introduced to optimize railway revenues and traffic

AUTOMOBILE

Indian is the fifth largest manufacturer of passenger cars in the world with annual production touching 4 million units in 2017-18. The industry estimates suggest that by 2026, passenger vehicle production volumes would increase to about 9.4–13.4 million units, commercial vehicles to 2.0–3.9 million units, two wheelers to 50.6–55.5 million units, and tractors to 1.5–1.7 million units.²⁴

In India, while the automobile production happens in a handful of clusters in North, West, and South regions, the points of final sale of these vehicles are across the length and breadth of the country. This requires extensive movement of automobiles from production hubs to the points of final sale. The distances between the major

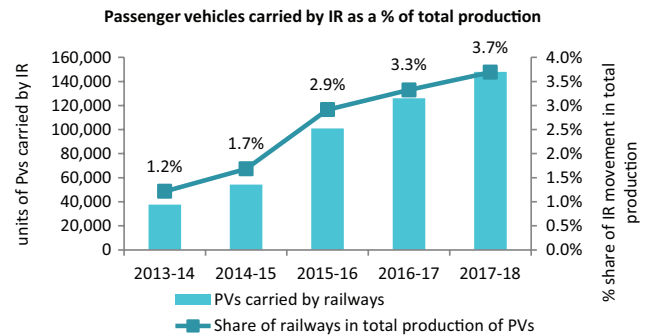


Figure 19: IR's share in the movement of passenger vehicles in total production
Source: Indian Railways

originating and destination cities for these transport circuits are nearly in excess of 1,000 km, making these movements ideal for efficient bulk transport modes such as the Railways. Majority of the rake movement by Indian Railways is currently happening on the north to south, south to north and west-south to north corridors. It is also seen that there is a huge scope of increasing traffic on these corridors. Despite rising in the last few years, the share of railways in automobile movement is significantly low as compared to other developed and developing nations.

As discussed earlier, Indian Railways initiated several measures to capture automobile traffic. One of the key initiatives is the launch of the AFTO policy in 2010, which has been modified later in 2014. This has gained significant traction among the private players who are currently operating and plan to expand in future. Several other private players have recently been approved by the Indian Railways to operate as an AFTO operator. Besides AFTO, the Railways also launched a policy for development of automobile and ancillary hub to facilitate end to end logistics.

Constraints impeding automobile loading

Although the automobile industry generates a high value product, the margins of their operations are extremely thin. As a result, the industry is extremely sensitive to transit costs which often determine the final margin of their profits. Currently the dominant mode of transport for automobiles, the road-based car carriers, not only provide end to end transport for automobiles from manufacturing plants to dealership locations, but they also provide these services at extremely competitive prices. The Railways, which is more rigid in their pricing methodology is comparatively inflexible.

²⁴ <http://auto.economictimes.indiatimes.com/news/industry/automotive-mission-plan-2016-26-unveiled-here-are-the-key-highlights/48772090>



Table 4: Cost of transporting a passenger car by rail vis-à-vis road (Factory to Dealer)

Stretch name	Rate per car - ROAD (Rs)	Rate per car - RAIL (Rs)	Percentage Difference (%)
Chennai–Delhi (2,251–2,300 km slab)	15,848	16,761	5.8
Delhi–Mumbai (1,301–1,350 km slab)	10,000	12,824	28.2
Chennai–Sanand (1,751–1,800 km slab)	14,093	14,963	6.2

Note: The cost of transporting cars by rail includes costs related last mile and first mile movement, terminal charges, etc.

Sources: Industry sources

Another important aspect of this high value product is that it is time sensitive and timely delivery of vehicles to the dealers is paramount. The Indian Railways started with the time guaranteed service for select routes. However, the performance on all the routes is below par, which has not gone down well with the manufacturers and private AFTO operators.

As far as rolling stock is concerned, the more recently inducted BCACBM wagons are not very robust and have already started showing signs of wear. Given that the private wagon design market is very nascent, even if improved and more optimal designs exist with the industry, the turnaround time for design approvals from Research Designs and Standards Organisation (RDSO) takes an extremely long time and involves a complex back and forth application process. The other challenge in moving dimensions is the overhead electric lines, the height of wagons restrict in adding a third level in each wagon. Further, the current terminal facilities for standard handling automobiles are extremely limited, with just a handful of facilities across the country.

Strategies to increase rail loading

The strategies to capture larger share of automobile movement by railways are mainly on the AFTO policy, terminal, rolling stock, tariff and transit time related issues. These have been listed below.

Suggestions related to AFTO

- There should not be any restrictions on the kind of

automobile or automobile parts moved using Indian Railways under the policy.

- The clause related to registration fee should be done away with. Since the private players are investing in the rolling stock, the need to pay registration fee should be waived off.
- Further, any terminal which has facilities for handling automobile traffic should be allowed on a cost-plus basis. In such a case, the operator should be allowed to add infrastructure required for handling automobiles.

Recommendations related to Automobile and Ancillary Hub policy

- Lease agreement should be valid for longer period of time, instead of just 7 years. This will give long-term plan perspective to the private operators.
- Development of auto hubs by railways should be done in consultation with the users/private operators.
- Single user should be permitted to develop railway land with clause of co-use on payment of the agreed fee.
- Transit time should be reduced between plant and port to make it competitive to the road transport
- Long term tariff contract could be signed between Indian Railways and manufacturers/3PL operators to ensure certainty in policy and tariff rates.

Rolling stock related suggestions

With regard to rolling stock, Indian Railways need to focus on encouraging the use of higher capacity of wagons, eventually leading to lower cost per unit of vehicle. There is also a need to focus on timely delivery of rake orders by the manufacturers. The design of the automobile carrying wagons should also be optimized by optimizing the length and height of the rolling stock. Most importantly, Railways should fast track the approval process for induction of new design wagons.

Tariff rates

Freight rates should be revised at regular intervals in consultation with the industry. These revisions should be implemented after studying the impacts/benefits of the revision.

Improvement in transit time

Indian Railways need to not only introduce more realistic time-tabled train operations for automobile transport but also have to stick to the times that it sets before itself.



The Railways need to define dedicated paths for auto trains and ensure that the logistic companies involved provide seamless first and last mile connectivity options so as to limit the chances of bottlenecks at either end of movement.

CONTAINER

Movement of cargo in containers has been proven to be cost effective and more efficient by facilitating faster movement of cargo. By 2009, almost 90% of the world's non-bulk cargo was moved by containers stacked in transport ships (Ebeling, 2009). Largely driven by services sector growth, India has been seeing a rapid growth in the white goods, engineering goods and fast moving consumer goods markets. Given the convenience of moving these goods in containers, containerized traffic has seen a very rapid growth over the last decade. In India, the container traffic has seen a CAGR of over 10% over the last ten years. However, the growth is largely contributed by the export-import (EXIM) segment, while the domestic sector is still dominated by the road transporters who carry goods in containerised boxes and not ISO²⁵ containers.

Of the 54 million tonnes container traffic carried by Indian Railways during 2017-18, 20% were domestic services and the remaining were EXIM traffic. Over the last five years (2013-18), container traffic volume has increased at a CAGR of 6%. The domestic container traffic volume has increased at a CAGR of 0.1% in 5 years whereas EXIM container traffic volume increased at a CAGR of by 7.4% from 2013-14 to 2017-18.

As a policy initiative to boost container traffic and containerization of freight traffic, Indian Railways, in January 2006 allowed the entry of private and public

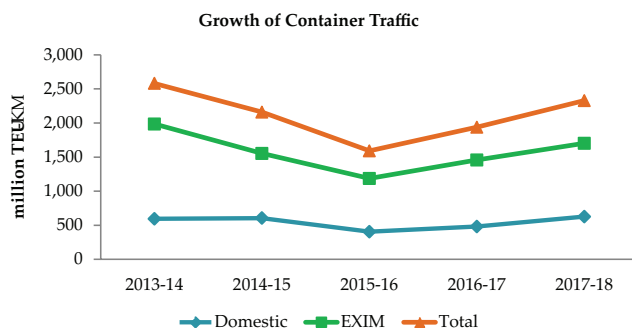


Figure 20: Growth of Container Traffic (in million TEU-KM)

Source: Centre for Railway Information System (CRIS)

²⁵ International Organization for Standards

container train operators (CTOs) to obtain licenses for running container trains in India. The policy opened up to all Indian companies, including subsidiaries of foreign companies registered in India with a minimum annual turnover of Rs 1,000 crore. As a result 14 operators (including CONCOR) signed an agreement with Indian Railways in the first round of registration (January-February 2006), while two more companies (Gammon and KRIBHCO) signed the agreement in the second round (December 2006 to January 2007).

Key findings of the study have been mentioned below.

EXIM Business

- The highest number of diverse commodities carried in EXIM containers are heavy cargo i.e. with an average weight of more than 16 tonnes per twenty-foot equivalent unit (TEU). Least diversity is observed in the light cargo category, which accounted for 0.3% share in EXIM traffic. Due to higher containerisation levels in shipping freight, import traffic has higher containerisation levels.
- In terms of distance moved or lead, about 50% of the EXIM container traffic accounted for longer lead (>750 km), followed by medium lead and short lead.
- The highest amount of TEUs carried in the last 5 years was of intermediate cargo (4-16 tonnes) over long distances followed by heavy cargo (>16 tonnes) for long distances.
- More than 50% of the EXIM container traffic is moved in the western corridor, between Western Railway, North Western Railway and Northern Railway.
- CRIS data analysed by TERI indicate that the container traffic in TEU-KM from other states to the southern states (Andhra Pradesh, Telangana, Karnataka, Kerala and Tamil Nadu) and from southern states to the other states has reduced significantly from 2013-14 to 2017-18.

Domestic Business

- As per CRIS data, 92% of the domestic traffic moved by IR is heavy cargo. Light cargo movement through rail is negligible. There was no movement of light cargo for distances greater than 1,000 km.
- As per CRIS data, these are mainly consumer good like shoes, candles, packaged soaps, and also cars and various other auto industry products. The heavy cargo



in containers include a large diversity of products like food grains like rice, scrap metals, cement, tiles, etc. The intermediate cargo also has a wide variety of consumer products like blankets, plastics to goods like plywood and glassware.

- The domestic traffic is predominantly heavy cargo. 92.4% of the total container traffic carried by IR in the period 2013-14 to 2017-18 has been goods with density more than 16 tonnes per TEU.
- The domestic traffic is relatively more distributed across the zones as compared to EXIM traffic.

Constraints impeding container loading

- The primary objective of creating CONCOR and opening up of the sector in 2006 was to achieve higher level of containerization. However, all these efforts by Indian Railways and other stakeholders have not worked out. The size of the container traffic pie has not increased significantly as envisaged, which has resulted in redistribution of traffic shares amongst the CTOs.
- The CTOs, who entered the sector post 2006, have been facing issues related to access to key infrastructure, which is primarily owned by the incumbent. CONCOR is the market leader with 81 ICDs/CFs spread throughout the country. Other CTOs are charged by CONCOR for usage of the infrastructure. Private CTOs indicate that the incumbent has an undue advantage in the absence of independent regulator.²⁶
- Haulage charge constitutes to about three-fourth of the operating cost for CTOs. The same haulage charges have been increased over 10 times since the competition policy was finalised in 2006 for allowing private CTOs. Road tariff is highly competitive and is one of the many reasons why customers are moving away from rail.
- Amongst the freight trains, container trains are not prioritised in anyway with respect to transit time. As IR doesn't ensure transit time, the transit time assurances made by the CTOs to their clients are often not met. Even though IR introduced Assured Transit Time (ATT) scheme in December 2009, the execution of the same was questioned by most stakeholders.

- As indicated from the analysis in this study, Northern Railway is a major consumption zone and the traffic is mainly import traffic from the western coast. Even if there is no corresponding traffic of goods moving out of the zone, the empty containers have to be moved to locations where the demand exists. There has been [IR's recent discount of 25% on empty containers has been noted in the report, which is likely to be shared by the CTOs with their clients and improve rail bound traffic]
- TERI's discussions with the industry stakeholders brought forward that there are no streamlined procedures for policy changes in stabling charges, hub and spoke policies, weightment and haulage charges for containers.

Strategies to increase rail loading

In order to fulfil the primary objective of increasing containerization and therefore container traffic, it is recommended that adequate marketing measures be taken to capture the industries, which have lower level of containerization. It is also recommended that linkage improvement from inland container depots (ICDs) to the factory is taken up through partnerships with trucking companies, which will help capture most cargo movement across long distances.

TERI recommends regulation of the prices levied by CONCOR on other CTOs for using their infrastructure. To regulate the competitiveness so as to maximise to potential of rail operations and the share of railways in inland container movement in India, TERI recommends the establishment of an independent regulatory authority to monitor the same. It is also recommended that IR simplify the stringent concession agreement provisions which restrict the sharing or pooling of rakes and terminals between the CTOs.

With regard to the issue of haulage charges, it is recommended to introduce differential pricing for the same commodity based on the demand and regional conditions. Indian Railways could design a dynamic pricing system to attract traffic on uncongested rail lines since more than 50% of the EXIM container traffic is moved in the western corridor, between Western Railway, North Western Railway and Northern Railway. The Western DFC is expected to decongest these routes. As there is negligible traffic on other routes, it is not

²⁶ http://niti.gov.in/writereaddata/files/Strategy_for_New_India.pdf



rational to have uniform haulage charges throughout the IR network.

Indian Railways should introduce scheduled freight trains on key routes and undertake rational prioritisation of the containers and other commodities identified as containerized freight. Benchmarking of its activities should be done with the road transportation as well so as to overcome the challenge of higher transit time and competition faced by the Railways.

FLY ASH

With a share of over 60% in total electricity generation, the volume of fly ash generated by the thermal power plants in India is significantly high. Fly ash, which is a by-product of coal-based power generation, is a fine hazardous powder.

Fly ash generation has increased from 68.9 million tonnes in 1996–97 to 196 million tonnes in 2017–18²⁷. Its utilization has also increased from 6.6 million tonnes in 1996–97 to 132 million tonnes in 2017-18. Fly ash finds several applications in areas such as agriculture, cement manufacturing, brick industry, construction of road and rail embankments, reclamation of low-lying areas, mine fillings, etc. The pozzolanic property of fly ash/lime reactivity makes it suitable for use in manufacturing of cement and concrete. Cement industry is the largest consumer of fly ash and accounts for about 25% of the total fly ash utilized in the country (2017-18).

Transportation of the product by Indian Railways, in an enclosed environment, has significant emission and

environmental benefits over road transport, which is highly unorganized. The share of Indian Railways in fly ash transportation is abysmally low and is dominated by road transport. Of the total fly ash utilized and transported in India, Railways carried only 1.8 million tonnes of fly ash during 2017-18, which is 1.4% of the total fly ash available for transport.

An origin-destination (O-D) analysis has also been carried out to understand the spatial pattern of fly-ash transportation in India by Indian Railways. It is seen that Bihar, Jharkhand, Karnataka, and West Bengal have the major share of originating trips for fly-ash transport by railways, whereas Assam and Karnataka serve as the major attraction/consumption zones where fly ash is being transported by railways.

Further, the O-D data suggests that most of these originating trips have been concentrated in only a few origin stations rather than being distributed uniformly across the country, which means transport by railways has been restricted to selected stations. Some of the key originating stations include Siuri in West Bengal; ARV Cement Society and ACC Limited, Raichur KPCL in Karnataka; NTPC private siding in Kahalgaon; private siding of Tata Power Company Limited at Jojobera in Jharkhand; Kesoram Cement Limited, Raghavapuram (NTPC Ramagundam) in Telangana; and Dhulian Ganga, NTPC Farakka in West Bengal.

Currently, most of the fly ash is being transported in BCN wagons, which are mainly used for transporting cement. Around 67% of the total fly ash is transported in BCN wagons, where it is first bagged and then loaded into the wagons. Other key wagon types used for fly ash movement include BCCW, BCFC, and BOXN. Another type of wagon, which carries a very small traffic, is the BTAP wagon.

The study focuses on the utilization of fly ash by the cement industry. Of the 280 million tonnes of cement production in 2016–17, Portland Pozzolana Cement (PPC) production could be estimated at around 182 million tonnes. Taking 20% fly ash blending while producing PPC-grade cement, the total amount of fly ash used in 2016–17 by the cement industry to produce 182 million tonnes of PPC would be about 36.4 million tonnes, which is close to the total fly-ash consumption by the cement industry in the same year. This signifies the opportunity

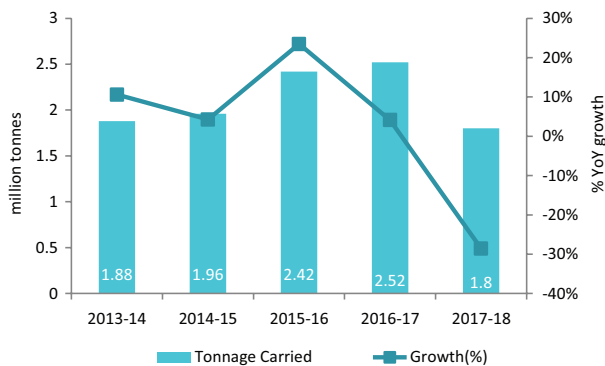


Figure 21: Fly-ash tonnage carried by railways

Source: CRIS

²⁷ Based on 167 thermal power plants studied by Central Electricity Authority, report released in January 2019



for Indian Railways to significantly increase loading from the current 1.8 million tonnes.

Constraints impeding fly ash loading

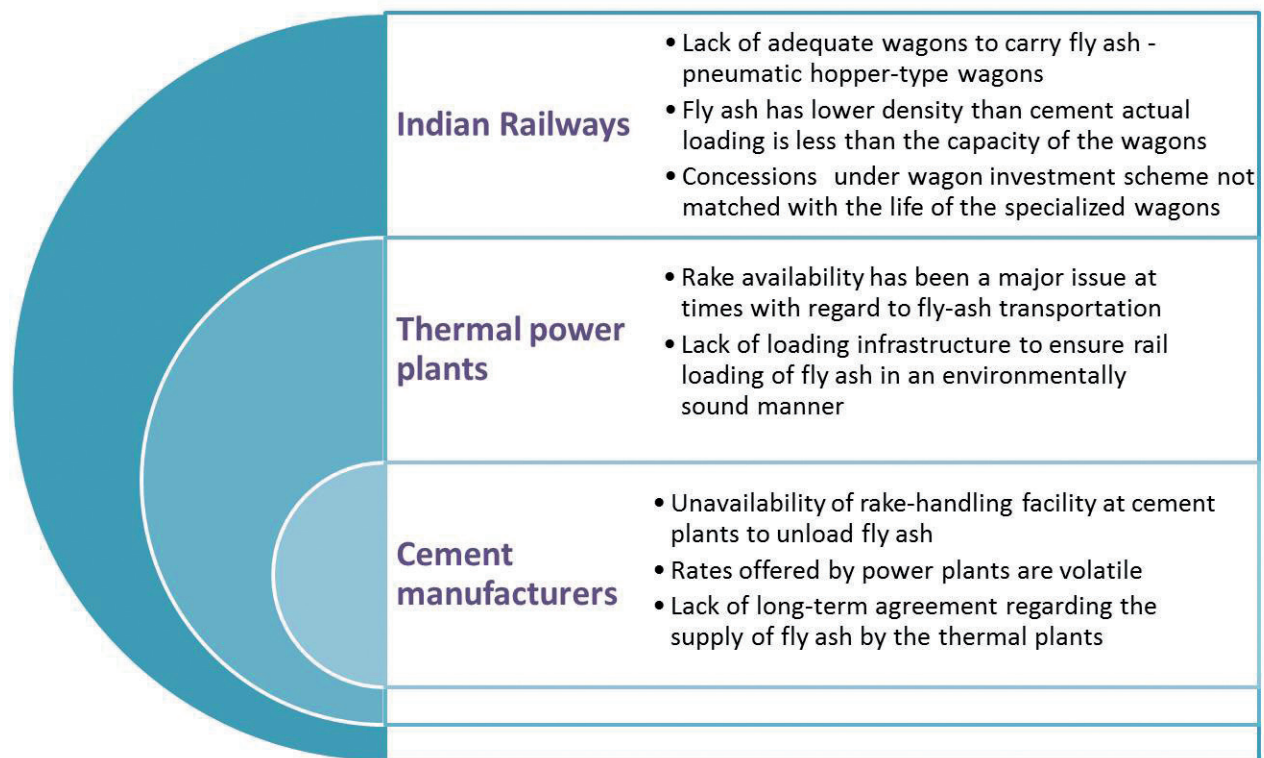
As per discussion with the various stakeholders from the industry, the following issues have been identified which are most probably responsible for the low modal share of railways in fly-ash transport. The issues have been highlighted stakeholder-wise in figure 22.

Strategies to increase rail loading

There is a clear lack of inter-agency collaboration when it comes to resolving issues related to fly-ash

will not only help in transporting fly ash in an efficient and environment-friendly manner, but will also help in reducing the loading and unloading time at both ends.

In terms of loading and unloading facilities, thermal power plants should develop the facilities for loading fly ash from silos into rail wagons and cement plants should install suitable unloading facilities such as compressors and pneumatic pipelines to unload fly ash from rail wagons into ash-storage silos. The argument regarding who would invest could be resolved using the 'polluter pays' principle commonly accepted practice followed across the World.



transportation. Railways should take the lead in bringing all the stakeholders, such as power plants and cement plants, together so as to devise a strategic action plan to increase fly-ash transportation by rail. This could be on the lines of tri-partite assessment of transportation demand for coal transportation, where thermal power plants, Coal India Limited and railways come together.

Increased use of high capacity specialized wagons is another area of improvement for increasing fly ash transport by rail. Using such high-capacity wagons

TERI also suggests that there is a need to reduce or revise the tariff structure for fly ash transportation if Railways want to compete with road transport. This is on account of the fact that fly ash has low density because of which only 45 to 50 tonnes can be loaded into a wagon, which can otherwise (e.g.: cement) load up to 60 tonnes.

STEEL

As per the World Steel Association, the global crude steel production increased from 1,627 million tonnes (MT) in



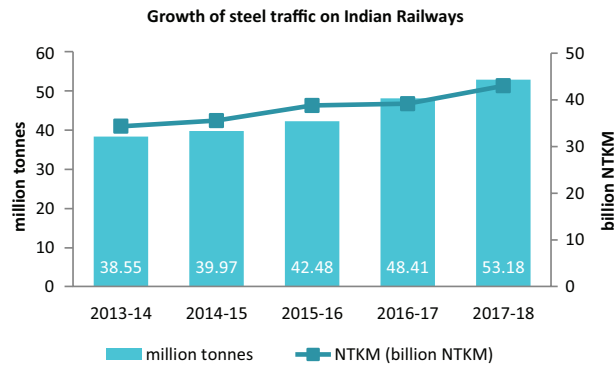


Figure 23: Trend in 'Finished Steel and Pig Iron' traffic on Indian Railways
Source: Indian Railways Indian Railways

2016 to 1,689 MT in 2017, an increase of 3.8% (World Steel Association, 2018). China remained the largest producer of crude steel producing 831.7 MT in 2017. India's market share in global steel manufacturing remained the same at 6% in 2017 and it remains the third largest crude steel producer in the world.

Over the past few years, India's steel industry has been observing a continuous growth in terms of production of crude and finished steel. As steel is a key intermediate good in many industrial sectors, its demand is driven by growth in infrastructure, construction and automobile sectors. As per Ministry of Steel's Joint Plant Committee (JPC), crude steel production in Indian increased from 81.7 MT in 2013-14 to 103 MT in 2017-18, CAGR of 6%.

The steel industry highly relies on iron-ore as a raw material and this has led to the concentration of major steel plants in the regions which are rich in coal and iron-ore reserves. Therefore, production of steel is dominated by three states Jharkhand, Odisha, Chhattisgarh, Karnataka, Maharashtra, Gujarat and West Bengal.

IR carries variety of steel products along the entire production chain. Steel is classified as a bulk commodity under "Finished Steel and Pig Iron", which also includes various steel products, intermediate goods, pig iron and sponge iron, scrap and slag. Over the last five year period, from 2013-14 to 2017-18, 'Finished Steel and Pig Iron' traffic on IR has grown at a CAGR of 8%.

On the basis of analysis done across railway zones of India, it is estimated that 90% of the finished steel traffic originated in four railway zones with Southern and Eastern zones accounting for the major share (South East, East Coast, South West, and South East Central). The highest traffic originated from South-Eastern zone with

a share of 33% in 2017-18. In terms of destination zones, 57% of the total finished steel traffic was unloaded at four zones (Northern, Southern, Central, Western zones), with Northern region being the highest consumer at a share of 32% in the year 2017-18.

In case of finished steel, open wagons and flat wagons are mainly used with highest share being of BRN, BOST and BOXN wagons. Among these three wagons, BRN and BOST are more suitable for carrying finished steel products and BOXN is more suitable for carrying raw materials like iron ore.

Constraints impeding steel loading

Despite accounting for high rail coefficient in steel transportation and increasing originating tonnage, there are a number of issues faced by the stakeholders in moving steel by railways. These have been listed below.

- Availability of wagons remains one of the major issues in improving the movement of steel by Indian Railways.
- Apart from limited rolling stock, the quality of the wagons was also highlighted as a significant issue. Besides, the suitability of the wagons supplied by the railways as against the indent raised by the customers is also an issue.
- Specific wagon requirements like BFNS wagons for hot-rolled and cold-rolled steel products are not met.
- In most cases the road players provide an assured transit time (usually 6-7 days) to the steel manufacturers. However, no such assurance is given in movement of steel freight.

Strategies to increase rail loading

TERI believes that the share of railways in steel transportation could be increased significantly as road transport is both environmentally and economically costlier. There are measures that have been recommended below, which could help Indian Railways to increase loading of steel.

- TERI recommends that IR conduct assessment of steel related commodity flow to estimate the different kinds of wagons required for suitably and sustainably moving the present traffic. This assessment will also

²⁸ <https://www.railwaypro.com/wp/indian-railways-sign-long-term-tariff-agreement-sail/>



help the private wagon owners to estimate the quantum investments in multiple wagon categories.

- Indian Railways should increase the capacity to carry finished steel as well raw materials (coking coal, iron ore, etc.) required for making steel. Additionally, it is important to consider the design of the wagons for granting protection from the weather influences, which can lead to huge losses for high quality commodities.
- As roadways are largely unorganised and extremely flexible in terms of rates and payments, LTTC are the ideal way for Railways to capture traffic for longer terms. In August 2017, IR signed a Long Term Tariff Contract with SAIL for movement of commodities from 15 zones²⁸. Similarly, Indian Railways should push for LTTC with as many producers as possible to create a stable and sustainable steel traffic on IR.
- Indian Railways could consider increasing the Permitted Free time so as to reduce the burden of wharfage charges.

PARCELS

Indian parcel market is characterised by the presence of large number of unorganised and small road transporters with the existence of few large players. The share of railways in total parcel movement is abysmally low, estimated to be less than 0.5%. This commodity is important from the railways perspective, especially in scenario where infrastructure and administrative set up is in place and the earning intensity is higher as compared to bulk commodities.

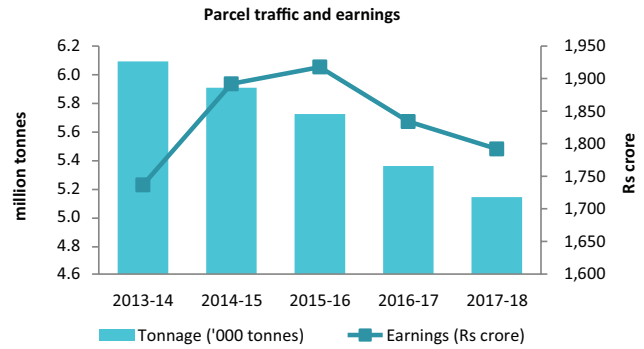


Figure 24: Parcel traffic and earnings trend of Indian Railways
 Source: Indian Railways

Movement of parcels by Indian Railways (IR) is categorized under the non-core business of the national transporter. The loading of parcels has been continuously declining – from 6.1 million tonnes in 2013-14 to 5.1 million tonnes in 2017-18. Some of the key findings are mentioned below.

- Railways move parcels through non-leased (departmental) and leased spaces. In the latter, parcel movement is done by private players who ‘lease’ space from Indian Railways. However, the share of leased parcel traffic has been declining over the years, from 35% in 2013-14 to 21% in 2017-18.
- With regard to rolling stock, Brake Vans or SLRs accounts for the maximum share with more than 80% of the total IR parcel traffic carried into it, followed by parcel vans (VPs) at 10% (2017-18), and 6.5% by parcel trains.
- Total number of parcel trains loaded, both leased and non-leased, during the years has been declining over

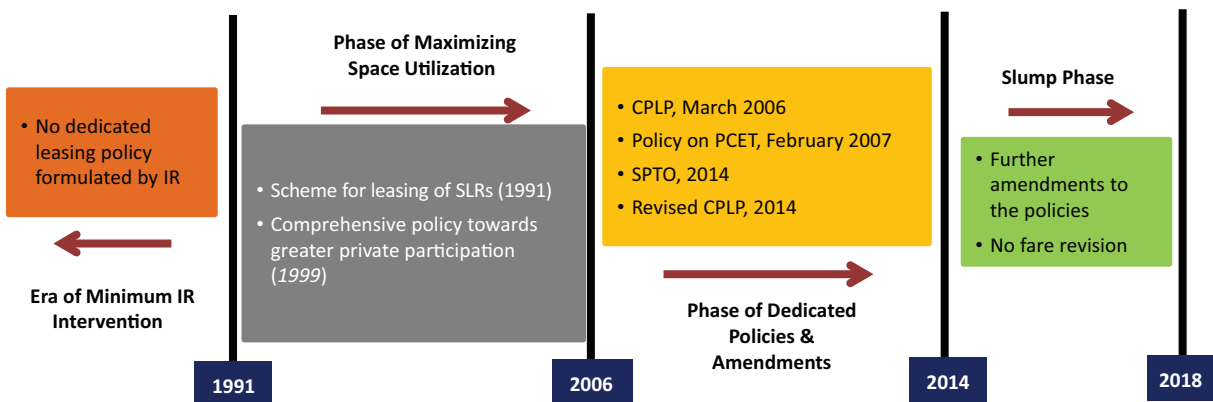
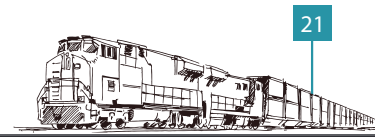


Figure 25: Evolution of parcels related policies
 Source: TERI Analysis



the years. From a high of 1,213 parcel trains in 2012-13, the number came down to 990 in 2016-17, negative CAGR of 5%.

- Key originating stations for non-lease traffic include three in Delhi (Delhi Jn., New Delhi and Hazrat Nizamuddin Jn. accounting for 30% of the total non-lease parcel traffic captured by PMS), Howrah, Chennai Central, and Mumbai Chhatrapati Terminus.
- As per CRIS, hard parcels account for the maximum share in total volume of parcel moved (72% of total traffic captured by Parcel Management System, 2016-17), followed by perishables (25%) and newspapers (1.9%).

Indian Railways has come out with a number of dedicated policies and schemes to encourage private participation in the movement of parcels through railways. Since 2006, IR introduced three policies related to parcel movement – Comprehensive Parcel Leasing Policy (CPLP) in 2006; Policy on Parcel Cargo Express Train (PCET) in 2007; and the most recent Special Parcel Train Operator (SPTO) Scheme in 2014. Despite all the policy initiatives, not much interest was generated among the private players/lease holders, which is reflected by the declining share of leased parcel traffic.

Constraints impeding parcel loading

There is a lack of strategy from the IR's side to revive parcel transportation. Lack of IR's strategy is not only in terms of policy initiatives but also in terms of infrastructure (terminals, etc.), rolling stock (SLRs, VPs, LHB compliant stocks, etc.), and manpower. Most importantly, lack of IR's market oriented approach to attract parcel traffic has played key role in moving parcel aggregators and private transporters away from railways.

The loadings and earnings from the special parcel trains have declined since the launch of the PCET policy. Some of the reasons for the decline highlighted by the sector experts and stakeholders include non-availability of parcel vans, issues related to non-compliance of transit time commitment given by Indian Railways, and the lack of accountability of IR for the safe movement of parcels.

There are two key reasons for the failure of the CPLP scheme. These are (i) Higher reserve price set by the Indian Railways, and (ii) Lack of lean period for the lease holders. Relatively higher tariff rates as compared to road

transport, introduction of GST on July 1, 2017 – making road transport cheaper and faster, non-availability of VPs, non-issuance of shortage certificate in case of theft, and lack of dedicated space for lease operations (storage/holding area). IR's notification, which states that R-scale tariff rate will be charged for parcels loaded onto SLRs in all trains where 60% of capacity is already utilized instead of S-class rate, has played a key role in increasing the cost of parcel movement for the private lease holders to carry parcels through railways. Another key reason for the declining participation of lease holders in parcel movement though IR is the lengthy and cumbersome process of appointment through tendering route.

With regard to infrastructural constraints, there is lack of dedicated loading/unloading space at stations for parcels at railway stations. Also, there is a severe lack of mechanized loading/unloading facilities at the platforms or parcel holding areas of railway stations. Further, IR's focus towards rolling stock is inadequate with almost no increase in the rolling stock capacity over the period 2013 to 2017. Also, there is an issue of lower volumetric capacity of current stock of VPs as compared to the non-standardized containers used by road transporters.

Strategies to increase rail loading

IR's approach towards parcel movement requires a major revamp of the current set up and practices of handling parcels. There is a need to formulate a resurrection plan for IR's parcel business. One of the most important steps that the IR still needs to take, which has also been highlighted in the Vision 2020 document (released in December 2009), is setting up of a dedicated unit or agency, in the lines of CONCOR, to manage and operate parcel business of Indian Railways. The Vision 2020 document stated that "the business would be segregated from passenger services". There are two important points under this recommendation, which are also an addition to that mentioned in the Vision 2020 document. These are: (1) Permanency of senior officials in the organization, and (2) Inclusion of a private sector expert at the helm of the organization. Also, tariff fixation should be done by a dedicated division under the Corporation, which would regularly benchmark the tariff rate with the road transport sector.

Other key recommendations related to parcel business of IR have been discussed below.



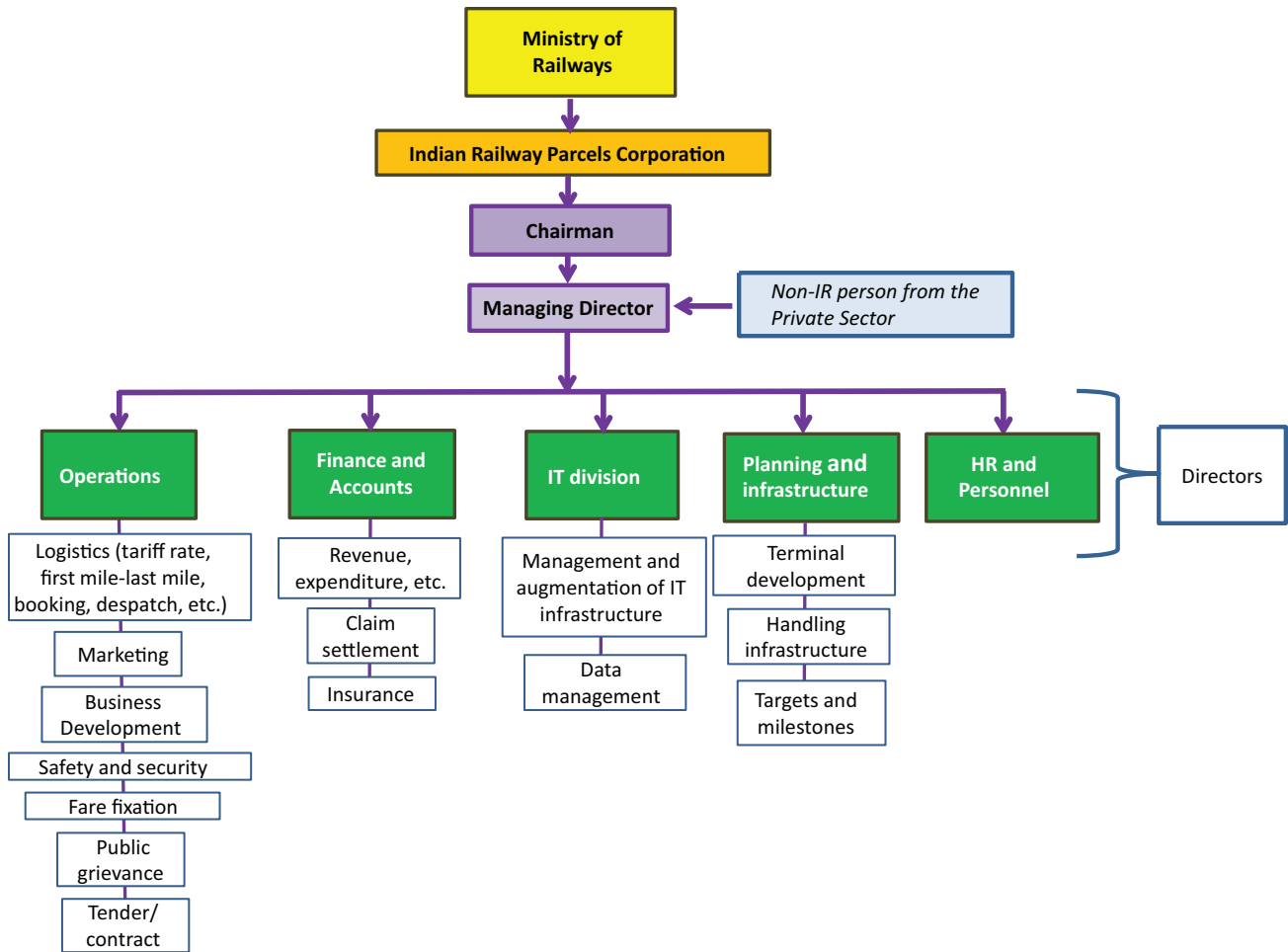


Figure 26: Proposed organizational architecture for parcel business of Indian Railways

Source: TERI

- IR should reconsider and roll back the tariff rate decision to charge R-class rate for parcels booked in SLRs of all trains with over 60% capacity utilization. Besides the service level, IR's effort should be towards making rail tariff rates for parcel movement competitive to that charged by the road transporters.
- Benchmarking IR's activities and services related to parcel business with road transport sector. Going forward, better service quality and customization of services as per the need of the consigners will help bring about higher parcel loading onto Indian Railways.
- In the long run, passenger and parcel movements should be separated from each other – both in terms of sharing of rolling stock as well as station infrastructure. For the short to medium term, dedicated space close to the available station area will be the way forward. IR should also offer adequate warehousing facilities to the operators, while the latter should be allowed to contribute in terms of development of superstructure based on the traffic requirement. This will also enhance safety and security of the parcels moved.
- A typical business progression in the logistics sector calls for a shift from lower volumetric capacity to larger capacity stock. Following this, IR should focus on moving away from SLRs to VPs to parcel trains.
- Parcel business being time sensitive and the transit time commitment has to be adhered to by the Indian Railways. This is specifically for the movement of parcel express trains, where transit time has been guaranteed by the Indian Railways. For parcel vans, commitment to adhere to time-table can also be achieved through round trip VP arrangement. In the



current scenario, VPs are provided on demand basis to the customers, which make it difficult to guarantee its availability in the near future. Besides, Indian Railways should incorporate accurate transit time in bid document for lease holders so that informed and realistic business decision is taken.

- Since parcel business is primarily a game played by volume, induction of light and high capacity parcel vans (higher cubic metre/tonne) will result in lower unit cost and higher profit margin.
- All the rolling stocks used to carry parcels should be classified as freight stock so that turnaround time is reduced. Currently, these are equated with coaching stock leading to terminal detention for examination purpose.
- Indian Railways should also concentrate on allowing authorized parties to operate collection centres for rail bound parcel traffic across major cities. The same collection centres could also be roped in for last mile delivery as well, thus bridging the gap related to first mile-last mile problem of the Indian Railways.
- The issue of over carriage could be resolved through palletisation of consignments. Right now all kinds of commodities/parcels are stuffed in the SLRs/VPs, which make it difficult for the parcel handlers at the stations to find and offload the consignment within the stipulated stoppage time.
- Indian Railways should take the initiative to mechanize parcel loading and unloading at stations and terminals. All these, would help create confidence in industries involved in white goods/value added products.
- Faster implementation of PMS across all major stations to improve transparency and enable informed decision making by the Indian Railways.

Road Map

Increasing modal share of railways is one of the most important measures to decarbonize the transportation

sector. This has also been reiterated under India's nationally determined contributions under the Paris Agreement, 2015. As stated in the document[1]: The endeavour is to increase the share of Railways in total land transportation from 36% to 45%, thereby decreasing the load on less efficient diesel operated road traffic.

This multi-commodity, multi-year study undertaken by TERI presents huge opportunity for Indian Railways to increase freight traffic, thereby increasing its share in total freight transported in India. This is also important in the light of Indian Railways' effort to look beyond coal.

Looking at the areas where focus is required from the Indian Railways going forward, TERI has come up with a list for the decision making body to consider. These are:

- Strategic Plan for Future
- Integration with DFC operations; Terminal infrastructure and operations;
- Use of railway land; Wagon design; Competitiveness/complimentary with road transport
- Commodity-specific dealing
- Retaining existing customers and attracting new players towards IR
- Container – focus on containerization, domestic and light goods
- Focus on smaller projects – mechanization and augmentation of existing facilities
- Move towards decentralized freight operations

Going forward, Indian Railways is expected to overcome the challenge related to capacity constraint with the commissioning of DFCs. However, substantial effort is still required in the areas of rolling stock, terminal development, logistical skills, and customer satisfaction. Indian Railways could also consider setting up of a dedicated cell to look into the issues and recommend measures related to non-bulk commodities that it already carries as well as commodities that it has not been able to capture so as to diversify its freight basket.



The background features a stylized industrial scene with three large grey silos, a worker in orange overalls, and a yellow forklift. The sky is a light teal color with abstract, horizontal, cloud-like shapes. The foreground shows a teal truck with a white trailer carrying several pallets of brown cardboard boxes. A worker in orange overalls is standing on the trailer, and another worker is operating a yellow forklift to move a pallet of boxes.

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