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SHAKTI
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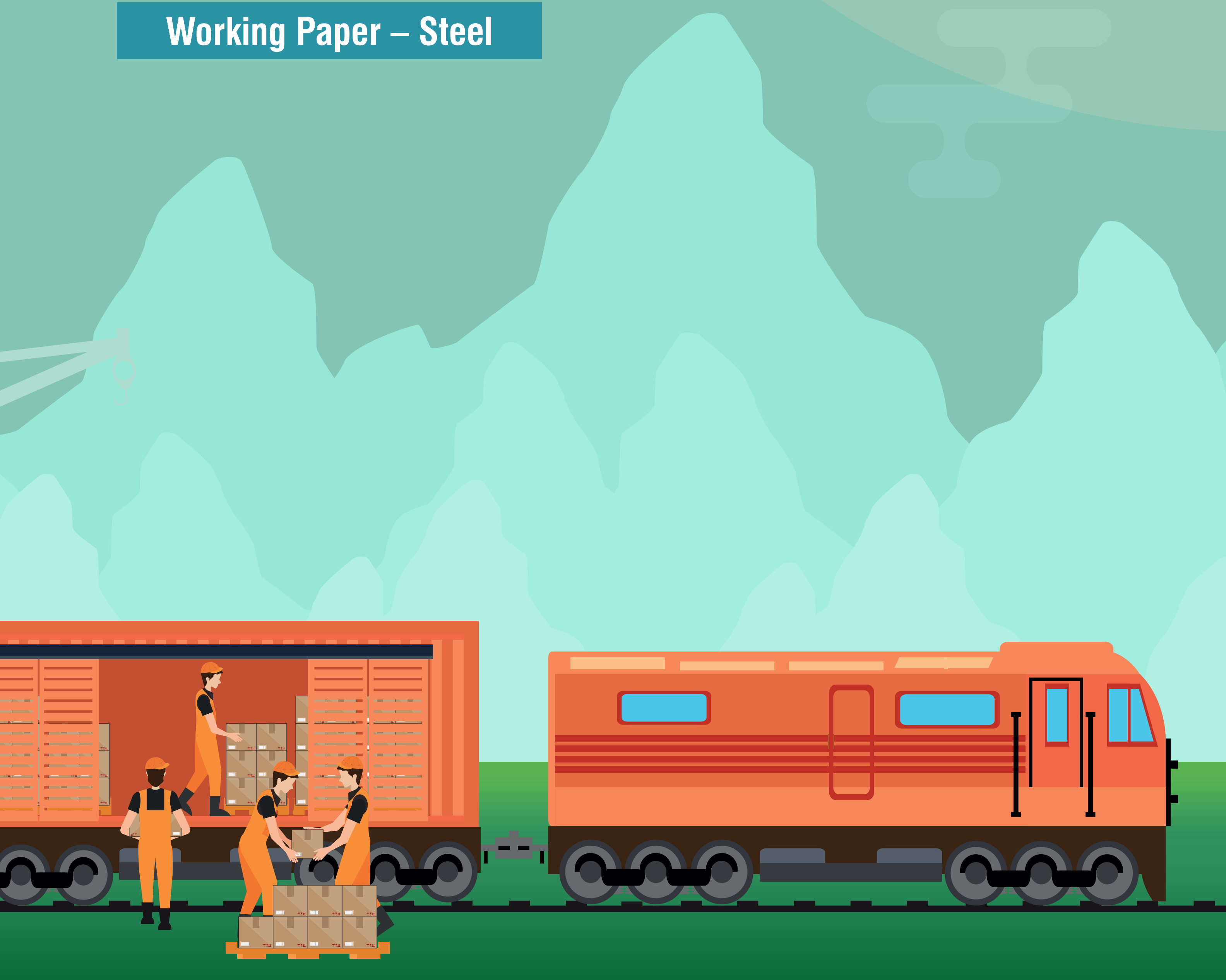
# MOVING TOWARDS A LOW-CARBON TRANSPORT FUTURE

## Increasing **Rail Share** in Freight Transport in India

**Working Paper – Steel**



# MOVING TOWARDS A LOW-CARBON TRANSPORT FUTURE

## Increasing **Rail Share** in Freight Transport in India

**Working Paper – Steel**

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# TABLE OF CONTENTS

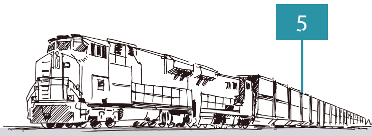
# LIST OF FIGURES





# LIST OF TABLES





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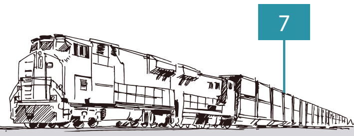


# STEEL

## Global Steel Sector

The steel sector forms the backbone of industrial development in any country. The world steel production has been on a constant growth path since the beginning of the modern era. As per the World Steel Association, the global crude steel production increased from 1,627 million tonnes (MT) in 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, an increase of 3% over the previous year and capturing 49.2% of the global market share. Japan, the second largest in the sector, observed a 0.1% decline in the total market share as compared to 2016. India's market share remained the same at 6% in 2017 and it remains the third largest crude steel producer in the world.

The world steel production has grown at a CAGR of 2.4% since 2010 and with increased industrial production; the growth is likely to continue. The top 10 crude steel producing countries account for 83% of the global crude steel production.

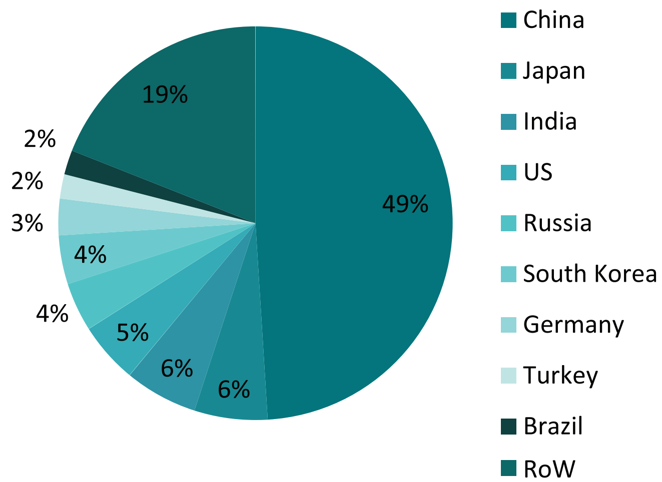



**Figure 1**: Steel production in the world, 2017; *Source: World Steel Association*

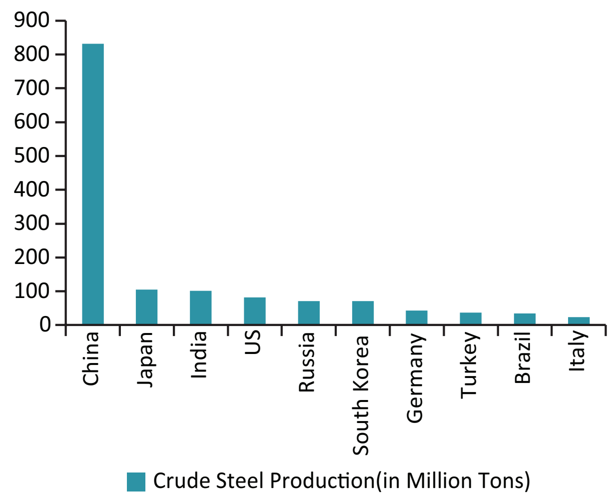



**Figure 2**: Global production of crude steel; *Source: World Steel Association*

## Importance of Steel

Over the past few years, India's steel industry has been observing 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 the infrastructure, construction, and automobile sectors. The current pace of growth in the Indian economy has fuelled up the infrastructure and construction sector, subsequently leading to increase in the demand for steel. Considering the current level of per capita steel consumption of 61 kg in India as compared to the global per capita consumption of 208 kg, the sector has huge potential in terms of demand expansion. Steel demand in India is expected to increase at a much faster rate with initiatives being undertaken in the housing and transport sectors. Accelerated demand along with investments by domestic players in expansion and up gradation of steel manufacturing facilities is expected to surge the domestic production and reduce reliance on imports.

## Key Trends—Capacity, Production, and Trade Volume

India became the third largest producer of crude steel in the year 2015 and has been able to maintain the market share in 2016 and 2017 as well. As per the Ministry of Steel, Government of India's Joint Plant Committee (JPC), crude steel production in India increased from 81.7 MT in 2013-14 to 103 MT in 2017-18, CAGR of 6%. For a developing country like India, growth in steel production is the representation of the country's industrial development as steel industry has robust linkages across sectors and applications. Along with contribution to India's infrastructure and construction sector, steel has a huge potential of contributing to the gross domestic product (GDP) and employment growth as it has an output multiplier effect of 1.4X on GDP and employment multiplier factor of 6.8X (NSP, 2017).

Continuous capacity increment has also been seen in the crude steel sector with an increment of 7.5% in 2017-18 (137.98 MT) as compared to 2016-17 (128.28 MT) to cater to the increasing demand for steel. India is also the second largest global producer of sponge iron after Iran and is the third largest finished steel consumer in the world. As per the estimates by the Ministry of Steel, Government of India, at the present rate of capacity addition and increase in production, India is poised to surpass Japan as the second largest producer of crude steel (Ministry of Steel, 2017).

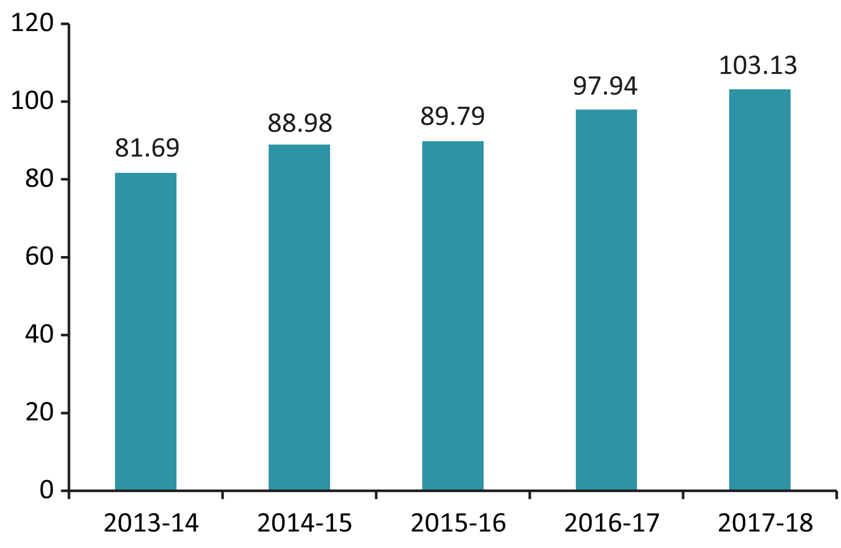



**Figure 3**: Crude steel production in India (million tonnes)
*Source: JPC, Ministry of Steel*

**Table 1**: Trend in steel production in India (million tonnes)

| Item | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | CAGR (%) |
|---|---|---|---|---|---|---|
| Working capacity for crude steel production | 102.26 | 109.85 | 121.97 | 128.28 | 137.98 | 8% |
| Crude steel | 81.69 | 88.98 | 89.79 | 97.94 | 103.13 | 6% |
| Capacity utilization (%) | 80% | 81% | 74% | 76% | 75% | - |
| Finished steel for sale | 87.68 | 92.16 | 90.98 | 101.81 | 104.98 | 5% |

*Source: (Joint Plant Committee, 2016), and Ministry of Steel 2017-18*

## Volume of Trade

In order to make the Indian steel sector self-sufficient and globally competitive, the government has taken several initiatives to curb the imports and identify the potential export opportunities in order to capture the global market share.

The volume of trade (export + import) in finished steel for India grew at a CAGR of 11%, from 11.4 MT in 2013-14 to 17.1 MT in 2017-18. While imports of finished steel grew at a CAGR of 8% between 2013-14 and 2017-18, exports recorded a high CAGR of 13% during the same period. Taking imports and exports into account, the net availability of finished steel was about 103 MT in 2017-18, growing at a CAGR of 4% since 2013-14. However, growth in consumption of finished steel stood at 5% over the same period, from 74 MT in 2011-12 to 91 MT in 2016-17. Notably, India was reported to be net exporter of steel during 2016-17 and 2017-18, mainly on account of the restrictions imposed by the government. [2]

**Table 2**: Trends in trade, availability and consumption of finished steel in India (in million tonnes; 2013-14 to 2017-18)

| Item | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | CAGR |
|---|---|---|---|---|---|---|
| i. Finished steel for sale | 87.68 | 92.16 | 90.98 | 101.81 | 104.98 | 5% |
| ii. Export of finished steel | 5.99 | 5.60 | 4.08 | 8.24 | 9.62 | 13% |
| iii. Import of finished steel | 5.45 | 9.32 | 11.71 | 7.23 | 7.48 | 8% |
| Net availability of finished steel (i - ii + iii) | 87.14 | 95.88 | 98.61 | 100.79 | 102.84 | 4% |
| Consumption of finished steel | 74.1 | 76.99 | 81.53 | 84.04 | 90.68 | 5% |
| Volume of trade (ii+ iii) | 11.44 | 14.92 | 15.79 | 15.46 | 17.10 | 11% |

*Source: (Joint Plant Committee, 2016), JPC 2018 and TERI Analysis*

[1] *An overview of steel sector by Ministry of Steel*

[2] *https://www.thedollarbusiness.com/news/india-has-become-a-net-exporter-of-steel-steel-minister/51599*

## Steel Plants in India

Steel plants in India are broadly classified into two sectors based on the production capacity: Integrated Steel Producers (ISPs) and Other Producers (which own mini plants and steel processing units). The ISPs comprise large public and private sector units, such as the Steel Authority of India Ltd (SAIL), Rashtriya Ispat Nigam Ltd (RINL), Tata Steel Ltd (TSL), Essar Steel Ltd (ESL), JSW Steel Ltd (JSWL), and Jindal Steel & Power Ltd (JSPL) with a steel producing capacity of 1 million tonne or more. In terms of enhancing productivity and consumption, the secondary steel plants are also of significant importance as these plants are the source of basic raw materials for steel making and play an important role in conversion of semi-finished steel into a higher value product.

The Indian steel industry can be characterized by production in both the public and the private sectors. As per JPC, of the total production capacity of 128 MT, only 19% was under public sector ownership while 81% was owned by the private sector. However, SAIL, a public sector enterprise, owned the highest capacity of 17.5 MT followed by JSW, in the private sector, with 16.6 MT.

In the year 2016-17, integrated steel plants accounted for almost 50% to the total crude steel production while the remaining share was accounted by other steel plants.

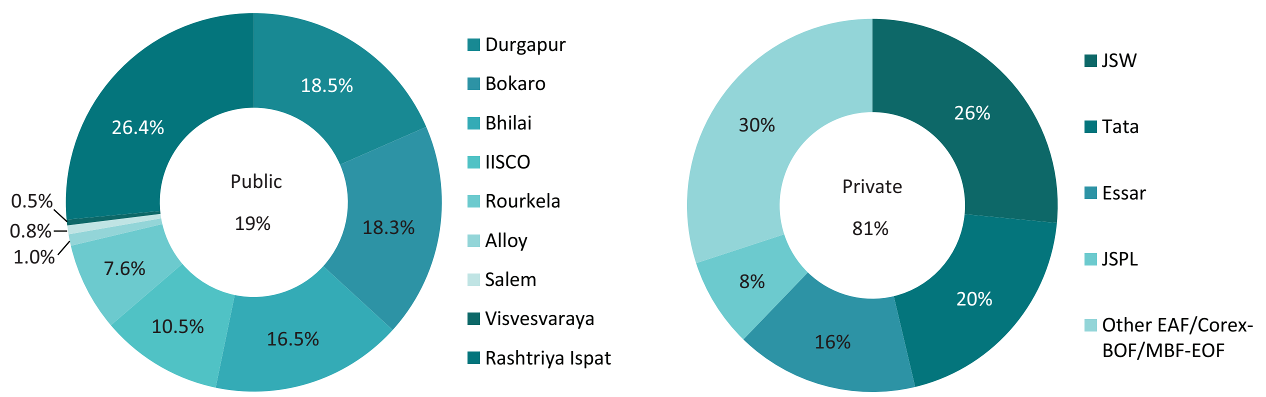



**Figure 4:** Crude steel production capacities in the public and private sectors
*Source: JPC, 2016-17*

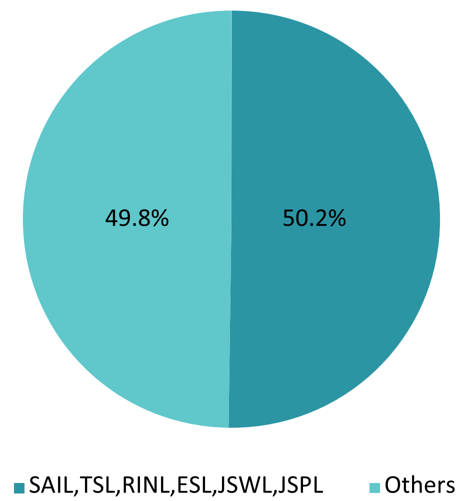



**Figure 5**: Share of ISP and other steel plants in finished steel in sale (Year: 2016-17)
*Source: JPC, 2016-17*

## Major Production and Consumption Zones

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. The other raw materials required for making iron and steel are limestone, scrap iron, manganese, coking coal for fuel, etc. The cost of transporting raw materials also plays a major role in determining the location of steel plants.

As per the Ministry of Steel, production of steel is dominated by three states—Jharkhand, Odisha, and Chhattisgarh—which are rich in mineral resources used for manufacturing steel. These three states account for 46% of the total steel-making capacity as well as total steel production in the country. The other key steel manufacturing states include Karnataka, Maharashtra, Gujarat, and West Bengal.

**Table 3**: State-wise capacity of steel plants and production ('000 tonnes, 2017-18)

| | Capacity | Production | % share in capacity | % share in production |
|---|---|---|---|---|
| Arunachal Pradesh | 74 | 62 | 0.05% | 0.06% |
| Assam | 314 | 229 | 0.23% | 0.22% |
| Bihar | 1,138 | 703 | 0.82% | 0.68% |
| Jharkhand | 19,995 | 17,113 | 14.49% | 16.59% |
| Meghalaya | 185 | 74 | 0.13% | 0.07% |
| Odisha | 27,239 | 16,968 | 19.74% | 16.45% |
| Tripura | 30 | 20 | 0.02% | 0.02% |
| West Bengal | 10,128 | 7,840 | 7.34% | 7.60% |
| Chhattisgarh | 16,464 | 13,033 | 11.93% | 12.64% |
| Dadra & Nagar Haveli | 291 | 246 | 0.21% | 0.24% |
| Daman & Diu | 41 | 33 | 0.03% | 0.03% |
| Goa | 509 | 345 | 0.37% | 0.33% |
| Gujarat | 12,337 | 8,260 | 8.94% | 8.01% |
| Madhya Pradesh | 170 | 144 | 0.12% | 0.14% |
| Maharashtra | 10,884 | 8,457 | 7.89% | 8.20% |
| Delhi | 14 | 12 | 0.01% | 0.01% |
| Haryana | 931 | 806 | 0.67% | 0.78% |
| Himachal Pradesh | 698 | 458 | 0.51% | 0.44% |
| Jammu & Kashmir | 187 | 130 | 0.14% | 0.13% |
| Punjab | 3,878 | 2,779 | 2.81% | 2.69% |
| Rajasthan | 1,093 | 793 | 0.79% | 0.77% |
| Uttar Pradesh | 1,245 | 1,001 | 0.90% | 0.97% |
| Uttarakhand | 604 | 438 | 0.44% | 0.42% |
| Andhra Pradesh | 8,205 | 6,156 | 5.95% | 5.97% |
| Karnataka | 14,266 | 12,766 | 10.34% | 12.38% |
| Kerala | 622 | 336 | 0.45% | 0.33% |
| Puducherry | 343 | 162 | 0.25% | 0.16% |
| Tamil Nadu | 4,316 | 2,699 | 3.13% | 2.62% |
| Telangana | 1,774 | 1,070 | 1.29% | 1.04% |
| Total | 137,975 | 103,131 | 100% | 100% |

*Source: JPC, Ministry of Steel*

## Steel Products Available for Transport

Production for sale and imports of finished steel together provide an estimate of the amount of such steel available for freight transport through all modes. Other products transported to various places for direct consumption, use in production or processing include pig iron, sponge iron, semi-finished products or 'semis' (slabs, billets, and blooms), scrap, and slag. Official estimates of production for all except two—scrap and slag—are available from the Joint Plant Committee publication, Annual Statistics. [3]

Slag is an important by-product of crude steel production. It is an important input for cement manufacturing given its limestone/dolomite content. Granulation of slag has greatly enhanced its feasibility of transport through railways and this is evident in the rising volumes being transported. Again, no official estimates of total slag production from steel industry are available. However, as per industry standards, 30%–35% by mass of crude steel output is slag. Using this industry standard, the total production of slag in the steel industry may be estimated as follows: Slag (tonnes) = Crude steel (tonnes) * (0.3/0.7)

The estimates generated for slag production are given in Table 7.

Scrap is becoming an important input for steel production in the country. Scrap availability is determined by production in domestic steel plants, dismantling of ships and other marine vessels, disposal of automobiles, heavy machinery, white goods, etc., domestic household and industrial waste, and imports from other countries. However, no official estimates are available for total iron and steel scrap available in the country. Further, as per steel producing companies, given the high level of heterogeneity in quality, density, weight, the form in which scrap is available, and non-standardization of scrap for packaging and transport, it becomes very difficult to be carried through the railways. As a result, traffic of scrap on IR network is quite miniscule.

## Steel Traffic on Railways

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 years, from 2013-14 to 2017-18, 'Finished Steel and Pig Iron' traffic on IR has grown at a compound annual growth rate (CAGR) of 8%.

**Table 4**: Estimated generation of slag in Indian steel industry

| | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|
| Crude steel | 81.7 | 89.0 | 89.8 | 97.94 | 103.1 |
| Slag | 35.0 | 38.1 | 38.5 | 41.9 | 44.2 |

*All figures in million tonnes*

*Source: TERI Analysis*

**Table 5**: Trend in 'Finished Steel and Pig Iron' traffic on Indian Railways in last five years (in million tonnes)

| | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|
| Finished steel and pig iron | | | | | |
| i. From steel plants | 27.81 | 28.25 | 29.59 | 33.61 | 35.44 |
| ii. From other points | 11.14 | 14.59 | 15.2 | 14.8 | 17.4 |
| **Total** | **38.95** | **42.84** | **44.79** | **48.41** | **53.18** |
| As per CRIS data | 38.26 | 42.16 | 44.06 | 40.94 | 45.08 |
| % CRIS | 98.23% | 98.42% | 98.37% | 84.48% | 84.76% |

*Source: Indian Railways and Centre for Railway Information Systems (CRIS)*

[3] *Details available at http://jpcindiansteel.nic.in/pages/display/128*

The official railway estimates on origin and destination traffic of iron and steel freight have been procured from the Centre for Railway Information Systems (CRIS). This data has been used for calculating various coefficients and traffic route estimates. As described in Table 5, this data accounted for about 90% of the official estimates quoted in IR's statistical publications (2017-18).

The steel traffic moved by IR has been increasing in terms of originating tonnes. Besides the products listed in Table 6, iron and steel scrap was also transported by IR but it has miniscule traffic relative to the other products. Finished steel and slag together accounted for 85% of the traffic of steel products.

**Table 6**: Trend in transportation of steel products (originating tonnage) by IR over last five years (million tonnes)

| Steel type | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|
| Finished steel | 26.6 | 27.9 | 28.4 | 27.0 | 34.6 |
| Semis | 4.1 | 4.2 | 5.1 | 4.6 | |
| Pig iron | 0.8 | 0.7 | 0.6 | 0.5 | 0.4 |
| Sponge iron | 0.7 | 0.8 | 0.7 | 0.5 | - |
| Slag | 6.0 | 8.6 | 9.3 | 8.4 | 10.1 |
| Others | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 |
| Total | 38.3 | 42.2 | 44.1 | 40.9 | 45.1 |

*Note: 'Others' include scrap and small amounts of raw material included in the data*
*Source: CRIS and TERI Analysis*

Analysis based on the CRIS 2017-18 data shows that 25% of the total finished steel originated from Odisha, 22% from Jharkhand, followed by Karnataka and Chhattisgarh at 19% and 12%, respectively. TERI observed that these states accounted for majority of the finished steel (originating) traffic in the previous years as well.

Analysis of the CRIS data for 2017-18 indicated that key destination states of finished steel traffic carried by IR are West Bengal (14%), Uttar Pradesh (13%), Maharashtra (13%), Odisha (12%), and Tamil Nadu (11%). Other important destination states served by the Indian Railways include, Andhra Pradesh, Jharkhand, Bihar, and Haryana.

In terms of total steel movement on Indian Railways, top 20 originating plant locations account for 96.32% of the total traffic on the IR network while the top 20 destination stations account for 43.2% of the total traffic.

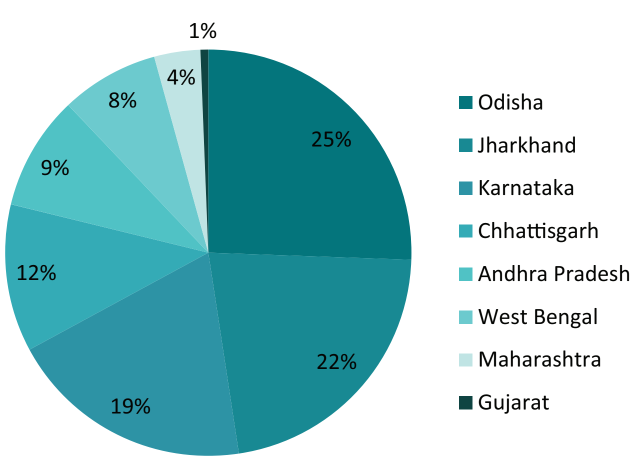



**Figure 6**: Key originating states for steel traffic (2017-18)
*Source: CRIS*

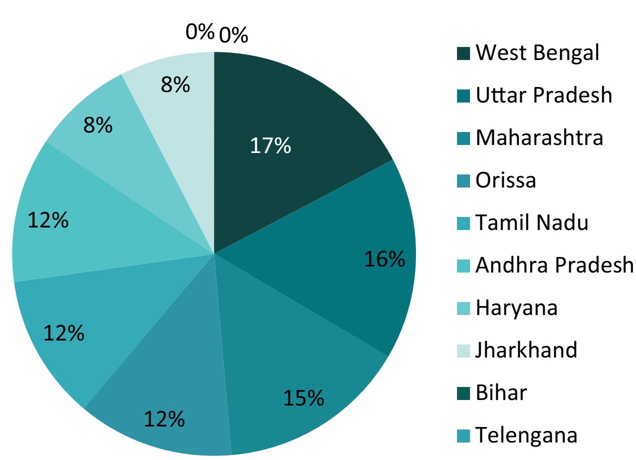



**Figure 7**: Key destination states for finished steel carried by IR (2017-18)
*Source: CRIS*

Table 7: Summary of Origins, Destinations and OD pairs (2013-14 to 2017-18)

| | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | CAGR (%) |
|---|---|---|---|---|---|---|
| NTKM (in millions) | 36,564 | 38,919 | 41,647 | 42,266 | 40,319 | 2.5% |
| Number of Origins | 132 | 133 | 122 | 128 | 130 | -0.4% |
| Number of Destinations | 424 | 414 | 375 | 428 | 414 | -0.6% |
| Number of OD Station/ Sidings Pairs | 1,031 | 1,013 | 972 | 1,118 | 1,083 | 1.2% |

*Source: CRIS*

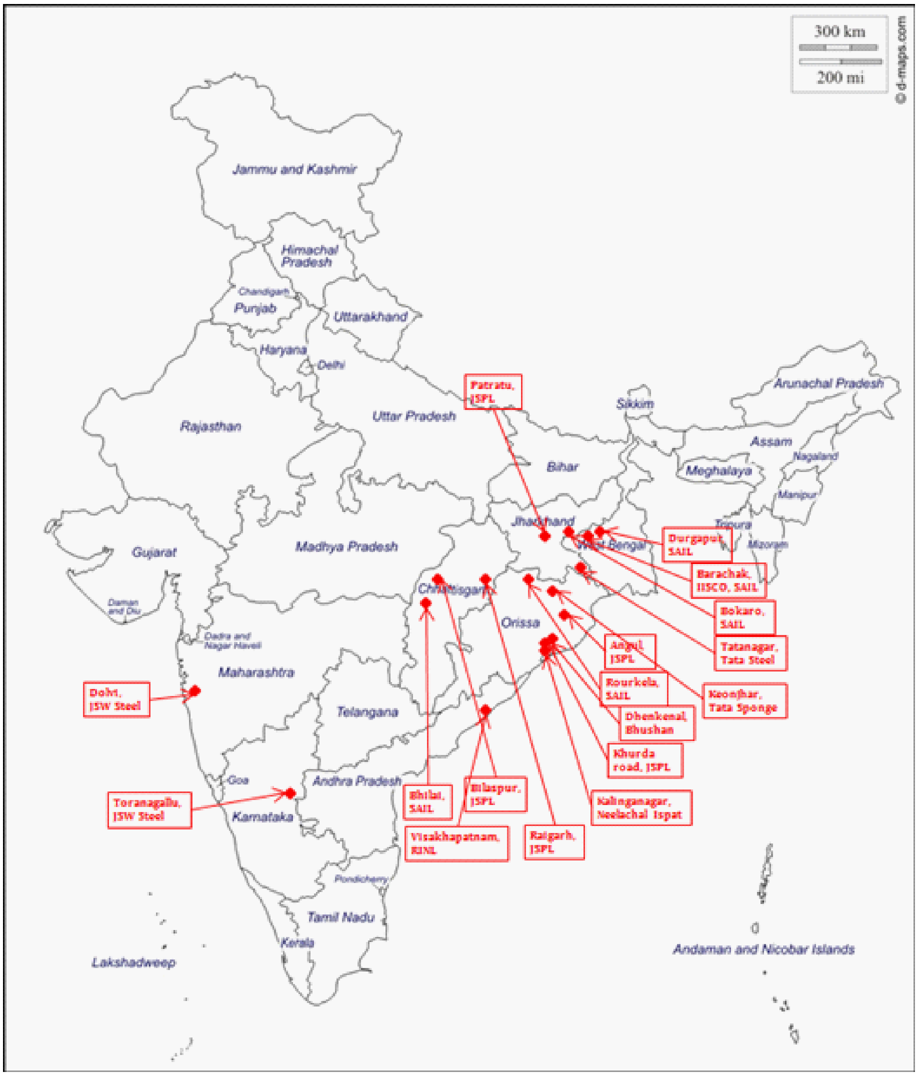



**Figure 8**: Top 20 Origins of Steel Traffic by Rail (CRIS data, 2017-18)

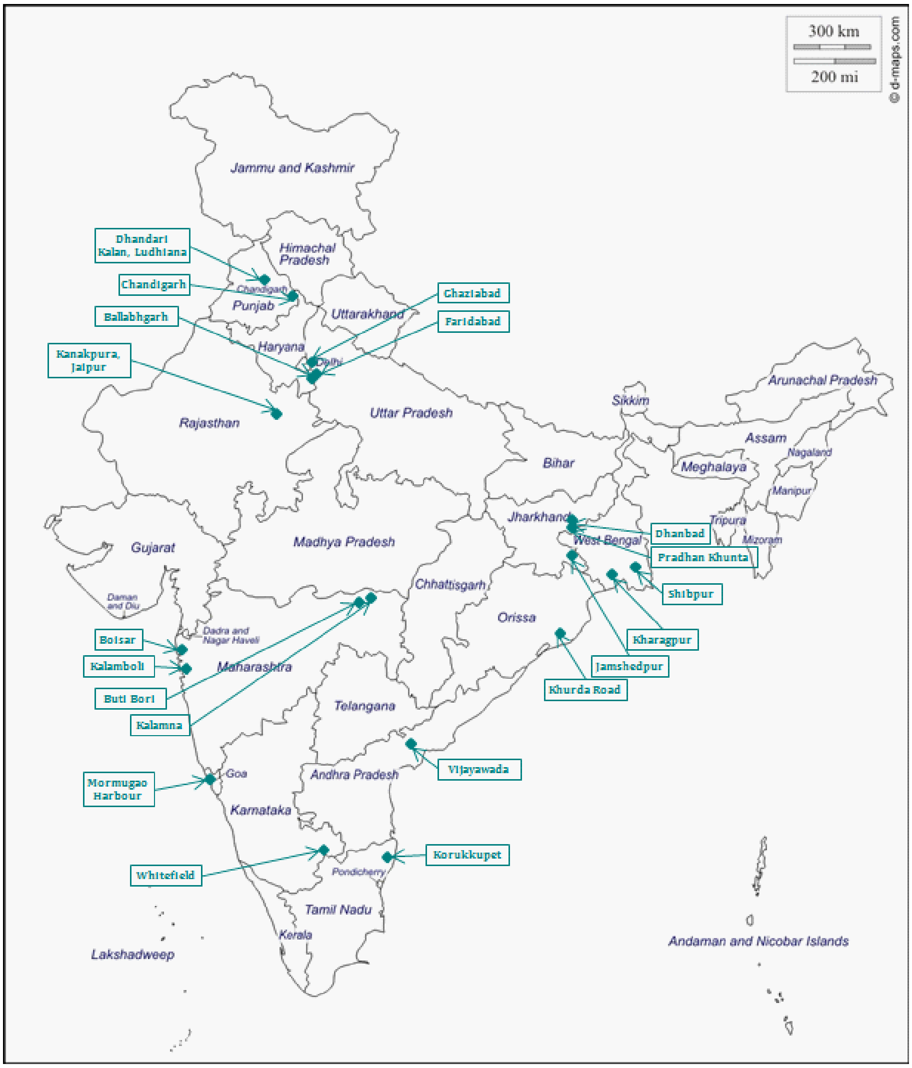



**Figure 9**: Top 20 destinations of steel traffic by rail in India
*Source: TERI Analysis*

On the basis of analysis conducted across railway zones of India, it is estimated that 90% of the finished steel traffic originated in 4 railway zones with Southern and Eastern zones accounting for the major share. The highest traffic originated from the South-Eastern zone with a share of 33% in 2017-18. Analysis of destination zones shows that 57% of the total finished steel traffic was unloaded at 4 zones with the northern region holding the highest consumers at a share of 32% in the year 2017-18.

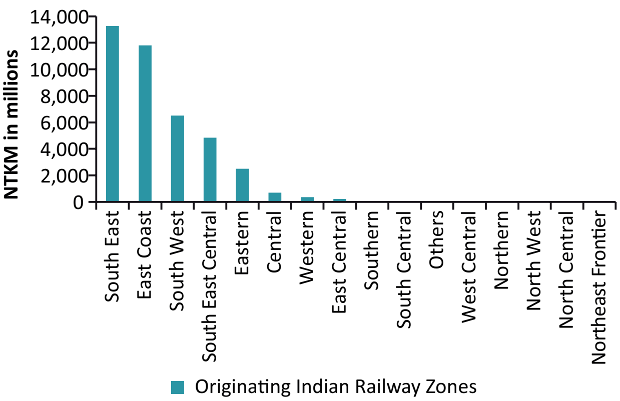
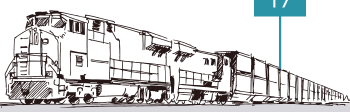



**Figure 10**: Originating Zonal steel traffic in IR (2017-18)
*Source: CRI*



## OD Ranking based on Standard Deviation in NTKM

TERI analysed station origin-destination (OD) pairs for steel freight carried by the Indian Railways between 2013-14 and 2017-18 to identify significant variations in traffic. For the purpose, for each of the five years (2013-14 to 2017-18), TERI selected the top 20 OD pairs based on NTKM. All such selected ODs were analysed for the variation in their traffic from 2013-14 to 2017-18 and were ranked based on standard deviation of the NTKMs from 2013-14 to 2017-18 to arrive at the data presented in Table 8. The table depicts ODs with the highest variation in traffic in the study period. These have been in top 20 ODs by NTKM in at least one of the five years.

**Table 8**: OD Station Pairs ranked based on standard deviation of NTKM from 2013-14 to 2017-18

| S. No. | OD | 2013-14 | | 2014-15 | | 2015-16 | | 2016-17 | | 2017-18 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NTKM | Market Share | NTKM | Market Share | NTKM | Market Share | NTKM | Market Share | NTKM | Market Share |
| 1 | JSWT-BVH | 969.6 | 3% | 1,144.8 | 3% | 1,598.7 | 4% | 684.9 | 2% | 204.6 | 1% |
| 2 | MBMB-GZB | 430.2 | 1% | 696.8 | 2% | 1,473.5 | 4% | 1,186.3 | 3% | 1,551.9 | 4% |
| 3 | MBMB-JAB | - | - | 147.8 | 0% | 505.9 | 1% | 833.2 | 2% | 140.5 | 0% |
| 4 | JSWT-GZB | 917.7 | 3% | 925.5 | 2% | 1231.7 | 3% | 820.0 | 2% | 535.1 | 1% |
| 5 | MBMB-KSV | 342.0 | 1% | 701.3 | 2% | 277.5 | 1% | 84.2 | 0% | 595.9 | 1% |
| 6 | TWS-BOR | 1,240.7 | 3% | 1,274.6 | 3% | 1,099.1 | 3% | 1,012.4 | 2% | 658.7 | 2% |
| 7 | MBMB-ATLP | 678.1 | 2% | 520.3 | 1% | 662.7 | 2% | 438.3 | 1% | 126.2 | 0% |
| 8 | TWS-FDSG | 1,209.4 | 3% | 1,274.2 | 3% | 1,263.0 | 3% | 1,062.0 | 3% | 781.1 | 2% |
| 9 | JSWT-MRH | 601.2 | 2% | 801.2 | 2% | 386.3 | 1% | 869.5 | 2% | 851.2 | 2% |
| 10 | JSWT-HOM | 542.0 | 1% | 247.7 | 1% | - | - | - | - | - | - |
| 11 | VSPS-SAS | - | - | - | - | 56.3 | 0% | 312.0 | 1% | 396.7 | 1% |
| 12 | JSWT-KORI | 371.0 | 1% | 257.8 | 1% | 77.8 | 0% | 5.7 | 0% | - | - |
| 13 | BSPC-SSPS | 375.7 | 1% | 540.6 | 1% | 406.0 | 1% | 323.6 | 1% | 115.3 | 0% |
| 14 | JSWT-STD | 288.2 | 1% | 328.1 | 1% | 616.0 | 1% | 278.3 | 1% | 322.5 | 1% |
| 15 | JSWT-GIMB | 410.3 | 1% | 249.2 | 1% | 179.0 | 0% | 54.8 | 0% | 122.5 | 0% |



**Table 8**: OD Station Pairs ranked based on standard deviation of NTKM from 2013-14 to 2017-18

| S. No. | OD | 2013-14 NTKM | 2013-14 Market Share | 2014-15 NTKM | 2014-15 Market Share | 2015-16 NTKM | 2015-16 Market Share | 2016-17 NTKM | 2016-17 Market Share | 2017-18 NTKM | 2017-18 Market Share |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | JSWT-HTPP | - | - | - | - | - | - | 317.3 | 1% | 552.4 | 1% |
| 17 | MBMB-KLMG | 97.3 | 0% | 413.6 | 1% | 287.9 | 1% | 365.8 | 1% | 321.5 | 1% |
| 18 | JSWT-DDL | 489.2 | 1% | 688.1 | 2% | 728.6 | 2% | 653.0 | 2% | 481.8 | 1% |
| 19 | TWS-TISR | 481.1 | 1% | 668.8 | 2% | 794.4 | 2% | 704.1 | 2% | 687.9 | 2% |
| 20 | TWS-TIST | 690.8 | 2% | 642.9 | 2% | 623.6 | 1% | 485.8 | 1% | 423.3 | 1% |

*Source: CRIS, TERI Analysis*
*The top 3 ODs have been discussed in the following section.*

### *JSW Steel Limited Siding, Tornagallu (Karnataka) to BVH Ballabhgarh (Haryana)*

The traffic flow from the JSWT siding in Karnataka to Ballabhgarh in Haryana reduced significantly in the study period. The NTKM in the OD pair reduced from 969.6 million tonne km in 2013-14 to 204.6 million tonne km 2017-18. Hot rolled coil traffic declined by 84% between 2015-16 and 2017-18. The OD's share in overall steel traffic in Indian Railways declined from 3% in 2013-14 to 1% in 2017-18.

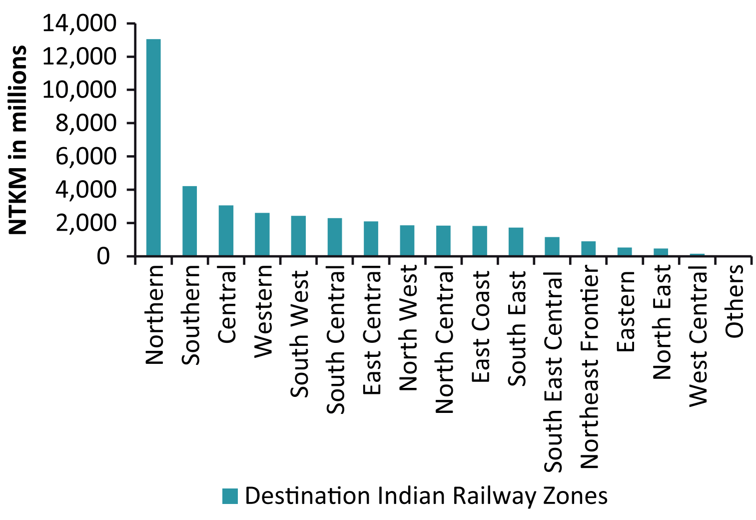



**Figure 11:** Traffic from JSWT, Torangallu to Ballabhgarh, Haryana
*Source: CRIS*

'Hot rolled sheets in coil form' was the main commodity moved in this OD in 2013-14 with around 51% share in NTKM. Hot rolled coils were the dominant commodity moved in 2017-18 with 71% of the NTKM. However, the traffic of commodities like 'cold rolled sheets' and 'stainless steel bars' has declined from significant volumes to no traffic at all. It must be noted that although the share of 'Hot Rolled Coils' increased in the period, the traffic has declined significantly.

**Table 9:** Traffic from JSWT, Torangallu to Ballabhgarh, Haryana (NTKM in tonne km)

| | 2013-14 | | 2014-15 | | 2015-16 | | 2016-17 | | 2017-18 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | NTKM | Proportion (%) | NTKM | Proportion (%) | NTKM | Proportion (%) | NTKM | Proportion (%) | NTKM | Proportion (%) |
| Angles | - | - | - | - | 2,380 | 0% | - | - | - | - |
| Bars including carbon steel bars | - | - | - | - | - | - | 27,844 | 4% | 34,871 | 17% |
| Billets | 99 | 0% | - | - | 806 | 0% | - | - | - | - |
| Cold rolled sheets | 75,769 | 8% | 3,992 | 0% | - | - | - | - | - | - |
| Hot rolled coils | - | - | - | - | 9,23,380 | 58% | 4,62,945 | 68% | 1,43,172 | 70% |
| Hot rolled sheets | - | - | 541 | 0% | - | - | - | - | - | - |
| Hot rolled sheets in coil form | 4,92,225 | 51% | 5,88,786 | 51% | - | - | - | - | - | - |
| Plates | 5,770 | 1% | 45,388 | 4% | 44,189 | 3% | - | - | - | - |
| Ribbed wire rod in coils | 1,68,126 | 17% | 1,55,014 | 14% | 1,45,935 | 9% | 69,738 | 10% | 26,546 | 13% |
| Stainless steel bars | 2,27,621 | 23% | 3,49,506 | 31% | 4,82,029 | 30% | 1,22,790 | 18% | - | - |
| Thermo mechanical treated bars | - | - | - | - | - | - | 1,618 | 0% | - | - |
| Wire rod in coils | - | - | 1,586 | 0% | - | - | - | - | - | - |
| Grand Total | 9,69,610 | 100% | 11,44,813 | 100% | 15,98,718 | 100% | 6,84,934 | 100% | 2,04,589 | 100% |

*Source: CRIS*

'Hot rolled coils' was introduced in this OD in 2015-16 and in the same year there also was usage of BFNS wagons (as shown in Table 10). However, no BFNS wagons were used in the subsequent years and the traffic of 'hot rolled coils' also declined.

**Table 10**: NTKM by Rake Type from JSWT to BVH (in tonne km)

| Rake type → Year ↓ | BFNS | BOST | BOXN | BOXNHL | BRH | BRHNEHS | BRN | SHRN | Grand Total |
|---|---|---|---|---|---|---|---|---|---|
| 2013-14 | - | 20,988 | - | - | 5,244 | - | 2,78,467 | 11,186 | 3,15,885 |
| 2014-15 | - | 65,429 | - | - | - | 5,544 | 2,74,256 | 77,997 | 4,23,226 |
| 2015-16 | 2,422 | 45,391 | - | - | - | - | 2,35,032 | 5,164 | 2,88,009 |
| 2016-17 | - | 13,219 | 1,19,656 | 20,927 | - | - | 41,354 | 12,624 | 2,07,780 |
| 2017-18 | - | 2,521 | 16,980 | - | - | - | | 2,285 | 21,786 |
| Grand Total | 2,422 | 1,71,683 | 1,36,636 | 20,927 | 23,875 | 5,544 | 11,04,277 | 1,09,256 | 15,74,620 |

*Source: CRIS*

### *JSW Steel Limited Siding, Tornagallu (Karnataka) to Ghaziabad (Uttar Pradesh)*

Similar to the traffic to Ballabhgarh, the traffic from JSWT siding in Tornagallu to Ghaziabad also reduced significantly. The traffic increased from 961 million tonne km in 2013-14 to 1,231 million tonne km in 2015-16 but declined to 535 million tonne km in in 2017-18.

'Stainless Steel Bars' from JSWT to Ghaziabad, which constituted 34% of the traffic in 2015-16, reduced to zero traffic in 2017-18. The traffic by NTKM of hot rolled coils also dropped significantly from over 614 million tonne kilometres in 2015-16 to 369 million tonne kilometres in 2017-18.

The traffic from the same plant to Khori in Haryana and GIMB Gandhidham Junction in Gujarat reduced significantly. In fact, there was no traffic from the JSWT siding to Khori in 2017-18, according to CRIS data.

## MBMB Bhushan Steel Limited Siding in Odisha to ATLP in KLMG Kalamboli, Maharashtra

Traffic from the Bhushan Steel Plant in Odisha to ATLP in KLMG Kalamboli, Maharashtra, declined significantly in the study period. It declined from 672.2 million tonne km in 2013-14 to 126.2 million tonne km in 2017-18. The major commodity type moved in the OD pair was hot rolled sheets, according to CRIS data.

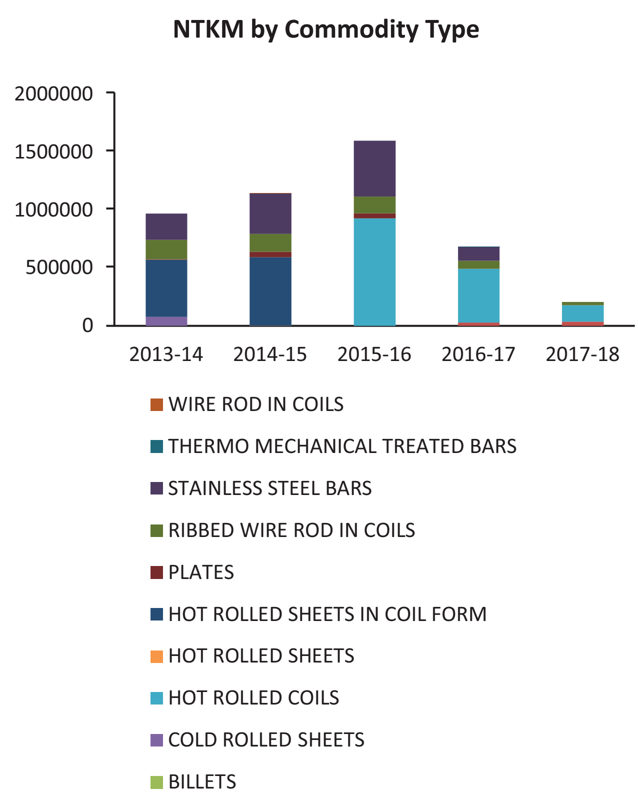



**Figure 12**: Traffic from JSWT Torangallu to Ghaziabad, Uttar Pradesh
*Source: CRIS*

| **Table 11**: Tonnage by Rake Type from MBMB to ATLP (in tonnes) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Rake type → Year ↓ | BFNS | BOST | BOXN | BOX NHL | BRH | BRHN EHS | BRN | SHRN | Grand Total |
| 2013-14 | - | 20,988 | - | - | 5,244 | - | 2,78,467 | 11,186 | 3,15,885 |
| 2014-15 | - | 65,429 | - | - | - | 5,544 | 2,74,256 | 77,997 | 4,23,226 |
| 2015-16 | 2,422 | 45,391 | - | - | - | - | 2,35,032 | 5,164 | 2,88,009 |
| 2016-17 | - | 13,219 | 1,19,656 | 20,927 | - | - | 41,354 | 12,624 | 2,07,780 |
| 2017-18 | - | 2,521 | 16,980 | - | - | - | | 2,285 | 21,786 |
| Grand total | 2,422 | 1,71,683 | 1,36,636 | 20,927 | 23,875 | 5,544 | 11,04,277 | 1,09,256 | 15,74,620 |

*Source: CRIS*

This OD only has HR coils and HR sheets as the commodities carried in the study period (2013-14 to 2017-18). However, the tonnage carried in BFNS wagons is negligible. This may be the reason for a 93% decline in the tonnage carried from MBMB to ATLP.

## Movement of Steel—Zone-wise

As per the analysis of production and consumption zones, it is observed that there exists huge disparity in terms of the location of major steel plants and the major steel consuming states. The steel production is majorly concentrated in the states of Jharkhand, Chhattisgarh, Karnataka, Maharashtra, Odisha and West Bengal due to the availability of raw materials with only few secondary steel plants producing in the regions of Bihar, Delhi, Gujarat, Punjab, etc., while the consumption is majorly concentrated in the states of Uttar Pradesh, Haryana, Gujarat, etc. Hence, the choice of transportation plays a key role in establishing a connection between the production and consumption points. Both the raw materials used for steel production and finished steel are the bulky transportation materials and therefore, the steel sector is a freight-dependent sector. It is estimated that transportation accounts for approximately 3% of the total value.[4]

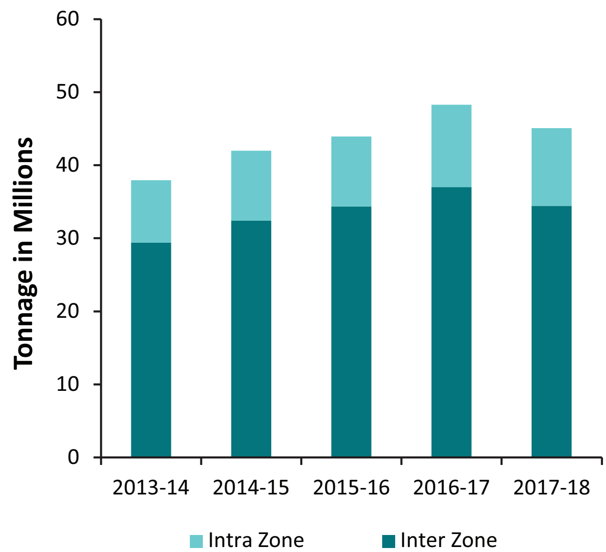



**Figure 13**: Inter-zone and intra-zone movement of steel
*Source: CRIS, TERI Analysis*

[4] *http://steelworld.com/focus1009.pdf*

An analysis of the inter-zone and intra-zone movement of steel shows that, on an average 23% of the steel traffic movement is within the zones. The inter-zone movement has increased at an average rate of 4% between 2013-14 and 2017-18. In the same period the intra-zone movement grew at an average rate of 6%. While the freight movement has increased in absolute terms, the annual growth rates have been declining sharply over the past few years. As compared to inter-zone movement, the fall in growth of intra-zone movement has been much steep. Between 2013-14 and 2014-15 the inter zone and intra zone movement observed an increase of 10% and 12%, respectively, while the same dropped to -7% and -6% between the years 2016-17 and 2017-18.

**Table 12**: Inter-zone and intra-zone movement of steel

| Tonnage in Millions | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|
| Inter Zone | 29.42 | 32.40 | 34.37 | 36.99 | 34.44 |
| Annual Growth (%) | | 10% | 6% | 8% | -7% |
| Intra Zone | 8.52 | 9.57 | 9.57 | 11.28 | 10.64 |
| Annual Growth (%) | | 12% | 0% | 18% | -6% |

*Source: CRIS, TERI Analysis*

**Intra-zonal movement – lead-wise**

It is observed that in case of intra-zone movement, there has been a 42% increase for the shortest distance category of 100–500 km and 169% increase for the distance category of 500–1,000 km over the four years. However, the medium category leads have observed a decline.

**Table 13**: Intra-Zone Steel Traffic by Lead type - Percentage of Total Intra-zone Tonnage

| Lead Category (in km) | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|
| <50 | 19% | 17% | 17% | 17% | 10% |
| 50-75 | 6% | 4% | 4% | 2% | 3% |
| 75-100 | 7% | 7% | 7% | 5% | 5% |
| 100-500 | 64% | 67% | 67% | 69% | 72% |
| 500-1,000 | 5% | 5% | 4% | 6% | 10% |
| 1,000-2,000 | 0% | 0% | 0% | 0% | 0% |

*Source: CRIS*

**Table 14**: Intra Zone steel traffic (in million tonnes)

| Years → Lead Category (in km) ↓ | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|
| <50 | 1.6 | 1.6 | 1.7 | 1.9 | 1.1 |
| 50-75 | 0.5 | 0.4 | 0.4 | 0.2 | 0.3 |
| 75-100 | 0.6 | 0.6 | 0.7 | 0.6 | 0.6 |
| 100-500 | 5.4 | 6.4 | 6.4 | 7.8 | 7.7 |
| 500-1,000 | 0.4 | 0.5 | 0.4 | 0.7 | 1.0 |
| 1,000-2,000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Grand total | 8.5 | 9.6 | 9.6 | 11.3 | 10.6 |

*Source: CRIS*

### Inter-zonal movement – lead-wise

For inter-zone movement, which comprises of long lead movement the share has more or less remained stagnanted or has declined with maximum decline of 70% being observed in the lead category of >3,000 km followed by a decline of 16% in the category of 2,000–3,000 km.

**Table 15**: Inter-Zone Steel Traffic by Lead type - Percentage of Total Inter-zone Tonnage

| Lead Category | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|
| <50 | 0% | 0% | 0% | 1% | 1% |
| 50-75 | 2% | 2% | 3% | 3% | 2% |
| 75-100 | 0% | 0% | 0% | 0% | 0% |
| 100-500 | 14% | 17% | 18% | 22% | 20% |
| 500-1,000 | 27% | 25% | 21% | 24% | 28% |
| 1,000-2,000 | 49% | 47% | 48% | 44% | 44% |
| 2,000-3,000 | 8% | 8% | 9% | 6% | 6% |
| >3,000 | 0% | 0% | 0% | 0% | 0% |

*Source: CRIS*

**Table 16**: Inter-Zone steel traffic (in million tonnes)

| Years → Lead Category (in km) ↓ | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|
| <50 | 0.02 | 0.02 | 0.16 | 0.32 | 0.26 |
| 50-75 | 0.46 | 0.73 | 0.95 | 1.00 | 0.82 |
| 75-100 | 0.00 | 0.13 | 0.12 | 0.03 | 0.04 |
| 100-500 | 4.12 | 5.62 | 6.22 | 8.28 | 6.72 |
| 500-1,000 | 8.01 | 8.05 | 7.18 | 8.87 | 9.54 |
| 1,000-2,000 | 14.37 | 15.30 | 16.59 | 16.16 | 15.03 |
| 2,000-3,000 | 2.42 | 2.54 | 3.15 | 2.31 | 2.04 |
| > 3,000 | 0.02 | 0.00 | 0.00 | 0.01 | 0.00 |
| Grand total | 29.42 | 32.40 | 34.37 | 36.99 | 34.44 |

*Source: CRIS*

Considering the fact that inter zonal rail movement carries around 77% of the total finished steel moved through railways, the continuous decline in tonnage carried across distance categories above 1,000 km, despite an increase in the total finished steel tonnage, is a point of concern for IR.

## Producer-wise steel despatch by rail

Table 17 shows the road and rail shares of the steel products moving from large public producers, large private producers, and other small producers. On an average, 75% of the steel produced in the public steel plants is moved by rail and 42% of the steel produced by the large private producers in moved by rail. However, the other small producers of steel who are responsible for producing around 30% of the total private steel production, on an average, only transport 7% of their finished produce by rail.

The provisions of the National Steel Policy 2017 aim to increase the country's crude steel capacity up to 300 million tonnes by 2030-31 and increase the per capita consumption from 61 kg at present to 160 kg by 2030-31. This increase in capacity and consumption will require Indian Railways to play a more critical role in terms of meeting the transportation demand. At present, only public sector majors, such as SAIL and RINL are moving a significant proportion (75%) of their finished steel produce via Indian Railways which in absolute terms is a very small share as their production accounts not more than 15% of the total finished steel in the country. The major private sector plants and secondary plants, constituting the major finished steel production, move only 42% and 7% of the production via Indian Railways, respectively.

## Freight Rates

Transportation cost plays a significant role in determining the modal choice for freight movement. For bulk commodities such as steel, which is dense and carried over long distance, freight rate fixed by railways becomes vital in determining the loading of steel onto railways. Freight rate also has a direct impact on the market price of the finished commodity, in this case, steel.

**Table 17**: Share of movement through rail of large public, large private, and other private producers (million tonnes)

| | Public Sector Plants | | Private Sector Plants | | Others (small units) | |
|---|---|---|---|---|---|---|
| | Total Production Pub | Rail Freight Movement Pub | Total Production Pvt | Rail Freight Movement Pvt | Total Production Others | Rail Freight Movement Others |
| 2012-13 | 12.8 | 9.8 | 29.6 | 11.3 | 47.2 | 2.8 |
| 2013-14 | 13.4 | 10.2 | 31.7 | 13.4 | 50.4 | 3.0 |
| 2014-15 | 12.8 | 9.6 | 34.0 | 15.2 | 53.9 | 3.1 |
| 2015-16 | 13.0 | 9.3 | 35.6 | 14.7 | 54.4 | 4.4 |

*Source: JPC and CRIS data*

Looking at the overall freight traffic of finished steel on Indian Railways, the share of public sector plants has been declining over the years from 41% in 2013 to 33% in 2017. On the other hand, the share of finished steel movement for private sector plants has increased slightly over the same period.

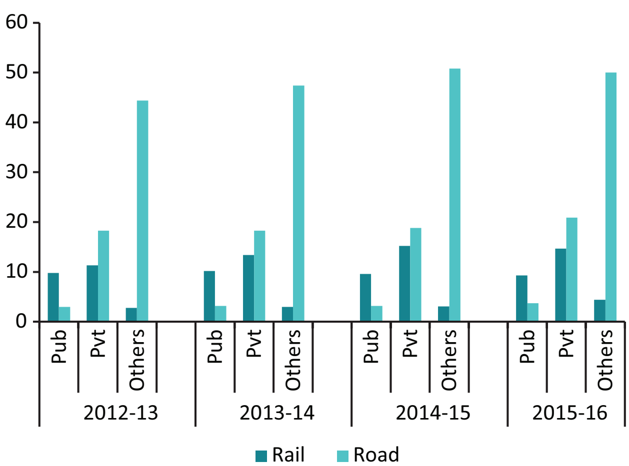



**Figure 14**: Share of public, private and other plants in total steel traffic on IR
*Source: JPC and CRIS data*

As per IR rules, minimum chargeable distance for freight of any commodity is 100 km. The bulk commodities are classified under various 'classes' for the purpose of determining freight rates on per tonne basis. Freight on iron and steel finished products is charged as per Class 165 under the goods tariff schedule while for other components in steel production, charges are imposed under different classes (Indian Railways, 2017).

## Freight rate - Rourkela Steel Plant Traffic

In order to make a cost comparison of transportation of steel via rail and road, data for medium lead and long lead freight rate has been collected from the Rourkela Steel Plant (RSP). Table 19 provides a detailed break-up of the cost involved, including first-mile and last-mile costs, in transporting steel by rail and road.

[5] *No discount on base freight is offered on 90-100 km, making 90 km the effective minimum distance for freight charged. Minimum chargeable distance is same for all goods irrespective of class.*

**Table 18**: Rail freight chart for steel products based on lead category (Rs per tonne)

| Item | Class | Freight charged in Rs per tonne | | | | % increase over Base class |
|---|---|---|---|---|---|---|
| | | Minimum (100-125 km) | Short lead (301-325 km) | Medium lead (501-550 km) | Long lead (1,001-1,100 km) | |
| Base class | C100 | 141.8 | 327.3 | 530.1 | 1,019.6 | 0% |
| Pipes and wire rod in coils | C130 | 184.3 | 425.5 | 689.1 | 1,325.5 | 30% |
| Iron and steel slag | C140 | 198.5 | 458.2 | 742.1 | 1,427.4 | 40% |
| Coal and coke, limestone, dolomite, manganese | C145 | 205.6 | 474.6 | 768.6 | 1,478.4 | 45% |
| Pig iron, sponge iron, iron/steel/ stainless steel scrap | C150 | 212.7 | 491.0 | 795.2 | 1,529.4 | 50% |
| Iron or steel (products excluding pipes and wire rod in coils), iron ore | C165 | 234.0 | 540.0 | 874.7 | 1,682.3 | 65% |

*Source: Rates Circular No. 20 of 2016, No. 24 of 2017, and Goods Tariff No. 48 Part I (Vol II) and Part II, Railway Board, Indian Railways*

**Table 19**: Rail and Road freight comparison for steel traffic from Rourkela Steel Plant (Medium and Long Lead)

| | | Medium lead (500-1,000 km) | Long lead (1,000-2,000 km) | Remark |
|---|---|---|---|---|
| Rail Transportation | | | | |
| Rail Related | Average loaded weight of steel products per wagon (in tonnes) | 63+1 | 63+1 | 63 tonnes minimum permissible weight + 1 tonne overloading |
| | 1. Rail freight per tonne (in Rs) | 1,097.3 | 1,829.4 | |
| | 2. Busy season surcharge (@15%) (in Rs) | 164.6 | 274.4 | for October |

[6] *http://www.indianrailways.gov.in/railwayboard/uploads/directorate/traffic_comm/Freight_Rate_2017/RC_24_2017.pdf*

**Table 19**: Rail and Road freight comparison for steel traffic from Rourkela Steel Plant (Medium and Long Lead)

| | | Medium lead (500-1,000 km) | Long lead (1,000-2,000 km) | Remark |
|---|---|---|---|---|
| Rail Related | 3. Punitive charges for overloading (in Rs) | 0.0 | 0.0 | |
| | 4. Other surcharges paid, if any (in Rs) | 20.5 | 20.5 | Demurrage per tonne for October in Rs |
| | Development surcharge (@5% of 1+2+3+4) (in Rs) | 64.1 | 106.2 | |
| | GST/tax charges on rail freight (per tonne) (in Rs) | 67.3 | 111.5 | 5% on total freight charge |
| Road Related (first mile and last mile) | Freight charge - First mile from Factory to Terminal (Rs per tonne) | 0.0 | 0.0 | |
| | Freight charge - Last mile from Terminal to Dealer (Rs per tonne) | 650.0 | 650.0 | Rs 400-900 per tonne for last 30-40 km |
| **Total Cost (Rs Per Tonne for transporting by Rail)** | **2,063.8** | **2,992.1** | | |
| **Road Transportation** | | | | |
| **Total Cost (Rs Per Tonne for transporting by Road)** | **2,246.44** | **3,853.92** | | |

*Source: Industry sources*

As can be seen from the cost comparison, the railways are much more cost-effective in terms of transportation of steel as compared to road. In case of medium lead, rail freight charges are 8% lower than the road freight and in case of long lead; road freight charges are 22% higher than rail freight.

It is observed that the difference between rail and road increases as the distance increases. Rail becomes more and more cost effective as the lead increases. The following graphs show the difference between rail and road freight to different location in India from the Rourkela steel plant.

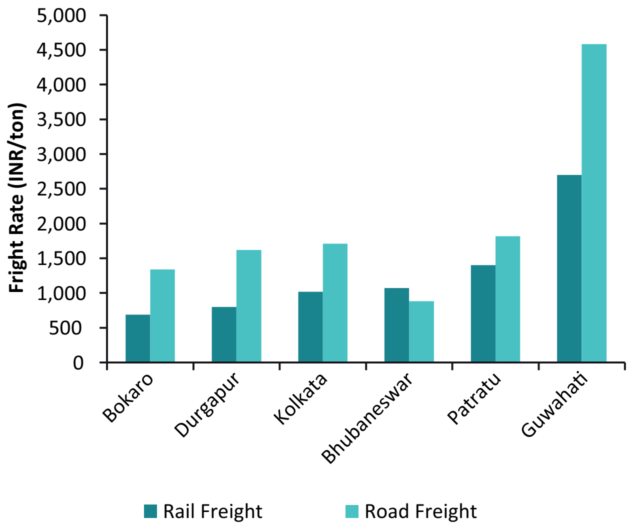



**Figure 15**: Rail and Road per tonne freight rate comparisons for RSP to Eastern India

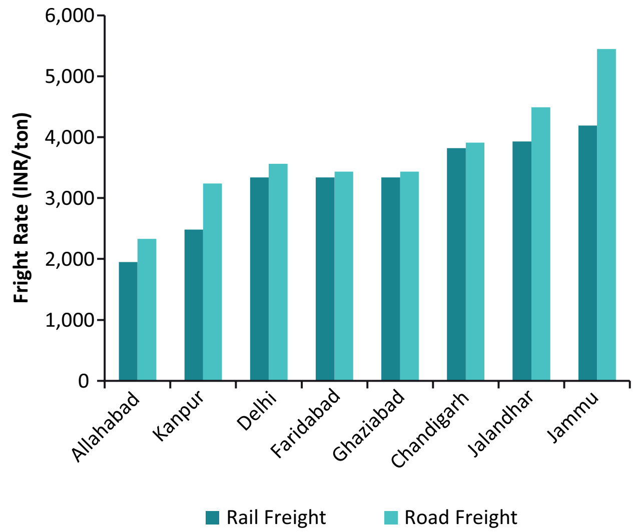



**Figure 16**: Rail and Road per tonne Freight Rate comparisons for RSP to Northern India

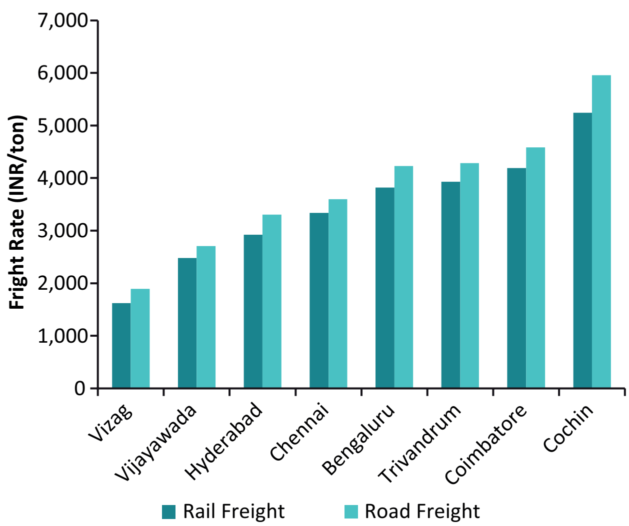



**Figure 17**: Rail and Road per tonne Freight Rate comparisons for RSP to Southern India

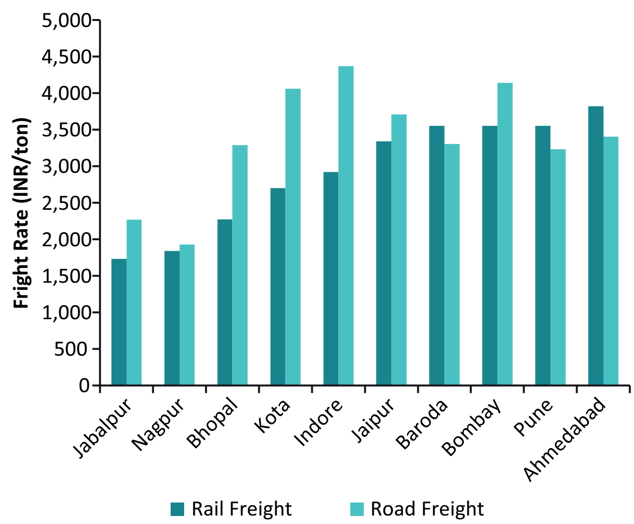



**Figure 18**: Rail and Road per tonne Freight Rate comparisons for RSP to Western India

It is observed that except for steel movement to Bhubaneswar, Baroda, Pune, and Ahmedabad, for all other destinations, moving by rail is cheaper than moving by road.

## Product-wise Steel Movement by IR

The finished steel is majorly transported in the form of hot rolled coils, bars (rod), cold rolled, flats, and plates. Slag which constitutes just 1.7% of the traffic carried by railways in 2013-14 is now a major steel commodity with 22.3% of the total traffic carried in 2017-18 whereas steel products and raw materials, such as coils, billets, flats, pig iron, sponge iron lost their share in rail movement in the period 2013-14 to 2017-18. Sponge iron went down from being 2% of steel traffic in IR to 0.8% in 2017-18. The traffic of slab too decreased from 1.8% in to 1.3% in the same period. The considerable increase in slag traffic comes out to be a potential area of investigation to understand the underlying factors that led to this increase in the study period.



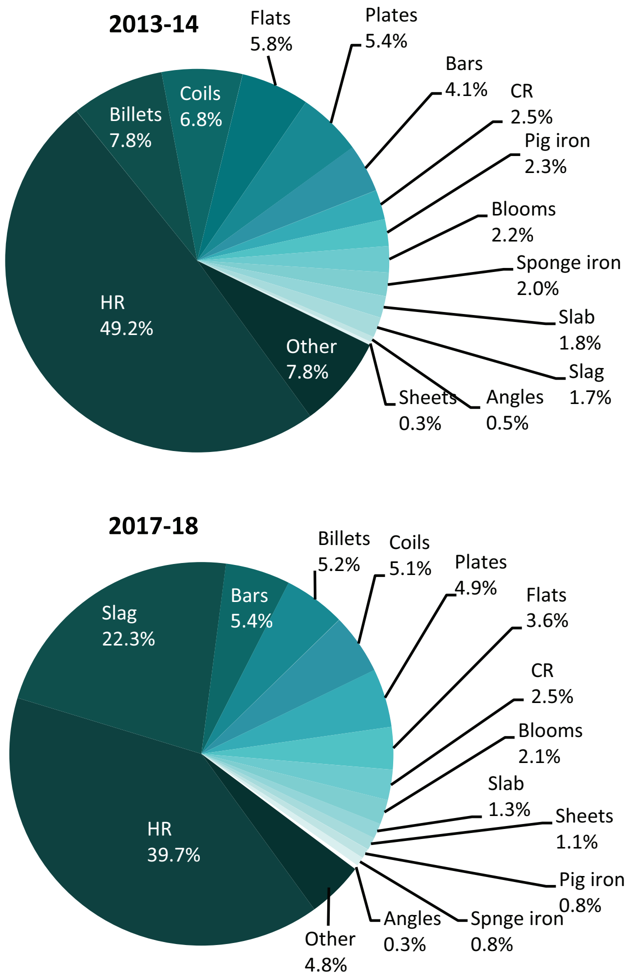



**Figure 19**: Product-wise share of steel traffic carried by Indian Railways (%)

## Wagon Analysis

Wagons form an important part of the logistics requirements for the steel industry. The availability of right and specific type of wagon is crucial in case of a commodity, such as steel, which comes in various forms as finished products. Considering that all the commodities discussed in previous section have specific wagon requirements, it is important that subsequent focus is placed on provision of special types of wagons.

### Movement of Finished Steel by Wagon Type

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, such as iron ore.

Both the BRN and BOST wagons are preferred for loading flat products like steel plates and flats and 90% of the plates and flats are being moved by Indian Railways via these wagons. For moving finished steel in the form of coils, BFNS wagons are more suitable but as assessed, even HR and CR coils are being majorly transported in wagons for flat products. In addition to this, more than 20% of the HR coils are being moved in BOXN wagons which are not preferred at all for moving finished steel.


**Figure 20**: Key wagons used to move steel by Indian Railways (Clockwise from top left: BOST, BOXN, and BRN)
*Source: IRFCA*

Of the total wagons used for finished steel, more than 80% of the wagons were the type BRN and BOST. Hence, the availability of wagons can be directly linked with the commodity movement. As mentioned earlier, the availability of BFNS wagons can be increased by Indian Railways for transporting coils.

## Issues and Recommendations

TERI identified the major issues through stakeholder discussions with steel manufacturers and IR officials, as well as through analysis of FOIS data of steel movement in India (2013-14 to 2017-18). The issues identified have been broadly classified as those concerning quality, service, and connectivity.

### Quality

#### *Wagon Availability*

- Availability of wagons was highlighted as one of the major issues in improving the movement of steel by Indian Railways. At the SAIL plant in Rourkela, daily minimum 10,000 tonnes have to be evacuated to avoid backlog and disruptions in production. This minimum requirement of 3 rakes per day is often

**Table 20**: Commodity-wise movement of steel in different wagon types (% share in total traffic carried by IR)

| | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | Grand Total |
|---|---|---|---|---|---|---|---|
| **Hot Rolled** | | | | | | | |
| BRN | 52% | 54% | 45% | 46% | 43% | 32% | 48% |
| BOXN | 24% | 20% | 24% | 22% | 31% | 37% | 24% |
| BOST | 23% | 24% | 26% | 25% | 23% | 19% | 24% |
| SHRN | 0% | 0% | 2% | 4% | 1% | 5% | 2% |
| Others | 1% | 2% | 3% | 3% | 3% | 7% | 2% |
| **Cold Rolled** | | | | | | | |
| BRN | 61% | 60% | 51% | 55% | 59% | 49% | 58% |
| BOST | 30% | 27% | 26% | 24% | 22% | 15% | 26% |
| BOXN | 8% | 10% | 19% | 15% | 14% | 20% | 13% |
| SHRN | 0% | 2% | 4% | 5% | 5% | 15% | 3% |
| Others | 1% | 1% | 1% | 0% | 0% | 1% | 1% |
| **Bar/Rod** | | | | | | | |
| BRN | 63% | 62% | 57% | 57% | 59% | 51% | 59% |
| BOST | 32% | 34% | 37% | 40% | 39% | 45% | 37% |
| BOXN | 4% | 4% | 5% | 2% | 2% | 1% | 3% |
| Others | 0% | 0% | 1% | 1% | 0% | 3% | 1% |
| **Plates** | | | | | | | |
| BRN | 72% | 73% | 69% | 67% | 72% | 65% | 70% |
| BOST | 25% | 23% | 21% | 23% | 21% | 20% | 23% |
| BOXN | 2% | 3% | 7% | 6% | 4% | 9% | 5% |
| SHRN | 0% | 0% | 3% | 4% | 2% | 3% | 2% |
| Others | 1% | 0% | 1% | 1% | 0% | 3% | 0% |
| **Flats** | | | | | | | |
| BRN | 89% | 82% | 63% | 55% | 68% | 68% | 73% |
| BOST | 1% | 14% | 31% | 41% | 30% | 19% | 21% |
| BOXN | 4% | 0% | 2% | 2% | 2% | 3% | 2% |
| SHRN | 1% | 2% | 3% | 2% | 0% | 11% | 2% |
| Others | 6% | 2% | 2% | 0% | 0% | 0% | 2% |

*Source: CRIS*

not met and traffic is diverted to road to minimize the effect on the production at the plant. Similar experiences have also been shared by other steel manufacturers which could be ascertained through analysis of the indent versus actual rake made available to the manufacturers.

- Apart from limited rolling stock, the quality of the wagons was also highlighted as a significant issue. It was mentioned by one of the stakeholders that it is often the case that wagons are declared sick when they reach the plant and sometimes the train examiner (TXR) may declare the wagon 'unfit' after the loading has been completed. The trans-shipment of the steel product in such cases to another rake often takes more time than the free time allotted and leads to additional demurrage costs.
- TERI's discussion with stakeholders also brought out that multiple rakes indented at different times may also be supplied together by the Indian Railways, resulting in bunching of rakes.
- Even under Long Term Tariff Contracts (LTTC), wagon availability was highlighted as an issue.
- Extra time is spent in repairing the wagons when the rake is provided.
- The overall capacity constraint in terms of line capacity, wagon availability, and availability of goods shed was indicated.
- Stakeholders have highlighted that railway rakes are not available for movement all 365 days as well as during peak periods (last 10 days of a month when deliveries begin).
- The following is a brief analysis of CRIS data to portray the declining wagon usage by Indian Railways.

**Table 21**: Average turnaround time and demurrage charge paid by Rourkela Steel Plant

| Month | 2016-17 | | 2017-18 | |
|---|---|---|---|---|
| | Average TR (hours) | Total loading demurrage (Rs lakhs) | Average TR (hours) | Total loading demurrage (Rs lakhs) |
| Apr | 48.41 | 70.72 | 44.99 | 58.15 |
| May | 47.35 | 59.01 | 44.16 | 51.96 |
| Jun | 48.97 | 67.01 | 42.77 | 44.25 |
| Jul | 49.44 | 75.44 | 41.15 | 41.43 |
| Aug | 48.83 | 66.7 | 44.98 | 68.03 |
| Sep | 48.08 | 63.7 | 41.32 | 41.45 |
| Oct | 41.82 | 39.2 | 36.67 | 25.72 |
| Nov | 41.28 | 36.65 | - | - |
| Dec | 37.72 | 24.07 | - | - |
| Jan | 36.77 | 26.93 | - | - |
| Feb | 42.54 | 35.2 | - | - |
| Mar | 38.00 | 21.78 | - | - |

*TR: Turnaround time; Note: < 34 hours attract zero demurrage charges [7]*
*Source: Rourkela Steel Plant*

[7] *http://www.indianrailways.gov.in/railwayboard/uploads/directorate/traffic_comm/freight_rate-2k5/RC_74_05.pdf*

| **Table 22**: Usage of wagons by commodity type (number of wagons) | | | | | | |
|---|---|---|---|---|---|---|
| | **2012-13** | **2013-14** | **2014-15** | **2015-16** | **2016-17** | **2017-18** |
| **Hot Rolled** | | | | | | |
| BRN | 3,326 | 2,359 | 2,042 | 2,364 | 2,378 | 2,489 |
| BOST | 1,992 | 1,325 | 1,368 | 1,429 | 1,193 | 1,084 |
| BOXN | 647 | 582 | 730 | 702 | 802 | 879 |
| Others | 85 | 117 | 343 | 510 | 294 | 245 |
| **Total** | **6,050** | **4,383** | **4,483** | **5,005** | **4,667** | **4,697** |
| **Bar/Rod** | | | | | | |
| BRN | 2,659 | 2,659 | 2,524 | 2,516 | 2,329 | 2,225 |
| BOST | 1,342 | 1,463 | 1,453 | 1,582 | 1,224 | 1,146 |
| BOXN | 130 | 128 | 178 | 98 | 75 | 68 |
| Others | 5 | 2 | 57 | 82 | 7 | 4 |
| **Total** | **4,136** | **4,252** | **4,212** | **4,278** | **3,635** | **3,443** |
| **Cold Rolled** | | | | | | |
| BRN | 1,063 | 638 | 476 | 395 | 511 | 449 |
| BOST | 664 | 433 | 311 | 267 | 274 | 265 |
| BOXN | 132 | 138 | 180 | 120 | 138 | 142 |
| Others | 12 | 16 | 47 | 72 | 68 | 65 |
| **Total** | **1,871** | **1,225** | **1,014** | **854** | **991** | **921** |
| **Flats** | | | | | | |
| BRN | 274 | 220 | 202 | 244 | 375 | 402 |
| BOST | 8 | 52 | 130 | 161 | 136 | 124 |
| SHRN | 6 | 15 | 21 | 16 | 3 | 4 |
| Others | 52 | 11 | 18 | 12 | 14 | 17 |
| **Total** | **340** | **298** | **371** | **433** | **528** | **547** |
| **Plates** | | | | | | |
| BRN | 1,451 | 1,045 | 1,035 | 967 | 929 | 887 |
| BOST | 828 | 539 | 551 | 518 | 423 | 415 |
| BOXN | 101 | 109 | 178 | 141 | 144 | 151 |
| Others | 36 | 24 | 95 | 141 | 56 | 62 |
| **Total** | **2,416** | **1,717** | **1,859** | **1,767** | **1,552** | **1515** |

*Source: CRIS*

### *Recommendation*

IR also is aware of the huge problem of wagon unavailability. IR launched General Purpose Wagon Investment Scheme (GPWIS) in April 2018 to precisely address this issue by inviting private players to invest in wagons. However, the privately-owned wagons are to be maintained solely by IR. Privatising the maintenance of such wagons may lead to better quality of the wagons when being supplied to the steel plants. TERI recommends that IR should explore the prospects of privatising maintenance of wagons without letting go of the Research Designs & Standards Organisation (RDSO) standards. The policy might also be expanded to facilitate private wagon leasing companies.

[8] *http://www.indianrailways.gov.in/railwayboard/uploads/directorate/traffic_comm/downloads/Freight_Marketing_2018/FM%20master%20circular%20GPWIS.pdf*



### *Wagon Suitability*

- TERI's discussions with steel plants revealed that over the availability of wagons, the suitability of the supplied wagons is also an issue. Suitable wagons for grade steel are often not available.
- Some rakes have link wagons which must be separated first to complete the rake. Such rearrangement of wagons often results in wastage of free and incurring of additional demurrage costs. For example, BOXN wagons have very few two-point rake unloading points whereas BRN, BOST, CONCORDE have many two-point rake locations available.
- Sometimes the wagon supplied may not be suitable and also be unsuitable for modification for steel products. This is a mostly a problem with BRN wagons which require hook and angle cutting for usage.
- Considering the fact that most of the times, due to short supply of specialized wagons for finished steel, steel plants have to rely on wagons for raw materials and this leads to detention in case of outward dispatches.
- Specific wagon requirements, such as BFNS wagons for HR and CR coils are not met. The following is analysis (Figure 21) of CRIS data (2013-14 to 2017-18) shows the usage of BFNS wagons for HR and CR coils.

Figure 21 shows the usage (in NTKM) of wagons for HR and CR Coils from 2013-14 to 2017-18.

Even though the use of BFNS wagons for HR and CR coils has increased significantly from 27.24 million tonne km to 159.82 million tonne km, proportionally only 1% of HR and CR coils moved by IR in 2017-18 constituted of BFNS wagons.

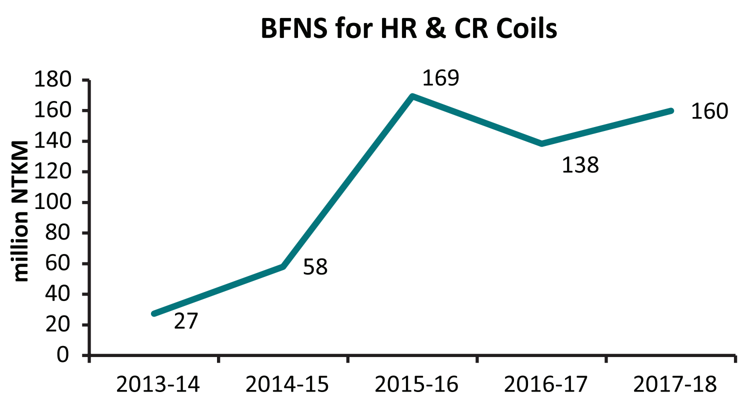



**Figure 21**: BFNS wagon used for HR and CR coils (2013-14 to 2017-18), CRIS data

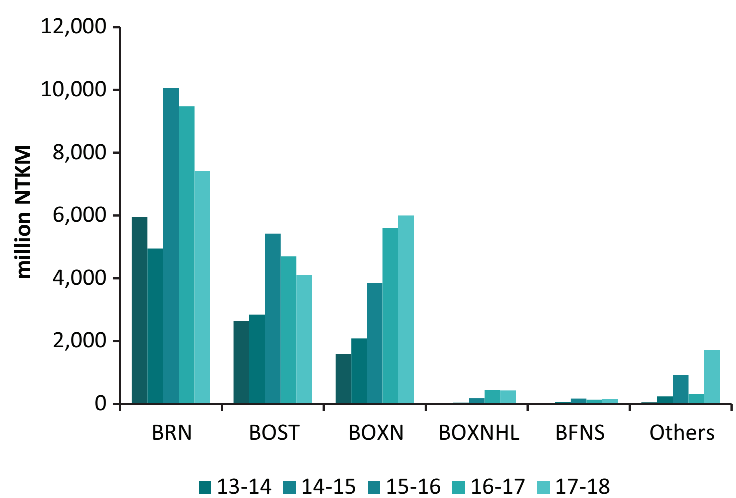
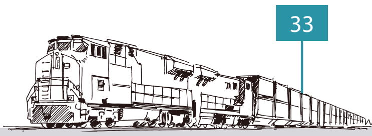



**Figure 22**: Wagon usage for HR and CR coils from 2013-14 till 2017-18
*Source: CRIS data*



### *Recommendations*

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

Even though IR has come up with GPWIS, it restricts the private investment in specialized wagons, such as BFNS which are best suited for movement of HR and CR coils. IR must encourage private parties to come up with innovative designs within the purview of the RDSO standards. Interventions by IR in reducing the gestation periods of new designs may further address the problem of wagon suitability in movement of steel products.

### *Wagon Design*

- 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.

### *Recommendations*

Similar to the recommendations listed earlier to improve wagon availability and wagon suitability, facilitating innovation in wagon design through RDSO-regulated schemes and allowing self-maintenance by private players may help maintain the quality of the wagons.

## Service

### *Weighment*

- Weighment was highlighted as a major issue with IR. It was expressed by some stakeholders that weigh bridges need to be corrected to calculate the accurate weight and not give different weights at different time for the same quantity of shipment.

### *Recommendations*

IR must on focus on standardizing the weighment mechanisms through consistent machines. The same standards need to be verified and any discrepancy reported by users must be resolved at a faster rate than the present.

### *Tariff Rates*

- It was expressed by some stakeholders that the busy season surcharge of 15% is levied on wagons acquired under Special Freight Train Operator (SFTO) and Liberalised Wagon Investment Scheme (LWIS) scheme. This discourages private wagon operators from expanding their investments.
- Similar tariff rates for movement of both raw material and finished product was also brought up as an issue. Finished steel movement has no preference over iron ore as a raw material as both are charged at the same rate class of C165.
- Financial rigidity: Indian Railways only accepts the payments in advance compared to road transport which provide up to 60 days grace period.
- There are certain commodities that cannot be loaded up to the carrying capacity of a wagon but are charged according to the fixed rates which also results in idle freight. Chargeable weight should be reasonable according to quantity loaded and not according to wagon weight. Can't load more than 63 tonnes but fee is charged based on the maximum load ability of 68 tonnes.

### *Recommendations*

Tariff rate by IR must be maintained at a competitive level with the trucking industry. Our analysis of rates from the Rourkela steel plant showed the rail tariff to be lower than the road for most destinations except Bhubaneswar, Pune, Baroda, and Ahmedabad. TERI ran a correlation between the difference between freight rates of road and rail and the distance from the plant. The low positive correlation coefficient (0.0023) indicates that increasing distance may make rail relatively cheaper than road but there are many other factors which influence the difference between road and rail tariff.

As roadways are largely unorganized and extremely flexible in terms of rates and payments, long-term tariff contracts are the ideal way for IR to captivate traffic for longer terms. In August 2017, IR signed a long term tariff contract with SAIL for movement of commodities from 15 zones. Similarly, IR must push for LTTC with as many producers as possible to create a stable and sustainable steel traffic on IR.

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

### *Restriction of Marketing Schemes*

- Some stakeholders posed the argument that restriction of wagons under SFTO and LWIS to only high capacity wagons or specialized wagons is a major restriction for growth of private wagon owners.
- As transport is only allowed between two Private Freight Terminals (PFT) for specialised wagons, the flexibility that could be offered to steel traffic movement by access to public Rail Freight Terminals (RFTs) is lost.

### *Recommendations*

IR may open the access of public RFTs to privately-owned wagons operating under GPWIS, LWIS or SFTO.

### *Lack of Assured Transit Time*

- In most cases, the road players provide an assured transit time (usually 6–7 days), however, no such assurance is given in movement of steel freight. The use of GST also has smoothened the movement of freight by road, further increasing the competition for railways.

### *Recommendations*

IR may identify key corridors of steel movement and offer Assured Transit Time in those corridors. Similarly, IR must also identify the key commodities of steel traffic in consultation with the steel industry and offer assured transit time to select steel commodities. Similar to assured transit time offered in containers, IR can offer to ATT to steel commodities a rational premium charge.

## Connectivity

- Steel is not feasible to be transported by rail for a distance less than 400 km
- Since 90% has been despatched by railways for a long time, customers are used to it and do not prefer switching to road transport. Also for ISPs, road transport is relatively expensive compared to railways but the inherent problems with railways has made it difficult to maintain rail traffic

### *Recommendations*

Most large public and private steel producers in India have rail connectivity to their plants. The small producers of steel have to be aggregated for rail to capture that traffic. As it is anyway cheaper for the large producers to transport by rail, assurance of time and long term tariff contracts will help the railways capture all such traffic. Strengthening the already connected ODs of steel movement must be IR's priority.

### *Other recommendations*

- Indian Railways should increase the capacity to carry finished steel as well raw materials (coking coal, iron ore, etc.) required for making steel.
- The following needs to be ensured by railways to provide proper service—time guarantee, supply guarantee of wagons, and guarantee of loading-unloading in reasonable time.
- A pressing need is data exchange between railways and consignors. FOIS should display rake composition at the point of booking as this would save crucial time, which is otherwise spent in recording rake composition at plant. Certification by TXR and manual feeding of data by railway official at plant also accounts for double work.

## Conclusion

India is the third largest producer of steel and the National Steel Policy 2017 envisages steering the industry in creating an environment to further increase the domestic steel production and ensure a scenario where the production will meet the anticipated consumption growth of steel in India. With this, the transportation requirement of finished steel and the raw materials to the steel plants will obviously increase. However, this report attempts to highlight the declining share of railways in the increasing transportation of finished steel and its auxiliary products in India. TERI identified multiple issues in steel movement through rail and suggested certain recommendations to mitigate the loss in rail market share and also to gain some by competing with the largely unorganized but efficient road transport. Rail connectivity is a limited issue for large private and public producers of steel in India. There is huge potential for IR to capture the transportation to and from such plants without excessive investment in line capacity and other infrastructure as most already have the same. This report through analysis of CRIS data and extensive discussions with stakeholders from steel plants, IR, and academia has recommended improvements in terms of tariff schemes, transit time, and IR service to maintain and improve rail share in the movement of steel.

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