Updated draft report on capacity enhancement/shelf of projects (including report on National Multi-Modal Transportation Grid) with high level cost estimates for major ports

July, 2016

CONTEXT

The Sagarmala initiative was conceived by the Government of India to address the challenges and capture the opportunity of port-led development comprehensively and holistically. Sagarmala is a national programme aimed at accelerating economic development in the country by harnessing the potential of India's coastline and river network.

A Strategy & Programme Management consultant ("the Consultant") was appointed by Ministry of Shipping, Government of India/ Indian Ports Association for conducting Sagarmala study. Table 1 lists down the deliverables to be submitted during the course of the study.

Table 1

S.No	Deliverable
1	Inception report depicting the methodology, variances if any, timelines, work plan
2	Draft report on cargo traffic projections & logistics bottlenecks
3	Final report on cargo traffic projections & logistics bottlenecks
4	Draft report on capacity enhancement / shelf of projects (including report on National Multi-Modal Transportation Grid) with high level cost estimates for major ports
5	Final report on capacity enhancement/shelf of projects with high level cost estimates for major ports
6	Report on identification of sites for new port development
7	Report on government imperatives including financing plan
8	Report on PMO structure
9	Perspective plan for Port-led Industrial Development of the Coastal Economic Clusters
10	Draft Final Report covering all elements
11	Final report based on stakeholder consultations

This report focuses on deliverable 4 – Draft report on capacity enhancement/shelf of projects (including report on National Multi-Modal Transportation Grid) with high level cost estimates for major ports. This report covers parts of Section C and D of Terms of Reference (TOR). Draft master plans for each of the 12 major ports and techno-economic feasibility reports for new ports have been separately submitted which contains all the details on port modernization and new port projects.

Contents

Executive summary 1

1 National Multi-modal transportation grid 9

1.1 Petroleum, oil and lubricants 10
1.2 Thermal coal 13
1.3 Steel and raw materials 17
1.4 Cement 26
1.5 Containers 29

2 Port modernization 33

2.1 Challenges in port capacity planning 33
2.2 Implications and opportunities for port capacity 38

3 Port connectivity 44

3.1 Overarching connectivity challenges 46
3.2 Mode wise projects 58

Annexure I – Multi-modal transportation model

Annexure II – Shelf of projects

Executive Summary

Projects identified under Sagarmala

The concept of "port-led development" is central to the Sagarmala vision. Port-led development focuses on logistics-intensive industries (where transportation either represents a high proportion of costs, or timely logistics is a critical success factor). These industries can be structurally competitive if developed proximate to coast/waterways. They would be supported by efficient and modern port infrastructure and seamless multi-modal connectivity. The synergistic and coordinated development of the above four components—logistics intensive industries, efficient ports, seamless connectivity and requisite skill base—leads to unlocking economic value.

The Sagarmala National Perspective Plan (NPP) has identified a range of projects and enablers under these four pillars, which can unlock the opportunities for port-led development. This report focuses on port modernisation and port connectivity pillars of Sagarmala. Projects related to the efficiency improvement and capacity enhancement of ports is covered under port modernisation. Port connectivity covers challenges relating to evacuation for EXIM and domestic cargo and proposes projects and initiatives to ensure connectivity across pipelines, waterways, rail and roads. There are three main sources of identifying projects and interventions for Sagarmala

- OD study – Demand and supply situation of major EXIM flow commodities were studied in order to ensure an optimized end to end logistics chain for the commodities
- Master plans for major ports – Based on the OD study, a detailed master plan was prepared for every port identifying port modernisation and connectivity projects
- State visits & consultation with major and non-major ports -
  - State Sagarmala meetings were held in all coastal states
  - Projects identified by states validated and included in list of projects with details captured in a concept plan
  - Post release of draft NPP, further meetings conducted in several states

In addition to this, a multi-modal model was developed on the basis of OD study to revalidate the key constraints in logistics movement which in turn were analysed to evolve projects to address bottlenecks.

Sagarmala OD study

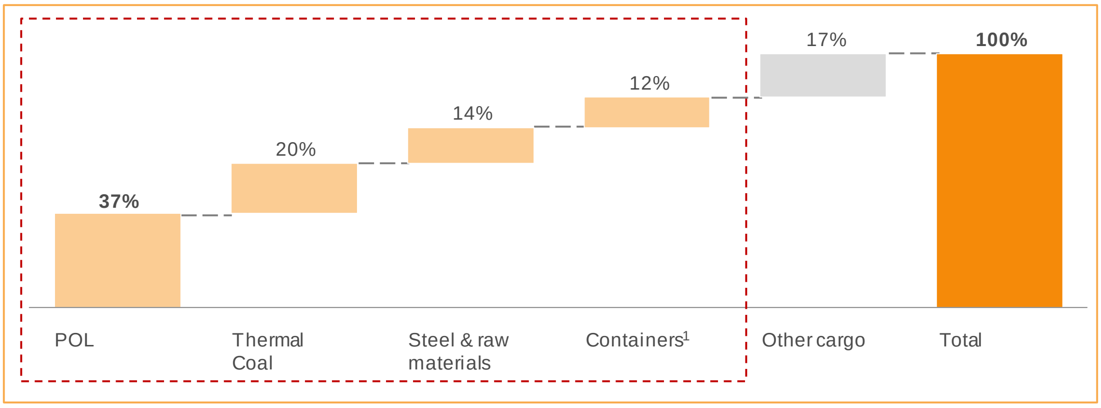
Conducting a detailed origin-destination mapping of major cargo items is necessary to align the port capacity and infrastructure needs at requisite demand & logistics chain centres. The Sagarmala OD study, therefore, lays the basis for the creation of efficient infrastructure—such as creating greenfield ports or increasing handling capacity at ports and relieving congestion on existing high-volume routes.

Towards this, it studies the total demand and supply situation of major EXIM flow commodities—coal, petroleum, oil and lubricants (POL), steel[1], foodgrains, fertilisers, and containers—upto 2035 with a sharper focus on 5-10 year timeframe as these five key commodities aggregated make 85 per cent of total freight volumes (972 MMTPA in 2013–14) currently handled by ports in India (Exhibit 1).

EXHIBIT 1

Commodities covering ~85% of port traffic were studied in detail to identify projects

MTPA, percent, 2013-14



1 Paper, cotton, machinery, chemicals, metals

POL

Over the next decade domestic demand for petroleum products is expected to increase to anywhere between 273 and 288 MMTPA, depending upon the pace of economic recovery and GDP growth. Domestic installed capacity of the existing refineries, on the other hand, can increase to a maximum of 282 MMTPA by the year 2025. Since only 56 to 65 per cent of crude input can be converted to MS/HSD, the current scenario is expected to lead to an increase in the crude import requirement by 75 MMTPA in the next 10 years.

Further, the recent deregulation of diesel prices in the economy is expected to cause a shift in the EXIM dynamics of petroleum products, inducing private refineries to divert the majority of their export volumes into the domestic market. In event of this happening, there will emerge new opportunities to coastally ship an additional 22 MMTPA petroleum products from the surplus to the deficit areas by 2025.

This expected increase in coastal shipping has implications for port infrastructure with regard to petroleum products. Storage facilities for petrol and diesel may have to increase by around 0.13 MMTPA at the destination ports. Port connectivity infrastructure—rail, road and pipelines—will also need to be strengthened to transport the coastally shipped petrol and diesel to the concerned refineries and depots, and then to the retail outlets.

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1 Includes coking coal, iron ore and steel

Liquefied Petroleum Gas

Domestic demand for LPG is expected to grow from the current level of 16 MMTPA at about 5 per cent per annum and by 2025, can increase to anywhere between 28 MMTPA to 35 MMTPA, depending upon the pace of urbanization and growth of piped gas penetration. Industry estimates fix the figure at around 33 MMTPA. As against this, domestic production of LPG is expected to increase to 14 MMTPA by 2025. Given India's present LPG import capacity of 7 MMTPA and the projected capacity increase of 3 MMTPA, this leaves a gap of nearly 9 MMTPA which needs to be provided for.

This will require enhanced import capacity at ports in Haldia, Paradip and Gujarat ports to supply gas to the LPG deficient states of northern and eastern India. Additionally, product pipeline infrastructure will have to be augmented to carry the product from ports to LPG terminals/depots.

Liquefied Natural Gas

Given the price sensitivity of demand for natural gas, along with the fact that the total cost of importing LNG, including procurement and end-to-end transportation, is unlikely to fall below $10 per mmbtu, taking domestic gas production at 125–138 mmscmd and making adjustments for subsidized gas supply, demand for LNG imports in the best case scenario would be 67-72 MMTPA (around 250 mmscmd) in 2025. . This demand is expected to be concentrated in selected industrial clusters in Maharashtra, Gujarat, Uttar Pradesh, Andhra Pradesh and Tamil Nadu. However, any increase in domestic gas production or price of imported LNG will reduce the demand for imported LNG, which may fall as low as 57-62 MMTPA.

Planned LNG import terminals in the next 10 years would increase import capacity to 73 MMTPA. Taking speculated projects into consideration, this number could reach 93.5 MMTPA. This leaves a high risk of underutilization for newer terminals. Consequently, all the proposed projects are unlikely to materialize while terminals connected with pipelines are more likely to come up.

Coal

In 2013–14, nearly 740 MMTPA of coal moved through the country predominantly through rail. Only 23 MMTPA moved through coastal shipping even though this mode costs one-sixth that of rail cost (INR 0.2 per tonne km vs. INR 1.2 to 1.4 per tonne km). More than 90 percent of the rail routes relevant to coal are running at over 100 percent utilization. With the expected ramp-up in coal production by Coal India Limited, India may need to move 1,000 to 1,200 MMTPA coal across the country by 2025, creating tremendous pressure on the already congested railways.

The study carried out a logistics cost comparison for all possible modal mix combinations for India's 400 thermal power plants. It estimated that using the right infrastructure and institutional support, India can coastally move 190 to 200 MMTPA of coal, and save around INR 17,000 Crores per annum, by 2025. This will help to save 1 lakh rail-rake days that can be used for other commodities. Since logistics contribute 30 to 35 percent of the cost of power generation, this initiative will also directly cut power costs by 50 paisa per unit for coastal power plants fed coal coastally.

Analysis reveals potential for transportation of thermal coal for 11 power plants with capacity of 12 GW on the NW-1 system. Estimated potential of 20 to 25 million tonnes of coal traffic by year 2025. Also, potential to carry 25-35 MMTPA from Talcher/Ib Valley to Paradip port on the NW-5.

Additionally another 70 MTPA of thermal coal for non-power uses can be transported through the coastal route if port based linkages of coal are provided.

Containers

Container traffic at Indian ports has grown at an average CAGR of 8 percent in the past decade. The non-major ports (private or state-owned) continued to fare better than the major government-owned ports, with a growth of over 24 percent in 2014–15. These non-major ports have registered higher growth rates in the past five years or so due to their adequate container-handling capacity, improved road and rail connectivity, better draft levels, and modern equipment and technology for faster cargo evacuation.

Sagarmala studies reveal that two optimization levers can lead to potential savings of ~INR 7,000-9,000 Crores per annum

- Reduced transit time can save inventory handling cost of ~INR 5,000 Crores to 6,000 Crores per annum
- Modal shift from road to rail can save ~INR 2,000 to 3,000 Crores per annum in terms of fuel import bill

National multi-modal transportation model

An important element of the OD study is the multi-modal cost optimisation model. The model optimises the cost of transportation for various commodities and suggests potential savings and capacity load on ports, rail routes, road routes and ICDs if the optimum plan is followed.

The objective of the model is to optimise the transportation of EXIM volumes of cargo comprising 85% of the total port volumes in the country. This mainly includes the containers, coal, fertilisers and steel sectors. POL traffic has been left out as it has very different supply chains consisting mainly of pipelines. Key inputs for the model are

- Details of origin points and quantities of containers and commodities
- Port location and capacities
- Transportation cost via rail and road.

The model first computes an unconstrained optimum route for origin-destination pair. In the next step, constraints in port and connectivity infrastructure hampering these movements are identified. Based on this projects to address these constraints are identified. A detailed user manual of the model is appended as Annexure-I.

Exhibit 2 is an example of the model output wherein major constrained rail routes are highlighted.

EXHIBIT 2

Exhibit 3 & 4 highlight congestion on key container routes

- Exhibit 3 shows the constraint in the route between northern hinterland (accounting for 3.7 mn TEUs of traffic) and ports in the west coast

- Exhibit 4 highlights the congestion in the Bangalore-Chennai route, another key corridor

EXHIBIT 3

EXHIBIT 4

Exhibit 5 gives an example of logistical constraint for coal movement. In this example, the model highlights congestion on Talcher-Paradip rail route.

EXHIBIT 5

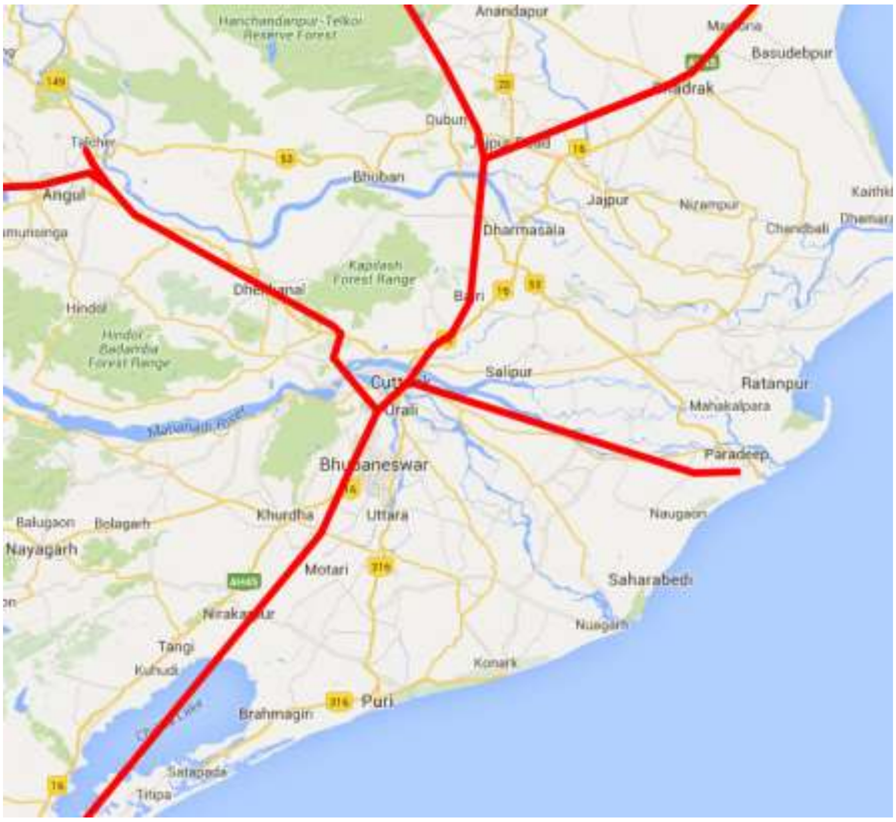
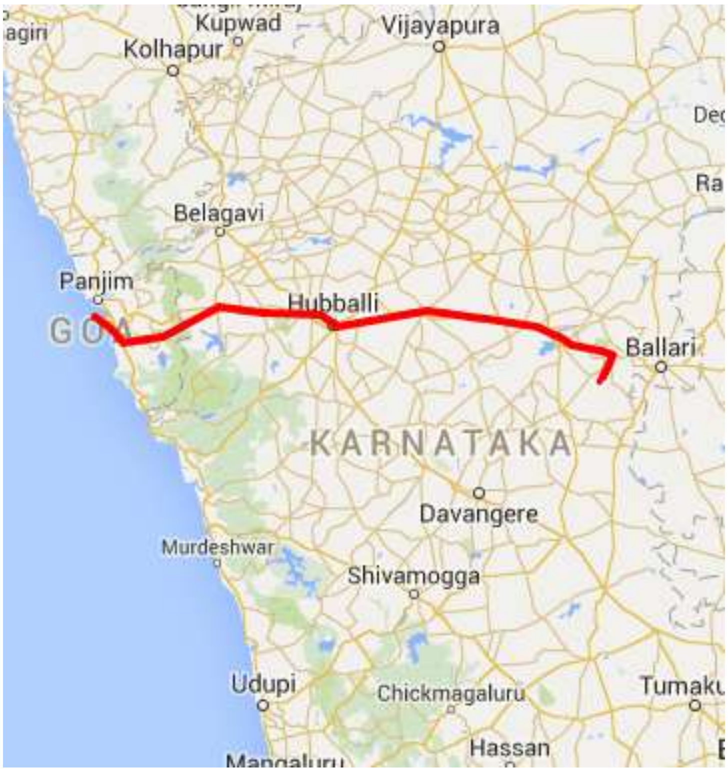


Exhibit 6 shows congestion in the evacuation of iron ore to Mormugao.

EXHIBIT 6



Shelf of projects

173 projects were identified for inclusion under Sagarmala. Broad details of these projects are presented in Exhibit 7. Exhibit 8 gives an overview of the financing plan for the projects. Annexure-II gives more details on projects identified.

EXHIBIT 7

Sagarmala: Port-led development

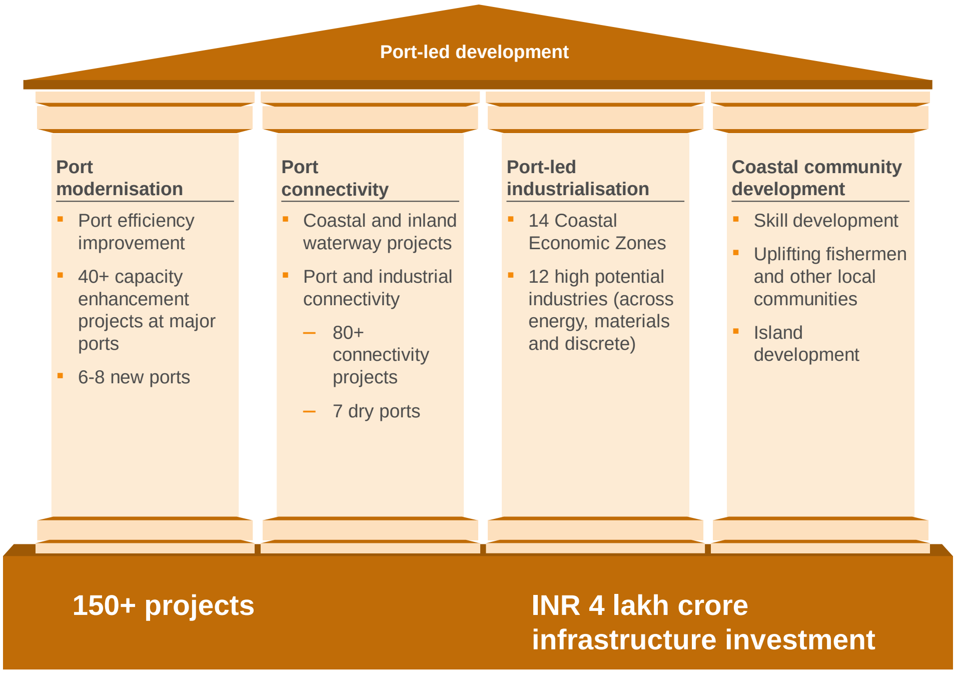


EXHIBIT 8

Theme	Project category	Project development agency	Funding required (INR Crore)
PM	New Major Ports	MoS	50,000
	Port Modernization - Major Ports	States	
	Non Major Port Projects	MoS	
PC	Expressways Projects	NHAI	200,000
	Port Road Connectivity Projects	IWAI	
	Internal Port Road Projects	MoS	
	Last Mile Road projects	States	
	Strategic Rail Projects	MoPNG	
	Port Rail Connectivity Projects	Railways	
	Multi Modal Hubs	NHAI	
	Inland Waterways Projects	Railways	
	Pipeline projects	CONCOR	
PLI	Bulk Cluster Projects	States, Ministries	100,000
	Discrete Cluster Projects	MoC, MoS, States	
	Tourism Projects	Ministry of Tourism, Ports	
CCD	Fishing Harbor Projects	MoS, States	5,000
	CCD Skill Initiatives	MoS	
	CCD Other Projects	Agriculture	
	Total		**355,000**

1 National multi-modal transportation grid

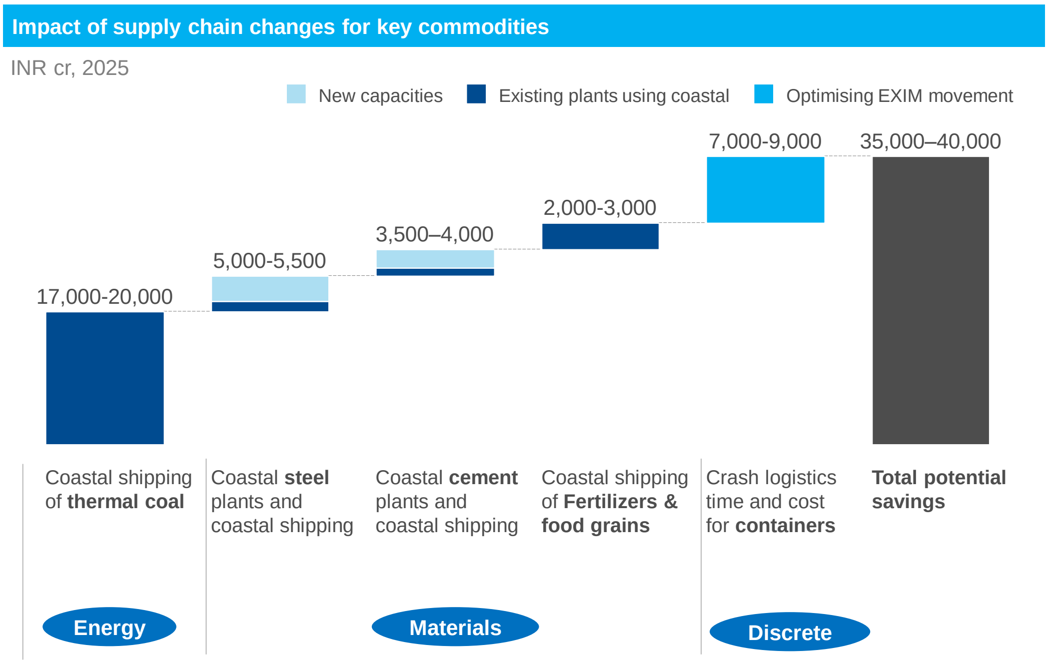
Logistics account for a major portion of India's industrial GDP, among the highest for any country. Inefficiency in logistics, thus, increases the cost of end products, requires higher amount of working capital and reduces competitiveness of exports. As part of the Sagarmala Programme, several opportunities have been identified to reduce logistics costs of bulk commodities and containers, totalling around INR 35,000 to 40,000 cr per annum (Exhibit 1.1). Main enablers for unlocking this opportunity include greater use of coastal shipping and inland waterways, addressing existing gaps and bottlenecks in road and rail connectivity, creation of multimodal logistics hubs and streamlining procedures. The following exhibit summarises these opportunities by commodity.

Savings opportunity has been estimated based on a comprehensive origin–destination study of logistics movement of key commodities. The main findings for each commodity are summarised in subsequent sections.

Exhibit 1.2 shows the proposed evacuation network with high potential projects marked.

EXHIBIT 1.1

Potential savings of INR 35–40 thousand cr across six levers

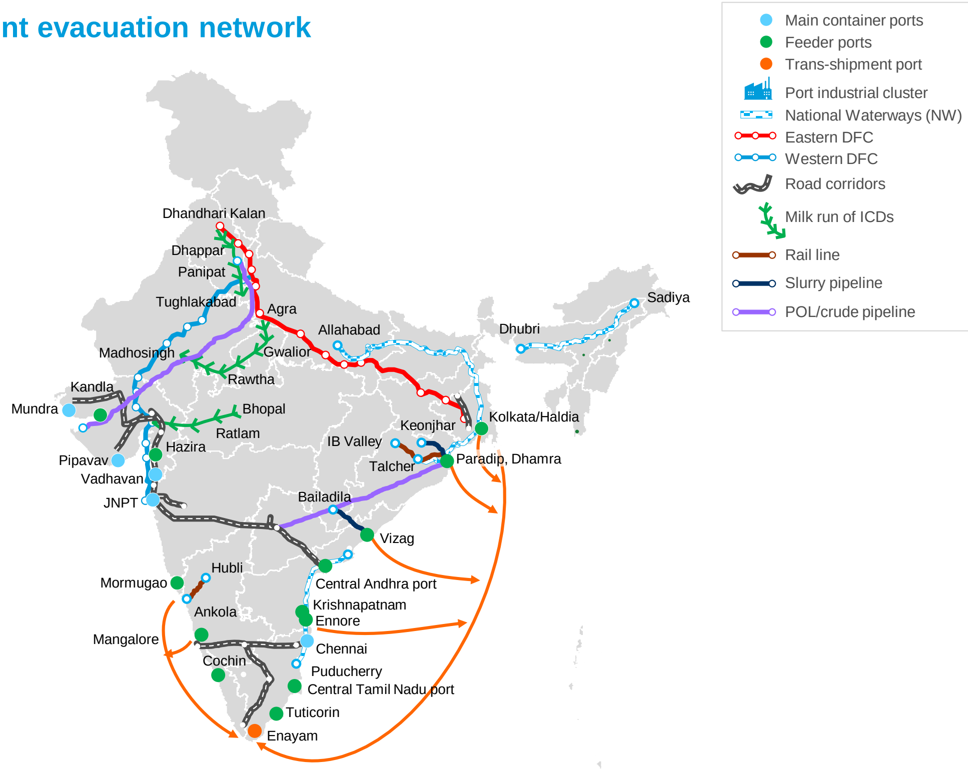


SOURCE: Industry discussions

EXHIBIT 1.2

Efficient evacuation network

FY 25



1.1 Petroleum, oil and lubricants

1.1.1 Petroleum and lubricants

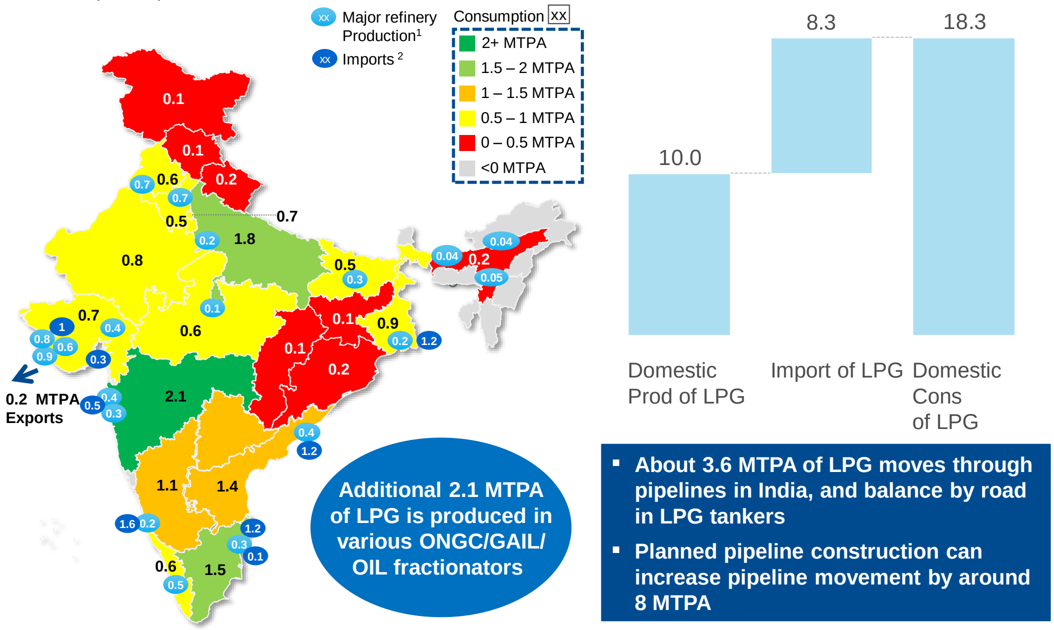
For liquefied petroleum gas (LPG), the current domestic consumption is around 18 MTPA, of which 10 MTPA is supplied by domestic production while the rest is imported.

Around 3.6 MTPA is transported through pipelines and the rest by road in tankers. The accompanying map depicts the consumption pattern for LPG in various states as well as the major locations of refinery production and import of LPG. Apart from these an additional 2.1 MTPA is produced in various fractionators belonging to Oil and Natural Gas Corporation Limited (ONGC) or Gas Authority of India Limited (GAIL) or Oil India Limited (OIL) (Exhibit 1.3).

EXHIBIT 1.3

Demand centres, production and distribution of LPG in 2014–2015

2014–15 (MTPA)



SOURCE: Indian Petroleum and Natural Gas Statistics 2013–14; IOCL “Indian LPG Market” report

The Indian economy currently consumes around 227 MTPA of crude oil, of which 189 MTPA is sourced through imports and 38 MTPA through domestic production (Exhibit 1.4). Imported crude is received at seven port clusters—the Gujarat cluster (Vadinar, Mundra, Sikka), Paradip, New Mangalore, Mumbai, Chennai, Kochi and Visakhapatnam. The Gujarat cluster handles around 65 per cent of the total crude imports. Mumbai, New Mangalore and Paradip account for 7 to 8 per cent each, while the rest handle 4 to 5 per cent each of the total import.

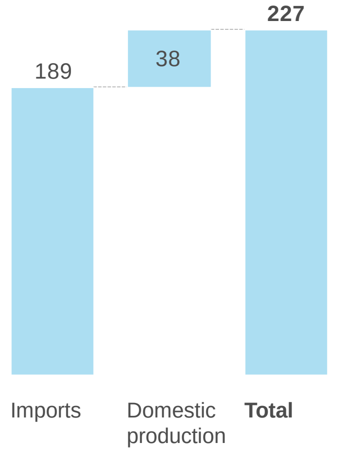
Imported crude is either processed at coastal refineries or moved to inland refineries by pipelines. An extensive inter-regional and intra-regional pipeline network transports the bulk of liquid products from refineries to terminals/depots. Around 80 per cent of evacuation from the refineries to the hinterland travels through the pipeline network, with the balance moving by road/rail. Private refineries sell products at the refinery gate and coastally ship products to demand centres along the coast.

EXHIBIT 1.4

Nearly 227 MTPA of crude is consumed in the country today, >80% of which is accounted by crude imports to 7 port clusters in the country

2013–14 Values (MTPA)

Total crude oil consumption



Crude imports by port

Port cluster (% of total crude imported)	Total crude imported at port MTPA	Consumed by refinery near port %	Moved inland by pipeline %
Gujarat cluster (65%)	121.6	66%	34%
Paradip (8%)	15.4	0%	100%
New Mangalore (7%)	13.5	100%	0%
Mumbai (7%)	13.4	100%	0%
Chennai (5%)	8.8	100%	0%
Cochin (4%)	7.8	100%	0%
Visakhapatnam (4%)	7.4	100%	0%

Coastal shipping of crude (13–16 MTPA) happens for

- Transport of domestic crude production (e.g., Bombay High crude sent to Mangalore, Cochin, Chennai and Visakhapatnam)
- Emergency transfer of crude from one port to another in case of disruption in regular supply of crude

SOURCE: Indian Petroleum and Natural Gas Statistics 2013–14; Basic Port Statistics of India 2013–14

Refineries will continue to rely on the pipeline network for domestic evacuation of products, since the cost of transporting comes to around INR 0.14 to 0.18 per tonne km compared to INR 1.2 to 1.5 per tonne km by rail.

The market scenario in the country is changing following the price de-regulation of diesel. Private refiners are expected to re-enter the domestic retail market. Since private sector refineries are based in Gujarat and these companies do not have a well-developed network of pipelines for moving products to other regions, it is expected that they will use coastal shipping for this purpose.

It is estimated that total scope for coastal shipping of MS/HSD would be around 15–20 MTPA by 2025[2]. In the case of Reliance SEZ being allowed to sell in the domestic market, the volume of coastal shipping could go up by another 20 MTPA.

1.1.2 Liquefied natural gas

Natural gas in India is either produced domestically (in gaseous form) or imported in liquefied form (liquefied natural gas or LNG). Gas imported in liquid form is gassified at the import terminals and then moved internally through pipelines. Currently 57 mn metric tonnes per annum (MTPA) (around 205 mn metric standard cubic metre per day [mmscmd]) of gas is consumed in the country annually.

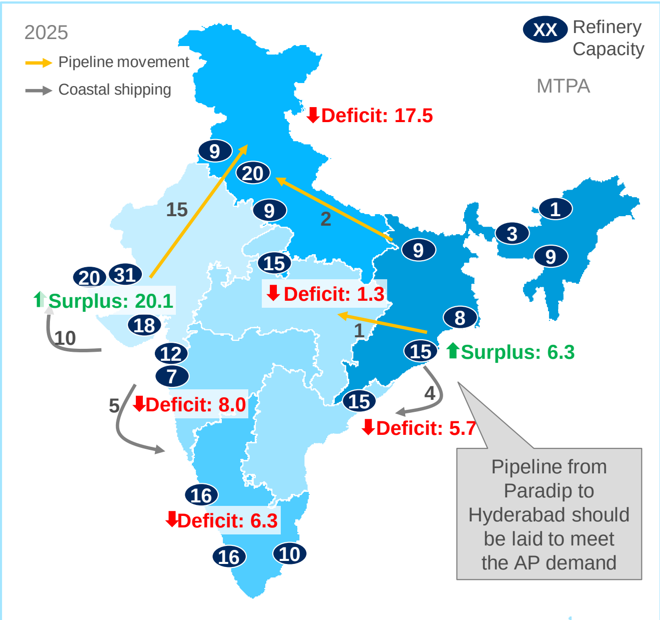
Assuming that domestic supply would range between 125–138 mmscmd (say, 130 mmscmd) in 2025, the supply shortfall would be around 220 mmscmd. Given that about 20 mmscmd of domestic gas is likely to be reinjected for internal use and another 10 mmscmd may be allocated to Segment 6 as per expected government allocation, therefore a total import

[2] Discussions with OMCs, PPAC

requirement of 25 mmscmd in 2025 at an import price of USD10 per mmbtu could be considered.

EXHIBIT 1.5

There is a potential for coastal shipping of ~20 MTPA of MS/HSD before greenfield refineries and pipelines materialize



Coastal shipping	Volume MTPA
Gujarat to Maharashtra	5
Orissa to AP	4
Jamnagar to Mundra	10
Total	~20

- **Maharashtra, AP and Odisha ports need to build infrastructure to handle increased volumes from coastal shipping**
- **Requirement of product import facilities at JNPT/ Mormugao and Ennore port before greenfield refineries come up**

1. Assumes RIL Jamnagar and Essar Oil export nothing while Reliance SEZ exports 100% product

SOURCE: Team analysis

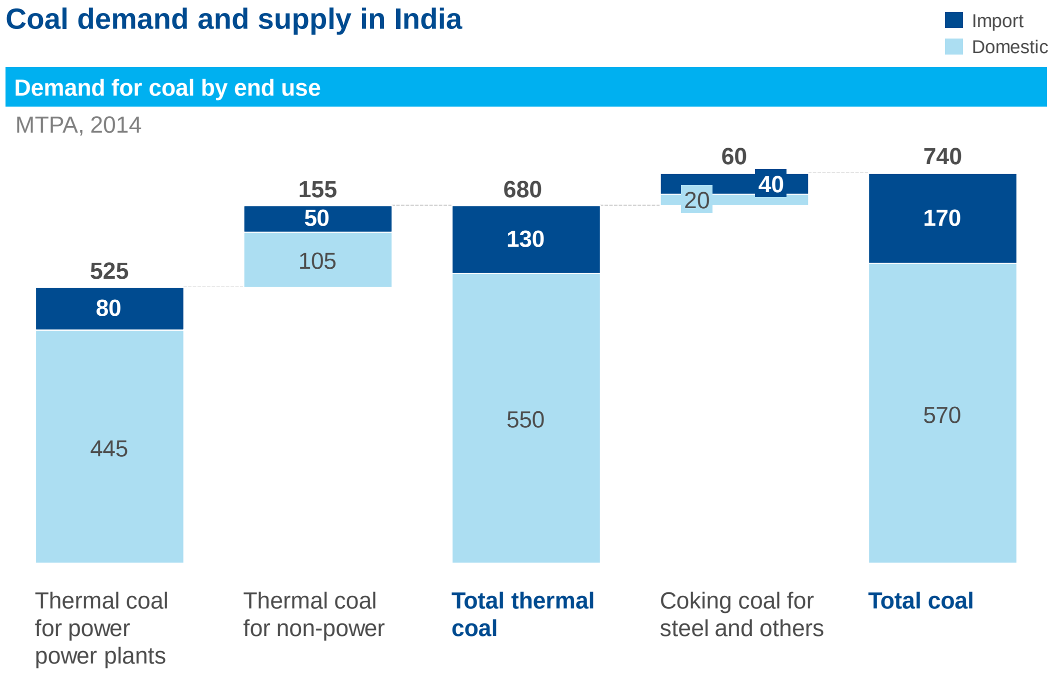
Exhibit 1.5 shows that out of a surplus of about 20 MTPA in the Gujarat cluster, 15 MTPA could be moved to the deficit areas in the North and 5 MTPA to Maharashtra through coastal shipping. Of the 6.3 MTPA surplus in the eastern region, 4 MTPA could be shipped to Hyderabad and the remaining moved to the North and central regions via pipeline. This would leave residual deficits of 6.3 MTPA in the South, 3 MTPA in the Maharashtra region and 2 MTPA in the Hyderabad region.

Of the 15 MTPA being moved north from the Gujarat cluster, 10 MTPA could be coastally shipped within Gujarat, from RIL Jamnagar to Mundra, and thereafter through pipeline to the North in the short run. There is also scope for coastal shipping of 4 MTPA from Odisha to Andhra Pradesh (AP), thus amounting to a nearly 15 MTPA of coastal shipping of petroleum products by 2025. To facilitate coastal shipping, supporting infrastructure shall be required at ports in Vizag, Paradip, Kandla, Jamnagar and JNPT/Mumbai.

1.2 Thermal coal

As of 2013–14, approximately 740 MTPA (Exhibit 1.6) of coal moved through the country, including domestic production and imports. The majority of coal produced and imported in India is thermal coal, while coking coal contributes a much smaller share of 60 MTPA. Power and steel plants use about 80 per cent of the total domestic and imported coal. While coal production is concentrated mostly in eastern and central India, it is transported primarily by rail to other parts of the country. Coastal shipping, at INR 0.20 per tonne-km after taking into account the cost of double handling[3], has a negligible share in the volume of coal movement even though cost per tonne by coastal shipping is 80 per cent lower than by rail, which is INR 1.2 to 1.5 per tonne-km for coal movement[4].

EXHIBIT 1.6



SOURCE: Sigma Insights; India coal market watch

While coal production is concentrated in the eastern and central zones of India, it is transported for power generation to nearly all parts of the country, e.g., 26 MTPA of coal travels from Odisha to Tamil Nadu. Similarly, 19 MTPA of coal also moves from Chhattisgarh to Maharashtra and 14 MTPA to Gujarat (Exhibit 1.7). Coal imported from Indonesia and South Africa arrives at various ports and then moves inland.

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3 Two additional handlings are caused during coastal shipping in most cases

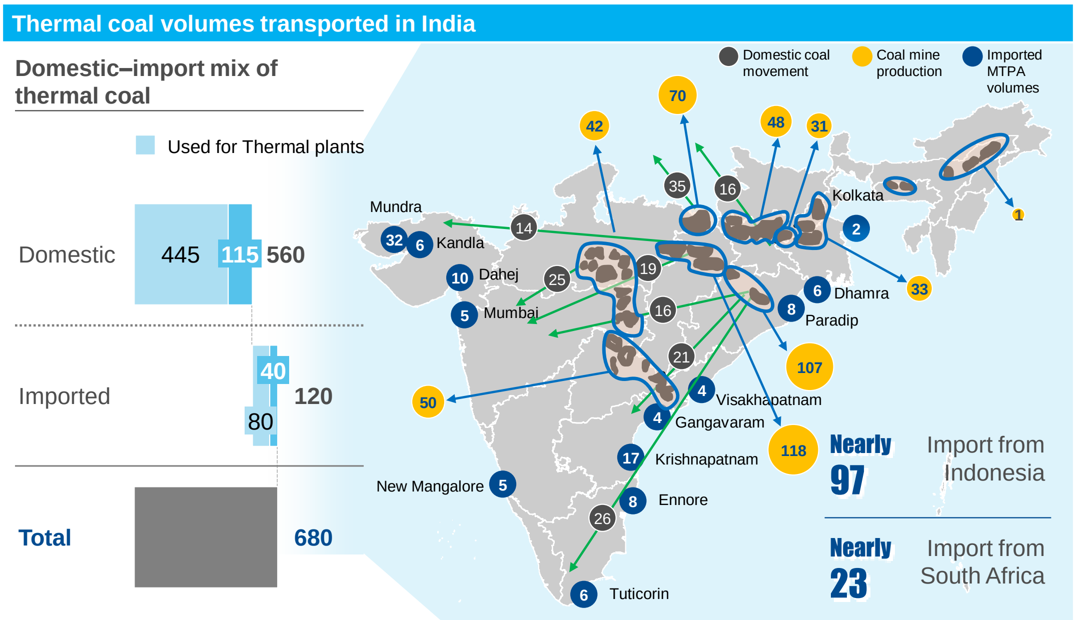
4 Source: Actual prices and clean sheet analysis

EXHIBIT 1.7

Current thermal coal origin-destination

MTPA; 2014

XX Imported MTPA volumes

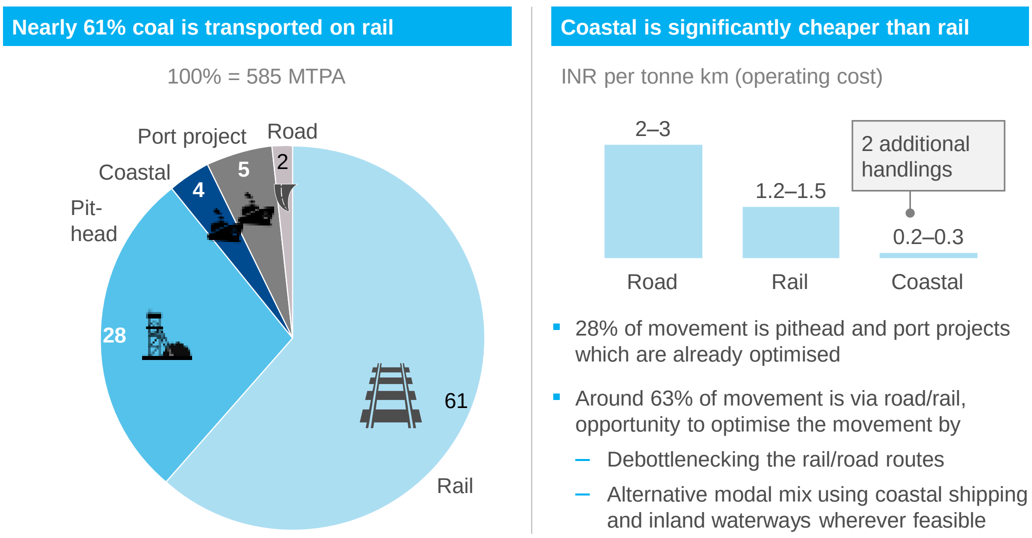


SOURCE: CIL; Sigma insights; Reuters

Rail network is not expanding at the pace necessary to keep up with the required coal capacity, having grown at only 0.7 per cent year-on-year historically. Coastal shipment only has a 4 per cent share (23 MTPA) in the total domestic coal movement (Exhibit 1.8).

EXHIBIT 1.8

Share of coastal shipping in freight mix



SOURCE: Sigma insights

An analysis of current and projected coal movement indicates significant potential to cut costs through a modal-mix shift towards coastal shipping (Exhibit 1.9).

EXHIBIT 1.9

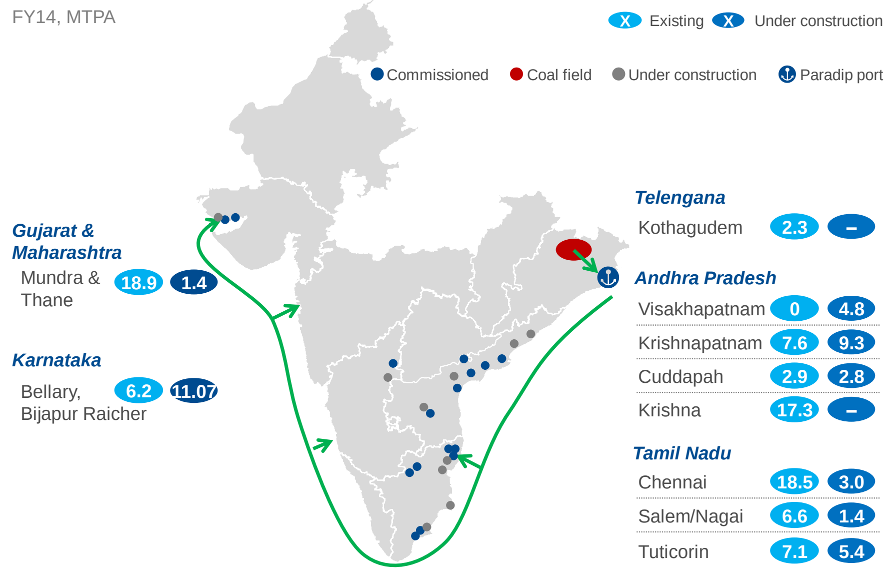
Key clusters for coastal movement of domestic thermal coal

2020 potential

Assumptions

1. Shipping cost[1] is INR 0.15–0.20 per tonne km
2. Railway freight cost is as per railway schedule
3. Road transport cost is INR 2.8 per tonne km
4. Handling charges of INR 150 per tonne km

Optimal logistics route for coal delivery



1 Excluding handling cost which is considered separately

SOURCE: Sigma insights; Coal optimisation model

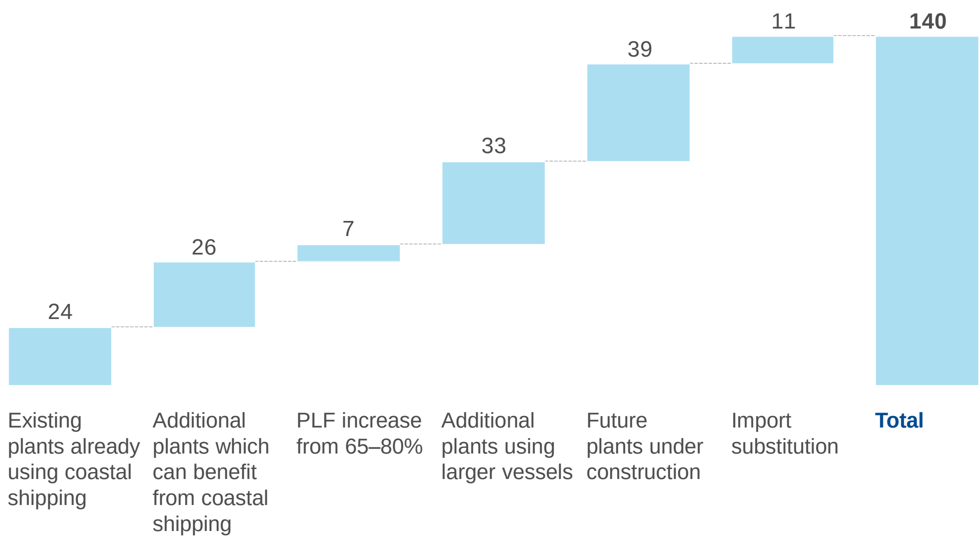
The cost of coastal shipping could be further reduced by deploying vessels of a larger capacity. Data suggests that with the right infrastructure and institutional support, movement of coal via coastal shipping could increase nearly six-fold from the current 23 MTPA to almost 140 MTPA by 2020 (Exhibit 1.10).

EXHIBIT 1.10

140 MTPA of coal could be moved via coastal shipping

MTPA; FY 2020

Coastal shipping potential break up



SOURCE: Sigma insights; Coal optimisation model

1.3 Steel and raw materials

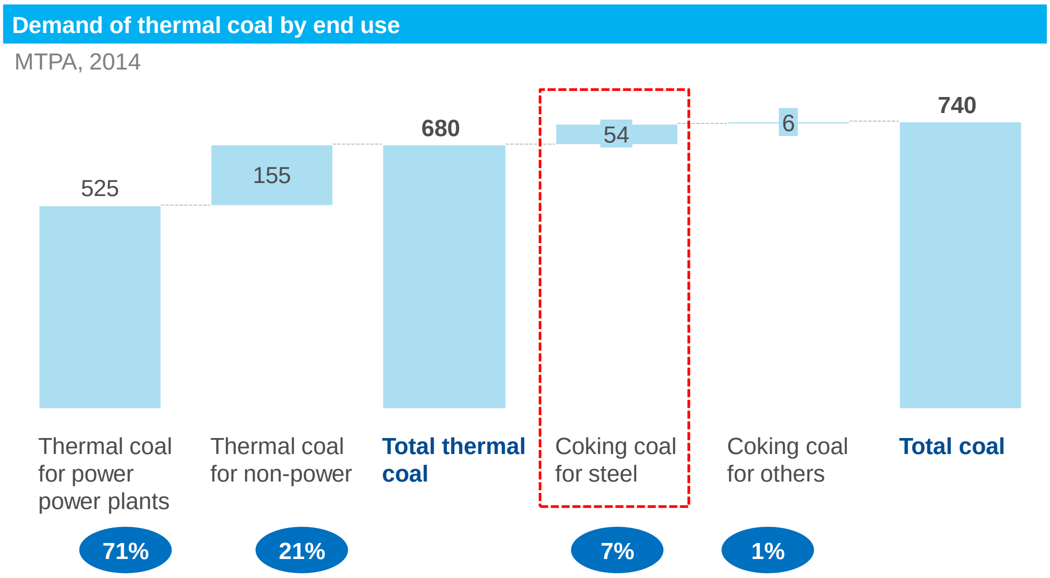
1.3.1 Coking coal

1.3.1.1 Current and future supply chain

Around 60 MTPA of coking coal is transported in the country of which around 54 MTPA is consumed for the production of steel (Exhibit 1.11). About 80 per cent of the coking coal consumed is imported due to insufficient coking coal reserves in India.

EXHIBIT 1.11

Coal consumption by steel and power sectors

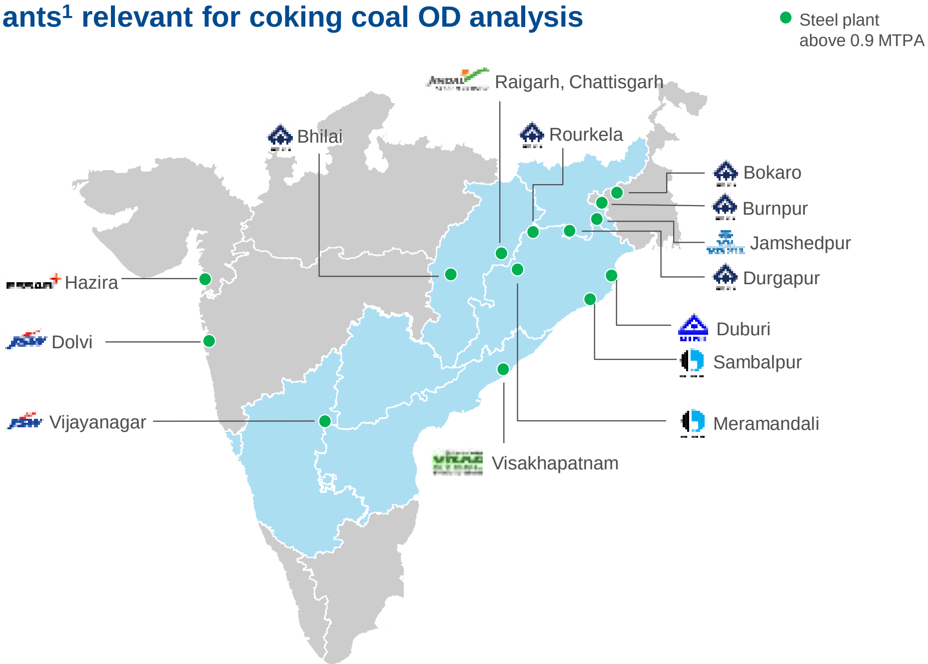


SOURCE: Sigma insights;

Each steel plant is aligned with one or more ports for sourcing imported coal with the entire evacuation done by rail. A total of 12 Indian ports handle around 37 MTPA of the imported coking coal used at 15 steel plants ((Exhibit 1.12 and 1.13).

EXHIBIT 1.12

Steel plants[1] relevant for coking coal OD analysis



1 Blast furnace based

SOURCE: World Steel Association; Steel Authority of India Limited; expert interviews

EXHIBIT 1.13

Origin-destination matrix for coking coal: Port to plant (Current)

Imported coking coal and plant origin destination, MTPA, 2014

Steel plants/ Import port	Dhamra	Dharamtar ISPAT	Ganga-varam	Haldia	Hazira	Karaikal	Krishna-patnam	Mangalore	Mor-mugao	Mumbai	Paradip	Vizag	Grand total
JSW, Vijayanagar						0.1	0.6		5.0				5.68
TISCO	4.1		0.1	1.2							0.9		6.20
SAIL, Bokaro				1.6									1.60
SAIL, Bhilai												4.0	4.00
RINL, Vizag			3.5										3.54
JSW, Dolvi		0.5						0.6	1.9	0.1			3.05
SAIL, IISCO				1.6								0.5	2.10
Essar – Hazira					0.8								0.81
SAIL, Rourkela			0.5								2.8		3.32
SAIL, Durgapur	1.6												1.60
Bhushan steel, Sambalpur	0.1										1.4		1.51
JSPL, Raipur			0.9								0.4		1.33
Bhushan steel, Meramandali			0.2									0.4	0.60
Neelachal Ispat Nigam, Odisha											0.6		0.60
JSW, Salem		0.2						0.6					0.83
Total	**5.83**	**0.66**	**5.20**	**4.35**	**0.81**	**0.11**	**0.57**	**1.24**	**6.90**	**0.08**	**6.09**	**4.92**	**36.76**

SOURCE: SteelMint; annual report and steel expert interview

Australia accounts for over 82 per cent (37 MTPA) of coking coal imports. Import volumes on the eastern seaboard are much higher than on the western seaboard. Rail, by far, is the largest contributor to the current coking coal inland movement since only around 10 per cent of India's steel capacity is coastal. Most steel plants are around 300 km inland from the coast, positioned to leverage iron ore reserves.

Current coking coal evacuation is facing challenges due to limited availability of rakes at unloading ports and rail line capacity at key railway routes. Around 21 MTPA of new steel capacity at key steel plants (1 MTPA and above blast furnace based) is under construction and would further need 18 to 20 MTPA of coking coal evacuation on the same routes, which are currently running at above 100 per cent utilisation.

Thus, evacuation capability at the relevant unloading ports and railway routes may need to be improved for optimal evacuation of coking coal.

1.3.2 Iron ore

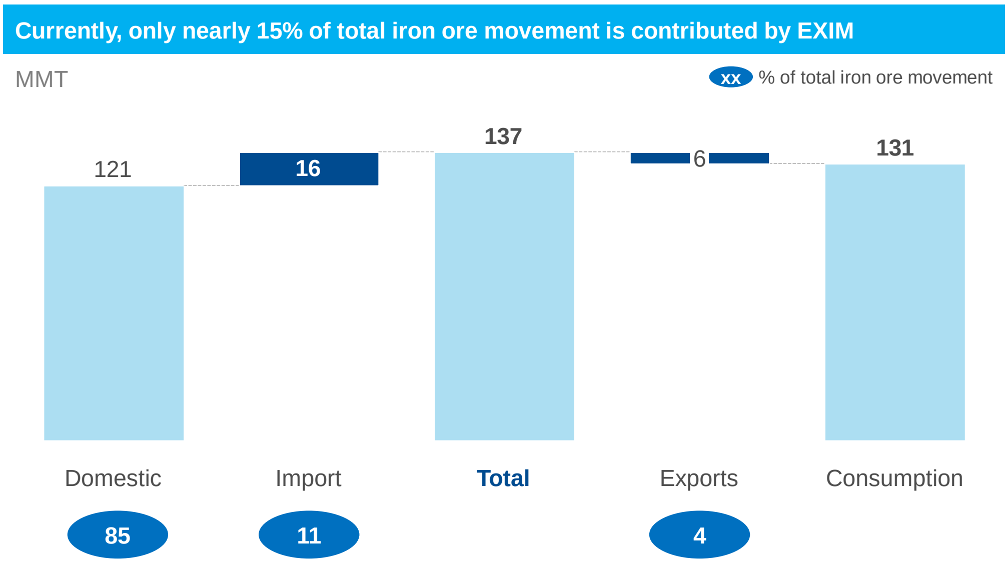
1.3.2.1 Current and future supply chain

Over the last five to six years, India has turned from a net exporting country to a net importing country for iron ore. In 2008–09, before the iron ore mining ban, India produced around 220 MTPA and exported 102 MTPA (around 32 per cent) of iron ore.

Today, India consumes around 131 MTPA of iron ore (as of FY 2014–15). Of this, 121 MTPA is produced domestically, 15.6 MTPA is imported, 5.4 MTPA is still exported. Total EXIM traffic at around 21 MTPA, contributes only about 15 per cent of the total iron ore movement in India (Exhibit 1.14).

EXHIBIT 1.14

Iron ore movement in India, FY 14–15



SOURCE: SteelMint

Visakhapatnam and Paradip are currently the most extensively used ports for exports. Around 3.1 MTPA of iron ore passes through Visakhapatnam. Across all ports, the maximum total export of around 0.84 MTPA goes to China while South Korea is a close second with 0.79 MTPA.

Around 80 per cent of all iron ore exports pass nine Indian ports [5], where they arrive from eight mining districts across Jharkhand, Odisha, Chhattisgarh, Goa and Karnataka (Exhibit 1.15). The mined commodity is mostly evacuated to the nearest port by rail, except from Goa, where evacuation happens through barges plying on inland waterways.

The highest volume of imports comes in through the Krishnapatnam port, which handled around 8.5 MTPA of iron ore in 2014–15, mainly from South Africa, followed by Brazil, Australia and Oman (Exhibit 1.16).

Three steel plants—Tata Steel Jamshedpur, JSW Vijaynagar and JSW Dolvi— accounted for around 80 per cent of all imports (Exhibit 1.17).

EXHIBIT 1.15

Iron ore export: Port to destination country

MTPA, 2014–15

Exported to	Dhamra	Ganga-varam	Haldia	Kandla	Manga-lore	Mormu-gao	Panaji	Paradip	Redi	Visakha-patnam	Grand total
China	-	0.00	0.05	0.02	0.06	0.03	0.20	0.09	0.38	0.02	0.84
South Korea	-	-	-	-	-	-	-	-	-	0.79	0.79
Iran	-	-	-	-	0.06	-	-	-	-	0.46	0.52
Japan	-	-	-	-	-	-	-	-	-	0.29	0.29
Gulf	-	-	-	-	-	-	-	-	-	0.05	0.05
Others[1]	0.10	0.02	0.23	-	-	0.19	0.19	0.85	-	1.20	2.77
Grand total	0.10	0.02	0.27	0.02	0.11	0.21	0.39	0.99	0.38	3.10	Nearly 5.47

1 Includes the US as well as African and European countries in very small quantities

SOURCE: SteelMint

[5] Visakhapatnam, Paradip, Panaji, Redi, Mormugao, Mangalore, Dhamra, Haldia, in that order of decreasing volumes

EXHIBIT 1.16

Iron ore import: Source country to port

MTPA, 2014–15

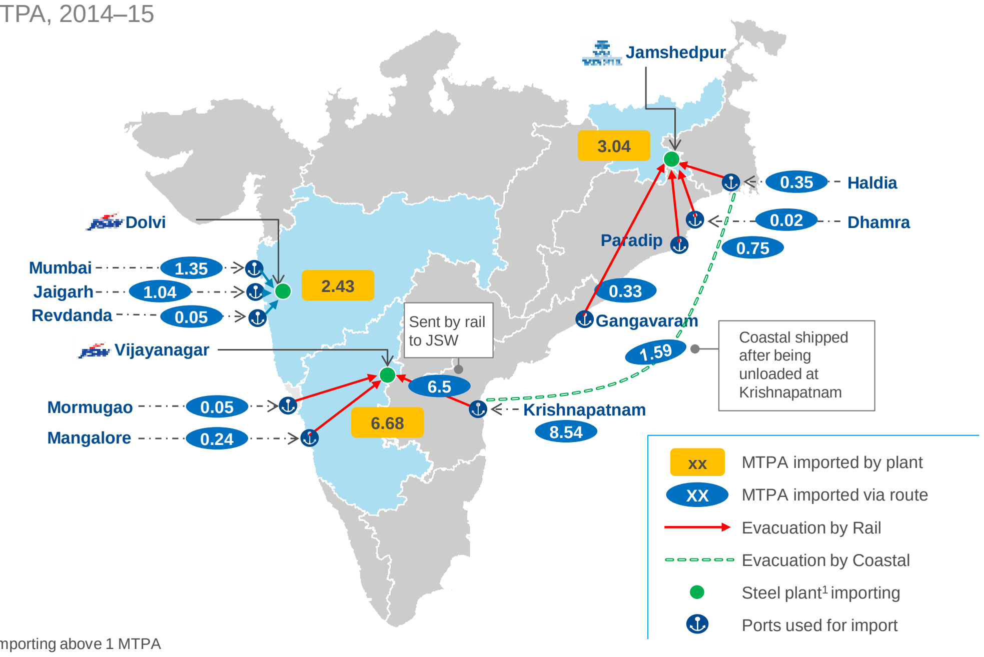
Imported from	Dhamra	Gangavaram	Haldia	Hazira	Jaigarh	Kandla	Karaikal	Krishnapatnam	Mangalore	Mormugao	Mumbai	Mundra	Paradip	Revdanda	Tuticorine	Visakhapatnam	Grand total
South Africa	-	0.08	0.11	0.34	0.65	0.80	-	3.05	0.08	0.05	-	0.22	0.35	-	0.05	0.05	5.84
Brazil	-	-	-	0.29	0.24	-	-	3.36	-	-	-	-	-	-	-	-	3.89
Australia	0.02	0.36	0.25	-	-	-	0.07	0.83	-	-	0.06	-	0.36	-	-	0.02	1.96
Oman	-	-	-	-	-	-	-	-	-	-	1.29	-	-	0.10	-	-	1.39
Canada	-	-	-	-	-	-	-	0.70	-	-	-	-	-	-	-	-	0.70
Malaysia	-	-	0.02	-	-	-	-	0.30	-	-	-	-	-	-	-	-	0.33
Marutania	-	-	-	-	-	-	-	0.30	-	-	-	-	-	-	-	-	0.30
Venezuela	-	-	-	-	0.14	-	-	-	-	-	-	-	-	-	-	-	0.14
Finland	-	-	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	0.05
Ukraine	-	-	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	0.05
Mozambique	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	0.05
Others	-	-	0.07	-	-	0.08	-	-	0.16	-	-	0.11	0.42	-	-	-	0.84
Grand total	0.02	0.44	0.45	0.68	1.04	0.98	0.07	8.54	0.24	0.05	1.35	0.33	1.13	0.10	0.05	0.07	15.54

SOURCE: SteelMint

EXHIBIT 1.17

Steel plants relevant for iron ore imports currently

MTPA, 2014–15



1 Importing above 1 MTPA

SOURCE: SteelMint

Given that the volumes have dropped significantly in the past few years and the trend is expected to continue, the current infrastructure will be more than enough on the key routes if expansions for all the other commodities are done in order. Key infrastructure projects concerning ports of NMPT and Mormugao that need to be undertaken have been discussed in detail in Chapter 2.

1.3.3 Steel

1.3.3.1 Current and future supply chain

Approximately 50 per cent of the total production, i.e., around 30 MTPA of domestic steel moves via rail while around 15 to 20 MTPA moves by road. In fact, most of the material for large steel plants moves by rail while small and medium units prefer road transport for their material (Exhibit 1.18).

EXHIBIT 1.18

	Rail		Road	
	Raw materials	Finished steel	Raw materials	Finished steel
Mega/large projects	90 %	70 %	10 %	30 %
Small & medium units	30 %	30 %	70 %	70 %

Source: Expert interviews

Production clusters of steel are centred on iron ore mines in eastern India and the North Karnataka–South Goa region, but consumption clusters are spread across the country depending on urbanisation and industrialisation. Uttar Pradesh, Maharashtra and Tamil Nadu account for the highest receivers of steel, mostly produced by plants in the eastern hinterland and North Karnataka.

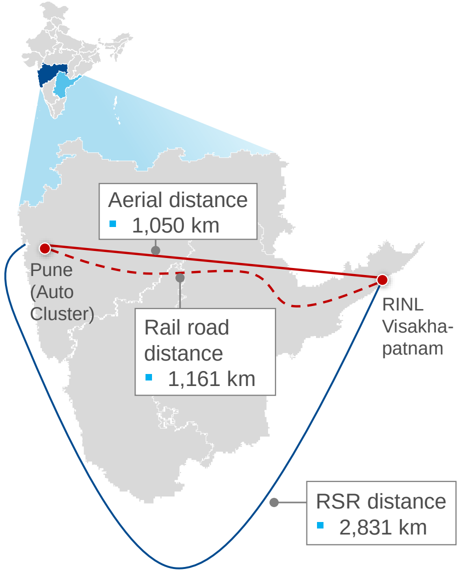
Approximately 50 per cent of the total production—around 30 MTPA of domestic steel—moves via rail, while around 15 to 20 MTPA moves by road. Most of the material for large steel plants moves by rail, while small and medium units prefer road transport for their material. Analysis of research data and expert opinions indicate that a modal-mix shift towards coastal shipping could significantly reduce costs.

An analysis of key inter-state rail movements across the country was conducted to examine the origination–destination movement of steel. At the same time, a cost comparison was also done of all possible combinations of the modal mix under different scenarios of vessel capacity (Exhibit 1.19).

EXHIBIT 1.19

ILLUSTRATIVE

Methodology snapshot: For each OD; 5 to 8 modal combination routes were identified and analysed for arriving at "optimal" route and mode



Optimised route | Currently used

6 modal combinations studied

RINL Visakhapatnam to Pune (Auto cluster)

Rank	Mode combinations	Distance km	Cost INR/tonne
1	Road–Port–Port–Rail	2,831	1,415
2	Rail–Port–Port–Rail	2,831	1,605
3	Road–Port–Port–Road	2,831	1,695
4	Rail	1,311	1,928
5	Road	1,161	2,090

Each route also has inbuilt costs of handling to arrive at fully landed cost

SOURCE: DGCIS data 2013–14

For instance, the movement between RINL Vizag (coastal Andhra Pradesh) and the auto cluster in Pune (Maharashtra) costs INR 1,930 per tonne via rail, while the same movement via road and rail-supported coastal shipping could be as low as INR 1,415 per tonne, which would be a cost saving of nearly 25 to 30 per cent

1.3.3.2 Possible outcomes and recommendations

Eventually, 13 major steel plants have the potential to shift to coastal shipping. The cost advantage is marginal in some cases, but overall railway congestion still makes the case for a shift to coastal shipping for these plants (Exhibit 1.20).

EXHIBIT 1.20

Almost every major plant has the potential to shift nearly 30–40% of their inter-state rail movements to coastal shipping

Plant	Location	Volume Potential to shift to coastal MTPA
Tata Steel	Jamshedpur	0.8–1.0
JSW Steel	Torangallu	0.5–0.6
RINL Steel	Visakhapatnam	1.0–1.3
JSW	Dolvi	0.3–0.4
SAIL	Durgapur	0.2–0.3
SAIL	Rourkela	0.9–1.2
SAIL	Bokaro	0.5–0.6
BPSL	Sambalpur	0.4–0.5
BSL	Meramandali	0.7–0.9
JSPL	Angul	0.6–0.8
SAIL ISSCO	Burnpur	0.3–0.4
Tata Steel	Kalinganagar	0.3–0.4
NINL	Duburi	0.3–0.4

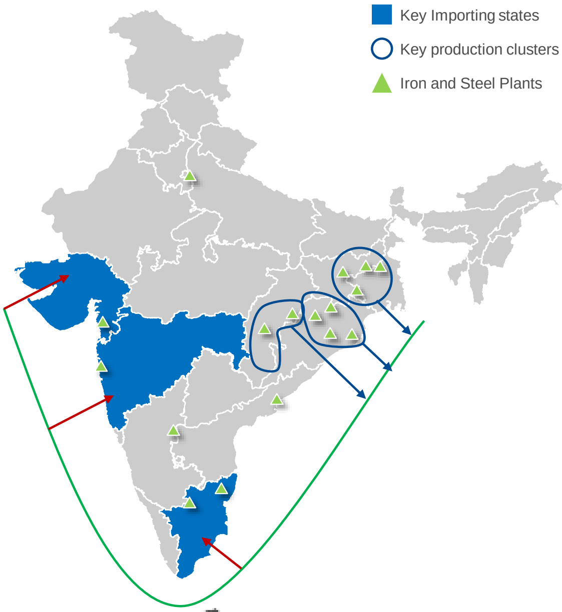
SOURCE: DGCIS data 2013–14

While each plant may have a unique set of factors to consider before shifting completely to coastal shipping, some of these plants can also be combined based on location for a cluster-based view on the potential for steel movement.

With the right infrastructure and institutional support, 7 to 8 MTPA of steel could be moved via coastal shipping, offering a savings potential of nearly INR 900 cr to 1,000 cr per annum. Furthermore, based on a business-as-usual (BAU) growth rate of around 6 per cent, the potential may rise up to 13 to 14 MTPA in the future, saving around INR 1,300 cr to 1,400 cr per annum by 2025 (Exhibit 1.21 and 1.22).

EXHIBIT 1.21

13–14 MTPA steel coastal shipping opportunity by 2025



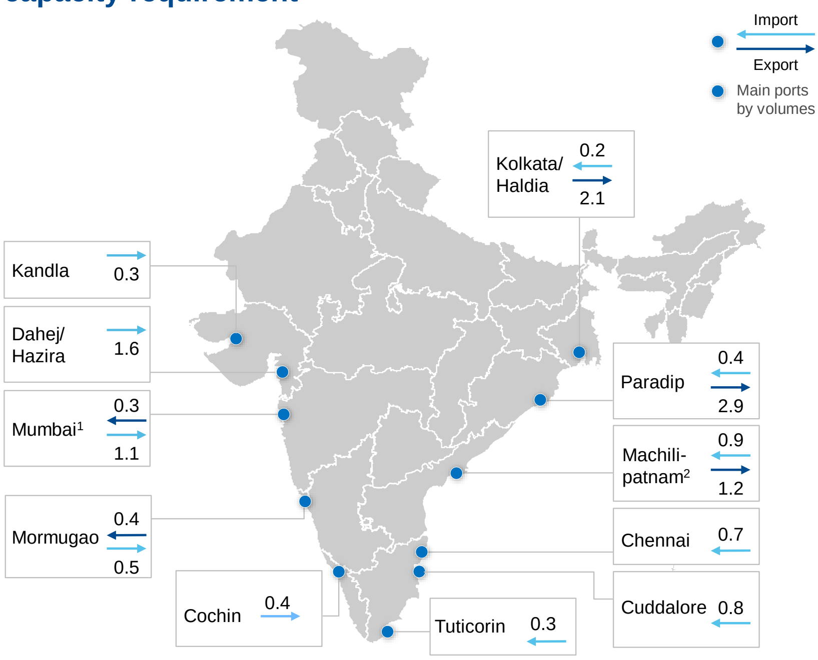
Route	Volume '000 TPA
Odisha to Andhra Pradesh	1,500
Odisha to Tamil Nadu	1,300
Jharkhand to Maharashtra	1,100
Odisha to Maharashtra	800
Odisha to Rajasthan	800
Karnataka to Gujarat	600
Jharkhand to Tamil Nadu	520
Odisha to Gujarat	450
Total	13,500

INR 1,300–1,400 cr saving

SOURCE: DGCIS data 2013

EXHIBIT 1.22

Port-wise capacity requirement



1 Includes 0.2 MTPA imports at Dahanu
2 Includes 0.8 MTPA exports at Visakhapatnam
SOURCE: Multimodal optimisation model

1.4 Cement

The Indian cement industry is the second largest in the world and is expected to grow in line with GDP growth in the future. Cement is a high-volume, low-value product, which becomes unprofitable when transported over long distances using road or rail transport. Low-cost sea transport routes could therefore be very important for cement.

Cement demand in India is projected to grow to 700 to 800 mn tonnes by 2025 under base case scenario of GDP growing at 7 to 8 per cent per annum. One tonne of cement requires 2 tonnes of raw materials. The volume of material to be transported for the cement industry will reach 1.6 bn tonnes by 2025. Logistics contribute about 25 per cent of the cost of cement. Logistics efficiency will be critical for making existing capacity more competitive.

1.4.1 Current and future supply chains

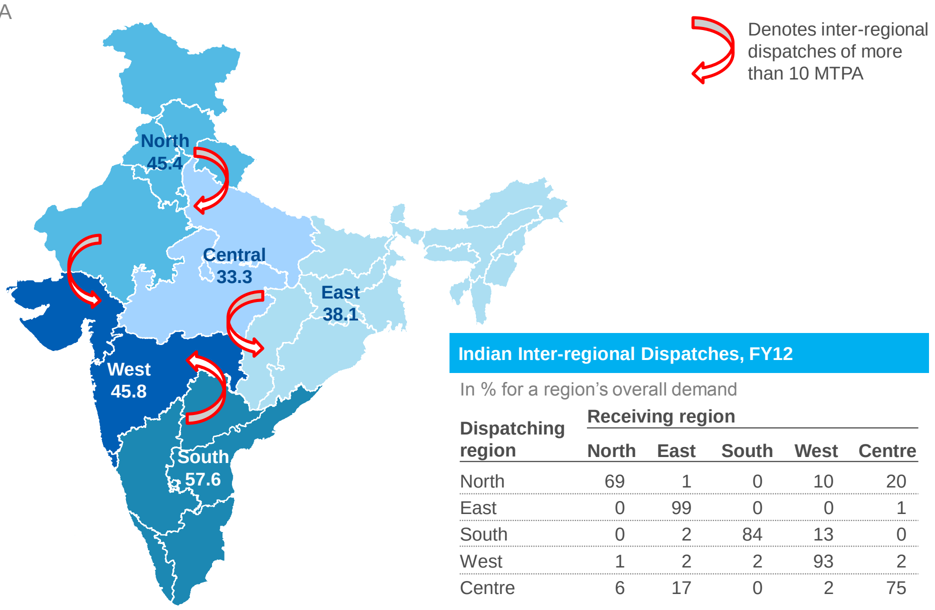
Inter-regional cement dispatches in India occur mostly through road or rail transport. Major dispatch routes are from southern to western India and from central to eastern India (Exhibit 1.23).

EXHIBIT 1.23

There is a moderate amount of inter-regional cement dispatches in India

Indian regional demand FY12

MTPA



Indian Inter-regional Dispatches, FY12

In % for a region's overall demand

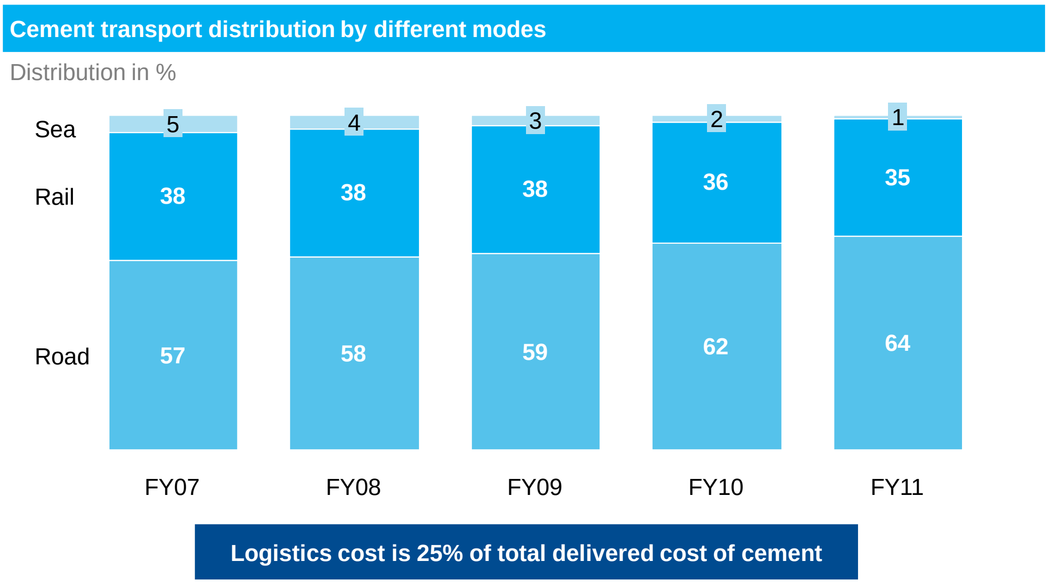
Dispatching region	Receiving region: North	East	South	West	Centre
North	69	1	0	10	20
East	0	99	0	0	1
South	0	2	84	13	0
West	1	2	2	93	2
Centre	6	17	0	2	75

SOURCE: Analyst reports (IDBI and TATA Securities); press releases; company websites

Logistics costs are around INR 1,500 per tonne of cement in the retail price (around INR 6,000). The sea route forms only a minuscule part of the modal mix for cement transport (Exhibit 1.24). This is primarily due to inefficiencies in coastal shipping, unavailability of port infrastructure and greater expansion in hinterland plants as compared to coastal plants. Rail is the preferred mode of movement for the long-distance transit of cement in the country, whereas shorter intra-state movements are primarily through road. Coastal movement is currently dominated by large players that have dedicated jetties or coastal berths at ports.

EXHIBIT 1.24

Modes used for cement transportation



SOURCE: Multiple analyst reports; press releases; company websites

An analysis of the key inter-state rail movements was conducted across the country to examine the origination–destination movement of cement. At the same time, a cost comparison was also done of all possible combinations of the modal mix under different scenarios of vessel capacity.

With the right infrastructure and institutional support, it could be possible to move around 9 to 10 MTPA of cement via coastal shipping by 2025, saving nearly INR 900 to 1,000 cr (Exhibit 1.25 and Exhibit 1.26).

It was estimated that another 5 to 6 MTPA of cement could be shipped via coastal route from the Kutch region (Sewagram) in Gujarat if dredging was done for the 5 km channel approaching the Sanghi Jetty. Plants owned by ABG, Sanghi Cements and Ultratech could use the coastal route for transportation to Maharashtra and Tamil Nadu from this region.

EXHIBIT 1.25

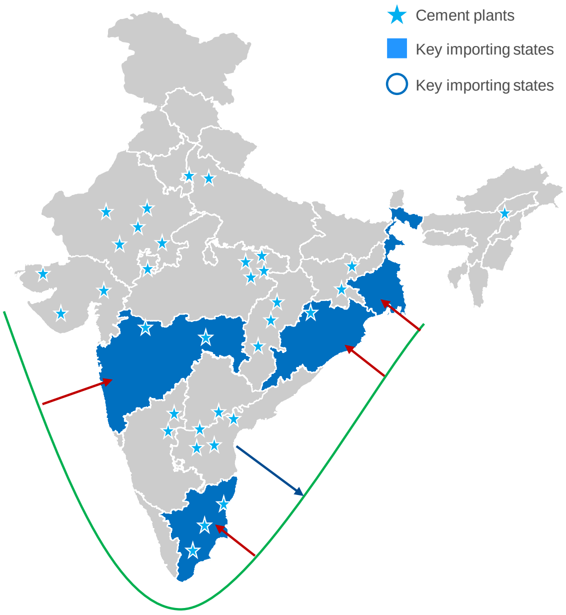
Plant-wise potential to shift to coastal

Plant	Location	Volume potential to shift to coastal MTPA
Maha Cement	Mellachevuru	1.2–1.4
India Cements/Raasi	Wadapally	1.0–1.2
Ultratech	Tadipatri	0.9–1.1
Zuari Cements	Jaggayyapeta	0.7–0.9
Zuari Cements	Kadapa	0.7–0.9
Ultratech-Vikram	Jawad Road/Neemuch	0.3–0.4
Birla/Vasvdatta	Sedam	0.1–0.2
J.K. Cement	Mudhol	0.1–0.2
Ultratech	Malkhed	0.1–0.2

SOURCE: DGCIS data 2013–14

EXHIBIT 1.26

9–10 MTPA cement coastal opportunity by 2025



Route	Volume '000 TPA
Andhra Pradesh to Tamil Nadu	2,420
Andhra Pradesh to West Bengal	1,780
Andhra Pradesh to Odisha	1,700
Andhra Pradesh to Kerala	1,400
MP to West Bengal	600
Karnataka to Kerala	450
Andhra Pradesh to Bihar	350
Andhra Pradesh to Coastal Maharashtra	340
Andhra Pradesh to Jharkhand	200
Karnataka to Tamil Nadu	150
Total	9,900

INR 900–1,000 cr saving potential

SOURCE: DGCIS data 2013–14

1.5 Containers

Out of the 10.7 MTEUs of total container volume, 0.6 MTEUs is coastally shipped traffic, 7.4 MTEUs is gateway traffic and 2.7 MTEUs is transshipped. Colombo, Singapore and Klang account for approximately 75 per cent of transshipped cargo from India.

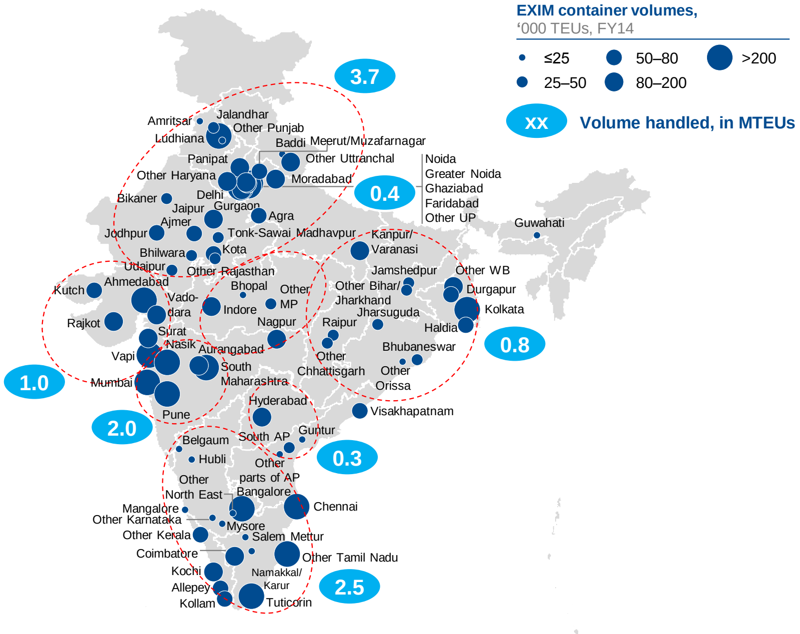
Three major hinterlands in India, i.e., the northwest, west and southern clusters, account for roughly 90 per cent of container volumes. The northwest cluster is farthest from the coastline and is the largest cluster, generating 3.7 MTEUs of container volumes in FY 2014. It, therefore, has the greatest impact on the overall logistics cost of container movement. It lies at a weighted average distance of 1,087 km from the Gujarat/JNPT port cluster. The container-handling hinterlands in the country are mapped in the Exhibit 1.27 along with the individual volumes handled.

The Gujarat–Maharashtra port cluster comprising the Mundra, Kandla, Pipavav and JNPT ports handles 70 per cent of India's EXIM traffic, while Chennai handles another 14 per cent. Other ports on the east coast, Haldia, Vizag and Tuticorin, account for the remaining traffic (Exhibit 1.28). Around 78 per cent of the traffic from east coast ports is transshipped in the absence of sufficient traffic to attract a gateway movement.

EXHIBIT 1.27

EXIM container volumes split for different hinterlands in India

mn TEUs, FY14

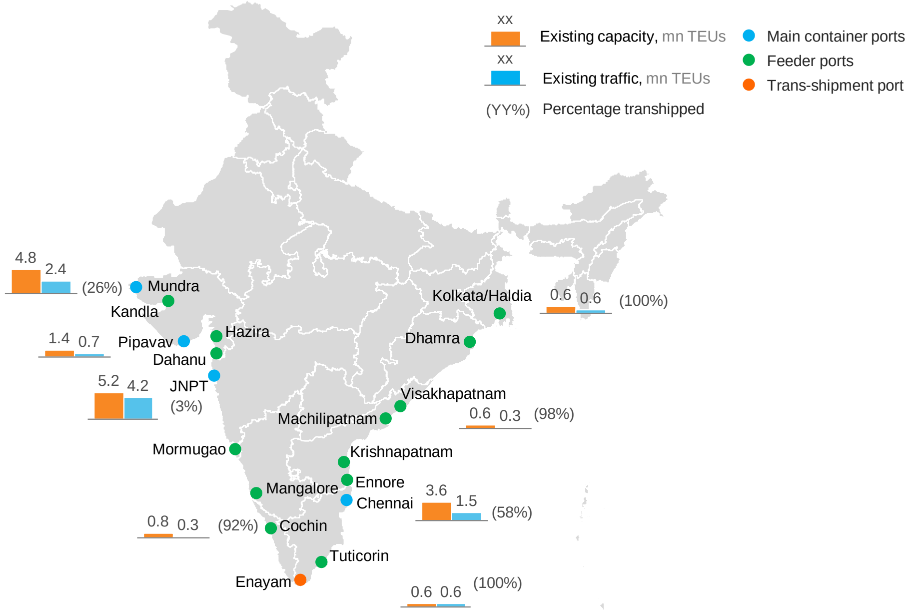


SOURCE: APMT; IPA statistics; stakeholder interviews

EXHIBIT 1.28

Port-wise EXIM container movement in India

mn TEUs, FY14



SOURCE: APMT; expert interviews

Exhibit 1.29 details the current split of container traffic at ports originating from the different hinterland clusters for FY 2014. Mundra and Pipavav are the only ports whose primary hinterland lies outside the port state. Also, a significant portion of the total traffic from the hinterlands of NCR and Punjab is handled at JNPT even though they are closer to the Gujarat port cluster.

EXHIBIT 1.29

Hinterland to port mapping of EXIM container movement

Primary hinterland of port

EXIM container volumes, '000 TEUs, FY14	JNPT	Mundra	Chennai	Pipavav	Tuticorin	Haldia	Vallarpadam	Visakhapatnam	Mangalore	Hinterland total
NCR+Punjab	936	1,264	0	329	0	0	0	0	0	2,540
Maharashtra	2,121	54	0	0	0	0	0	0	0	2,177
Tamil Nadu	0	0	1,240	0	484	0	0	0	0	1,724
Gujarat	552	262	0	169	0	0	0	0	0	984
Uttar Pradesh	228	274	0	107	0	0	0	0	0	613
West Bengal	0	0	0	0	0	458	0	0	0	458
Rajasthan	43	448	0	60	0	0	0	0	0	560
Karnataka	94	0	163	0	66	0	0	0	50	406
Kerala	0	0	0	0	0	0	351	0	0	351
Andhra Pradesh	75	0	65	0	0	0	0	110	0	250
Madhya Pradesh	43	70	0	14	0	0	0	29	0	156
Bihar/Jharkhand	0	0	0	0	0	85	0	8	0	93
Uttarakhand	95	0	0	0	0	0	0	0	0	95
Odisha	0	0	0	0	0	12	0	69	0	81
Chhattisgarh	15	18	0	14	0	0	0	15	0	64
Northeast	0	0	0	0	0	7	0	0	0	7
Port total	4,202	2,390	1,468	693	551	562	351	263	50	10,711

SOURCE: APMT; expert interviews

With respect to the modal mix for container movement from the hinterland to ports, road has an 82 per cent share overall while rail accounts for just 18 per cent. The rail coefficient for five out of the eight major container-handling ports is less than 10 per cent[6].

1.5.1 Price rationalisation for containers on railways

The analysis of current and optimal revenue for railways shows that current rail can maximise its revenue at charges of INR 14 to 15 per TEU per km for an average distance of 1,100 km as opposed to the prevailing charges of around INR 21 per TEU per km (reduction of roughly 33 per cent). The same analysis for DFC shows that revenue would be maximised at around INR 15 per TEU per km (Exhibit 1.30). The higher price in DFC as compared to current rail is because DFC is dedicated to cargo handling with the ability to carry four times the cargo (DFC will be double the length with double-stacked containers as compared to current rail).

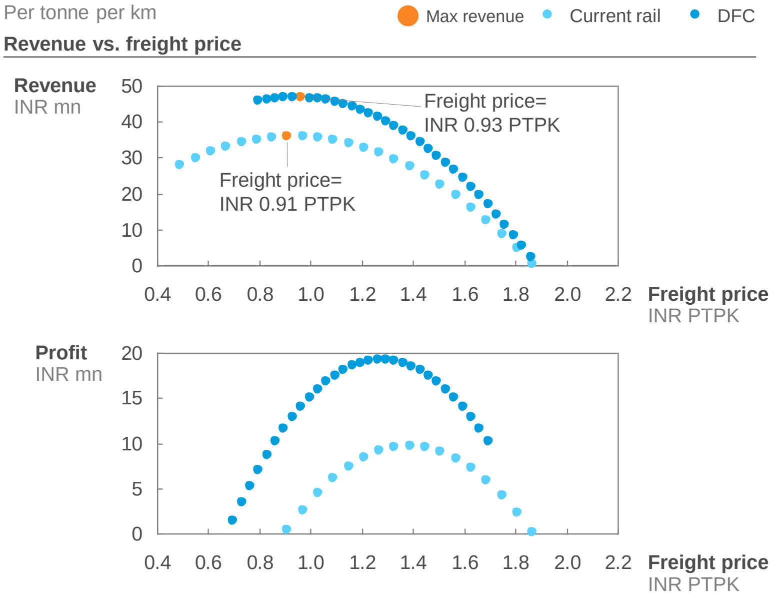
EXHIBIT 1.30

Enabler for increased rail share: Rationalisation of rail freight charges

Assumptions

- Cost for current rail = INR 0.9 per tonner per km
- Cost for DFC = 25% of current rail cost, INR 0.7 per tonne per km
- Price = INR 21 per TEU per km
- 1 TEU = 15.8 tonnes
- Current share of rail for of long haul traffic (> 1,100 km) = 38%
- Current long haul traffic = 3.7 mn TEUs

Revenue maximisation price for railways



SOURCE: CONCOR; transporter interviews

Even a 25 per cent reduction in freight charges for DFC (from INR 21 per TEU per km to INR 16 per TEU per km) can still yield an IRR of 16 per cent assuming DFC investment of INR 48,000 cr and amortisation period of 30 years. This reduction in price can reduce the cut-off distance where rail becomes more economical than road for current rail current rail from 1,000 or 1,300 km to 400 or 500 km (Exhibit 1.31).

The shift from road to rail will be driven primarily by the northern hinterland, including NCR, Punjab, Haryana, Rajasthan and western UP, which would contribute around 30 per cent of container volumes by FY 2025. With 25 per cent reduction in freight charges allowing DFC to handle 80 per cent of the above volumes, rail share could go up from 18 to 25 per cent (Exhibit 1.32). Assuming a growth rate of around 8 per cent in container volumes until FY 2025, the higher rail share could lead to potential savings of INR 2,000 to 3,000 cr.

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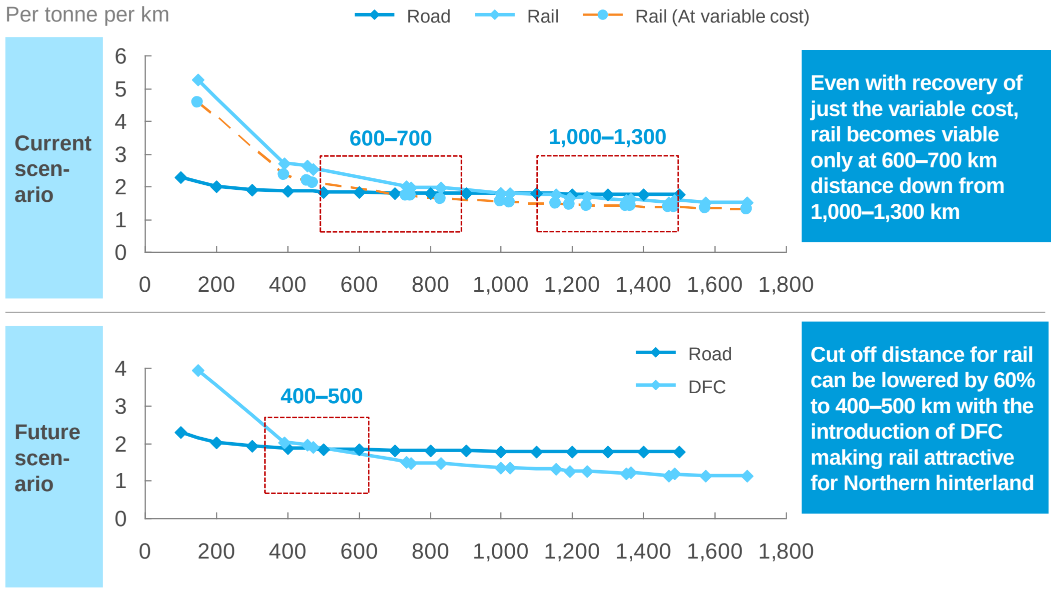
[6] Khambadkones

EXHIBIT 1.31

Enabler for increased rail share: Rationalisation of rail freight charges

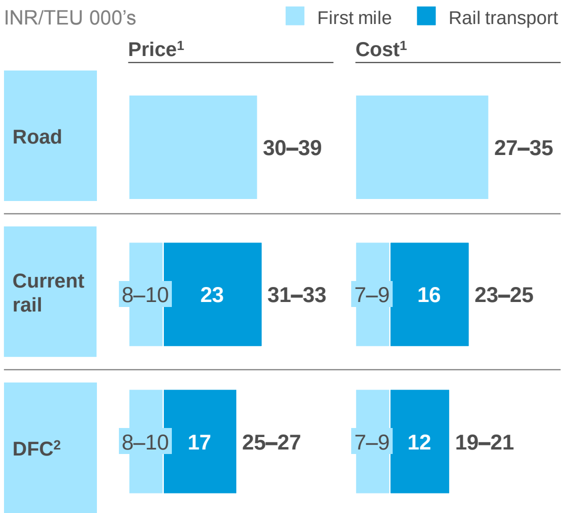
Break even number of km for cost of carrying containers by rail and road in India



SOURCE: CONCOR; transporter interviews

EXHIBIT 1.32

Comparison of carrying a container from a factory to port at a distance of 1,100 km by road and rail



Potential savings with increased rail share	
Potential volumes of North hinterland, FY25	7.7 mn TEUs
Cost of transporting with Rail@38% share	INR 20–24k cr
Cost of transporting with Rail@80% share	INR 17–18k cr
Price of transporting with Rail@38% share	INR 24–28k cr
Price of transporting with Rail@80% share	INR 21–23k cr

1 Does not include ICD/CFS and port handling charges
2 To achieve IRR of 16%, prices can be reduced to 25% assuming cost of building western DFC is INR 48,000 cr at current cost of construction, 25% lesser operating cost due to double stacking, no cross subsidisation and capex amortisation over 30 years

SOURCE: Interviews with DFCCIL; transporters

2 Port Modernisation

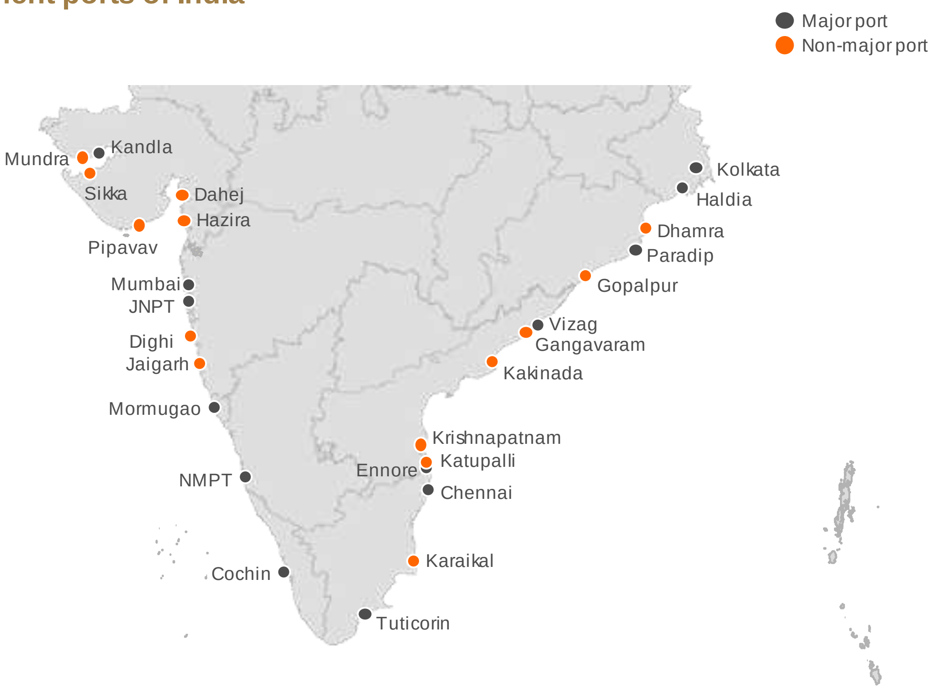
2.1 Challenges in port capacity planning

Overall supply and demand scenario today and port-wise cargo

India has a coastline of around 7,500 km with 12 major ports (Exhibit 2.1) and around 200 notified non-major ports along the coastline and sea-islands. The ports are important economic and service provision units since they are intermodal, acting as the interchange point for two transport modes, maritime and land.

EXHIBIT 2.1

Prominent ports of India

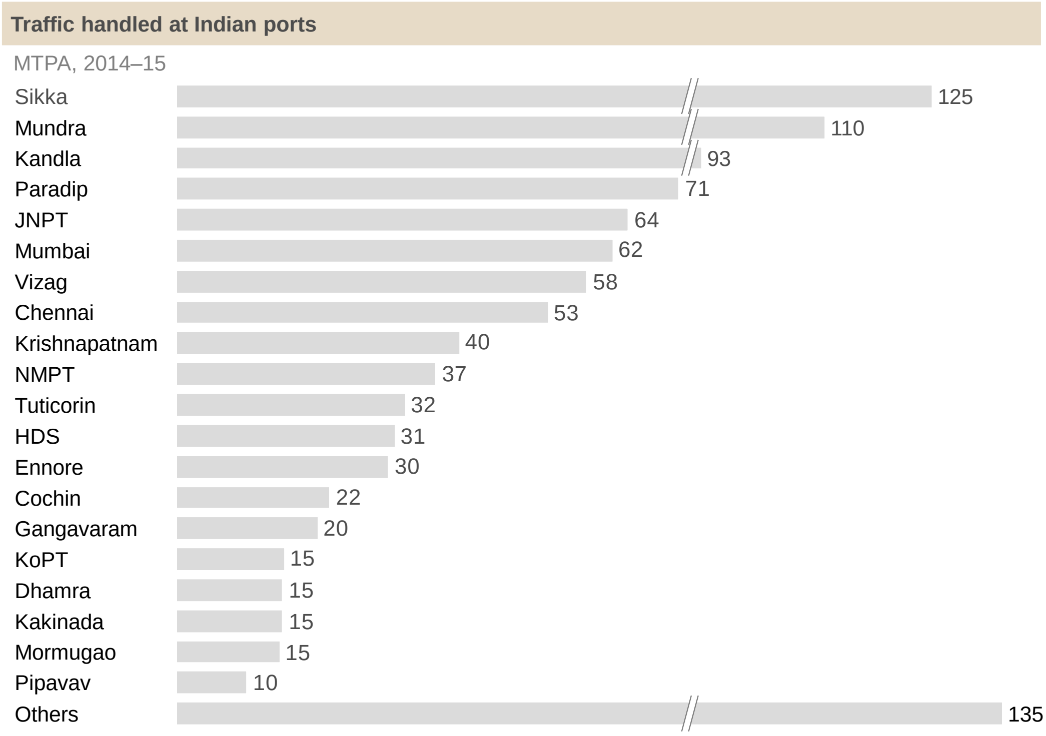


The total traffic handled at Indian ports rose from 934 MTPA in 2012–13 to 1050 MTPA in 2014–15 (Exhibit 2.2). Major ports handled 55 per cent of the total cargo at Indian ports. The capacity of major ports stands at 871 MTPA, while they handled cargo of 581 MTPA. The capacity of non-major ports stands at 660 MTPA while they handled 471 MTPA of cargo[7]. The capacity utilisation of major ports has been decreasing and stands at 70 per cent; in non-major ports it is at more than 80 per cent. Nineteen ports account for around 80 per cent of the cargo handled.

[7] IPA

EXHIBIT 2.2

Traffic handled at Indian ports



Indian ports came short on many performance parameters against international ports

Benchmarking Indian ports against Chinese and US ports shows that India lags behind significantly in port infrastructure (Exhibit 2.3). Seven of the top 10 ports in the world today (by throughput) are Chinese, while no Indian ports figure in the top 30. Most Indian ports don't have the draft to handle cape sized vessels. The average size of a container vessel calling at Indian ports is around 5,000 TEUs while for China it is around 12,000. At JNPT—India's biggest container port—draft by volume is 14 m while a cape size vessel requires upwards of 18 m (Exhibit 2.4) . Around 25 per cent of India's container cargo is transshipped through international transshipment ports due to the lack of infrastructure to handle larger vessels at Indian ports. Average turnaround time (Exhibit 2.5) at Indian ports is much higher—4.5 days as compared to just one day in China.

EXHIBIT 2.3

Comparison of port-related KPIs – India, China and US

	India	China	US
Port capacity stock *(% of GDP)*	1	3	10
Number of shipyards[2]	7	70	45
Number of ports in global top 20	0	9	2
Container traffic *(mn TEU)*	11	185	44
Average annual growth in container traffic[1] *(mn TEU)*	0.5	10	0.4
Contribution of waterways in domestic transportation[3]	<1%	24%	6%
Average turn-around time *(Days)*	4.5	1	1.2

1 Over 2008–2012
2 That can make more than 120 mts long ships
3 Includes both Coastal Shipping and Inland Waterways

SOURCE: Expert discussion; World Bank; Lloyd's list; OECD; Port technology; Clarksons

The low productivity and high vessel turnaround time at Indian ports are due to:

- Low level of mechanisation and insufficient draft
- Skewed handling capacity for different types of cargo
- Infrastructure constraints in hinterland connectivity

Lagging behind other countries on performance parameters pushes up the cost of trade and renders Indian ports less competitive. Non-major ports have fared well—ensuring quicker turnaround by investing in the infrastructure to handle larger vessels. Considering the strategic location of India's major ports and their importance to trade, there is an opportunity to improve their performance to meet global benchmarks. Most of the major ports have high turnaround times even while the utilisation level is low and only a few have the ability to handle bigger cape-size vessels. The shipping industry is moving towards cape-size vessels, so it is important that India develops cape handling capability at its key ports to ensure economies of scale for the trade.

EXHIBIT 2.4

Vessel-handling capability at Indian ports

Few ports have cape-size handling capacity

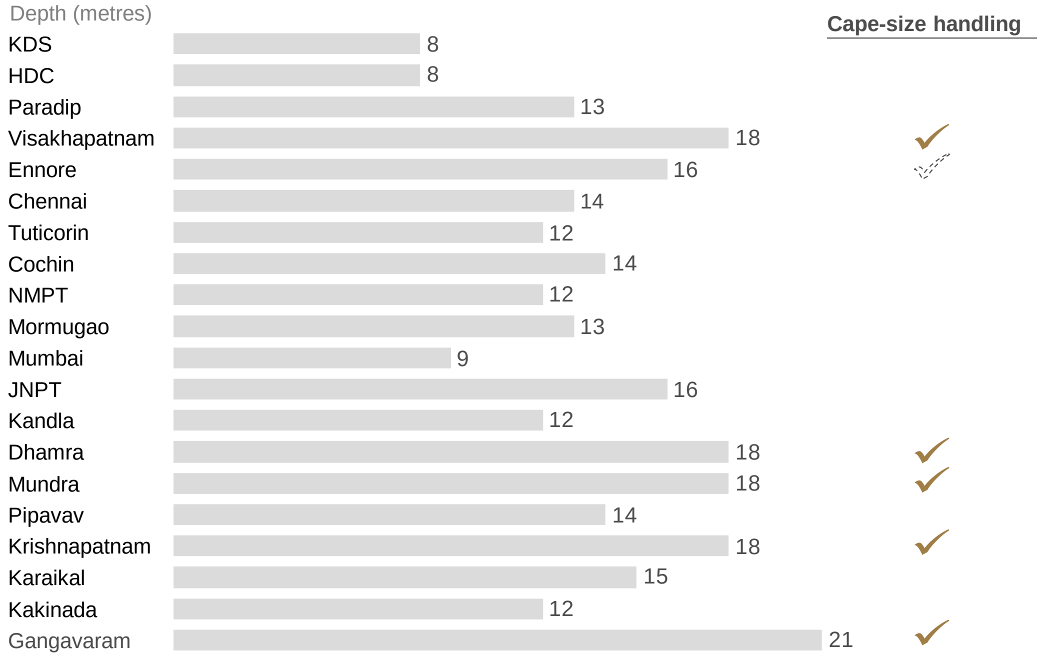
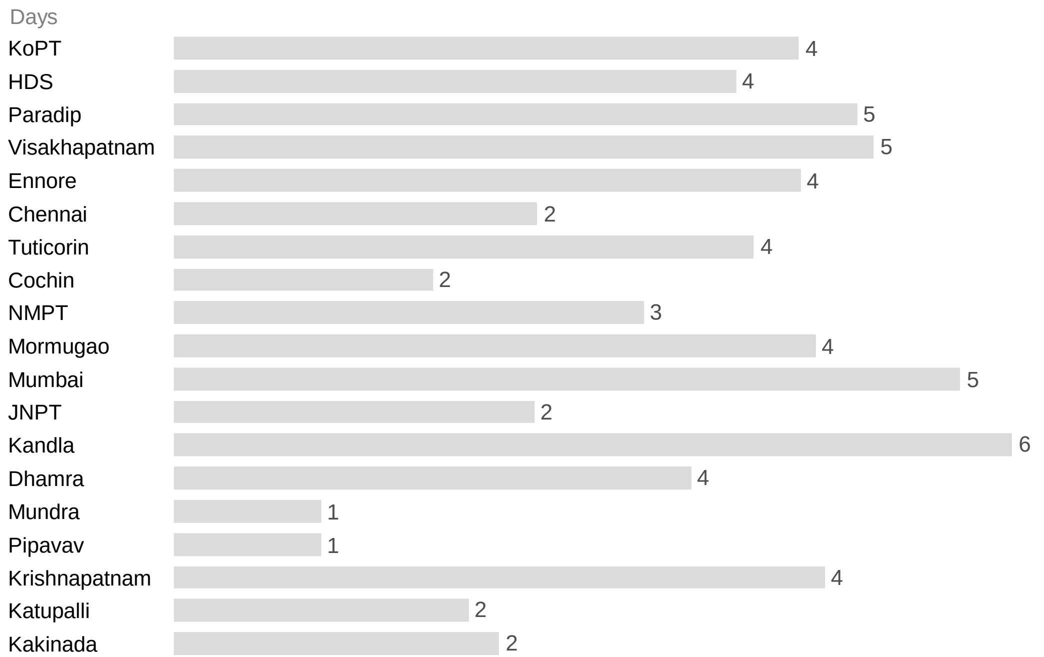


EXHIBIT 2.5

Port-wise average turnaround time

Most of the ports' turnaround time is much higher than international benchmarks



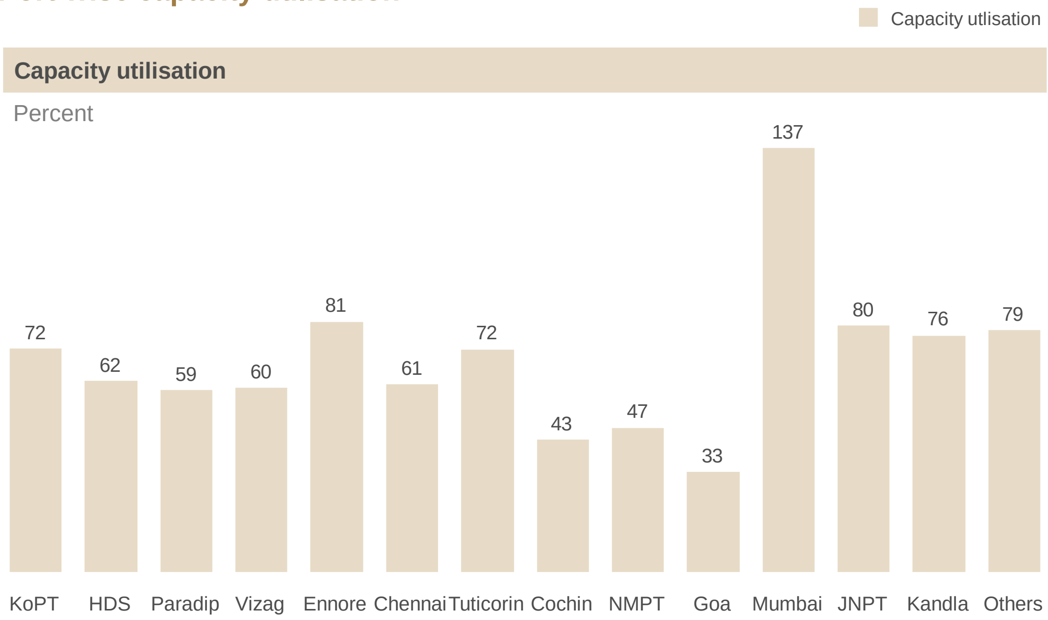
Coordinated approach to capacity addition needed

The Indian port sector has a dual structure, with the central government controlling major ports and respective maritime states controlling the non-major ports. The lack of a coordinated strategy for capacity building along the coastline has led to a geographical skew of capacity and skewed commodity-handling capacity inside the ports – some regions have significant overcapacity while others have low capacity (Exhibit 2.6). Northern Tamil Nadu and southern Andhra Pradesh (AP) have built up significant extra container-handling capacity – Chennai and Ennore are the major ports while Krishnapatnam and Kattupalli are the non-major ports catering to the same hinterland. On the other hand, Maharashtra lacks container-handling capacity – JNPT is running full, resulting in traffic spilling over to Mundra and Pipavav.

Limited commodity-wise capacity creates high variance in berth occupancy rates within ports. At Tuticorin port, berth occupancy of terminals ranges from 9–120 per cent (Exhibit 2.7).

EXHIBIT 2.6

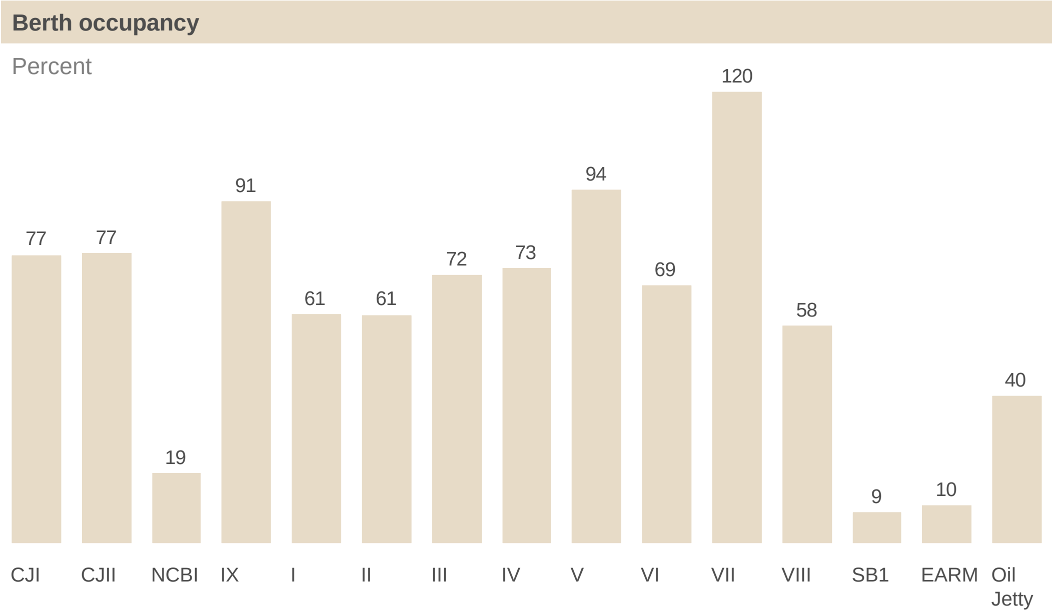
Port-wise capacity utilisation



SOURCE: Basic port Statistics, IPA

EXHIBIT 2.7

Higher pressure on coal berths through increased traffic – Tuticorin



SOURCE: VOC port vessel log 2014–15

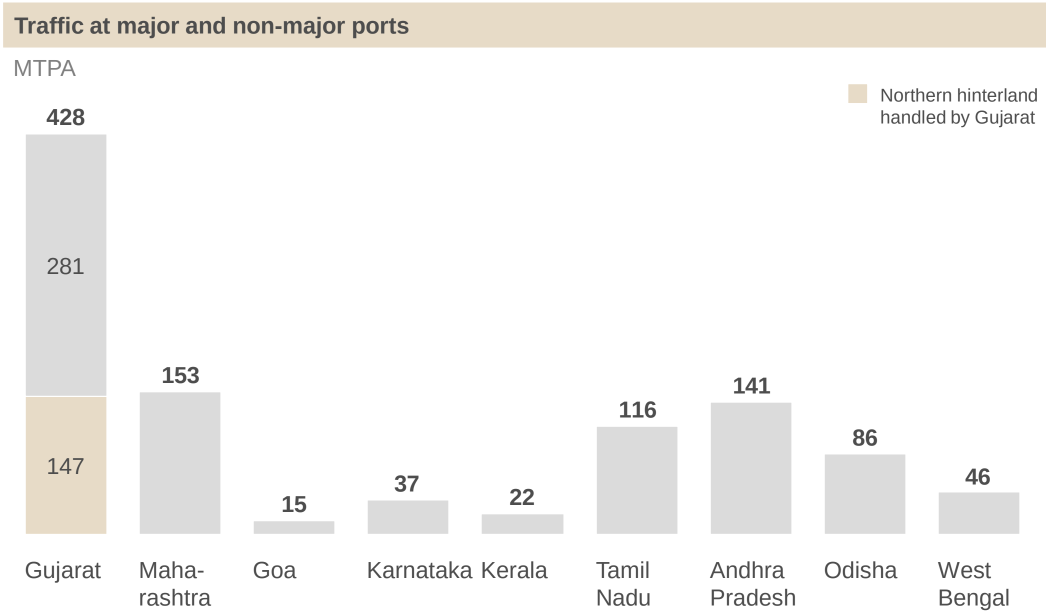
2.2 Implications and opportunities for port capacity

2.2.1 Port capacity needs

In 2014–15, Indian ports handled ~1050 MTPA of cargo, growing at a rate of 4.5 per cent per annum. Western coast ports handle more than 60 per cent of the total cargo owing to the large North West hinterland that the west coast caters to (Exhibit 2.8).

EXHIBIT 2.8

State-wise cargo traffic in 2015



SOURCE: Updated basic port statistics

Over the next decade, the following commodity wise factors could drive traffic at the ports:

- Petroleum, oil and lubricant
  - Continual increase in the import of petroleum, oil and lubricant (POL) products
  - Coastal shipping of POL products from surplus to deficit centres
  - Setting up of new refining capacity near increasing demand centres
  - Rising demand of LPG due to increased penetration
  - Increased demand of LNG
- Coal
  - High growth rate of the power sector and continued reliance on demand centre coal-based power plants
  - High growth in CIL's production, enabling coastal shipping of thermal coal to serve power plants in the coastal states
- Materials
  - Coastal shipping of bulk commodities like steel from production to consumption centres
  - Setting up of new coastal capacities for bulk commodities, such as steel and cement

– Capacity expansion of steel plants boosting demand for imported coking coal

- Discrete manufacturing
  - Increase in container volumes due to growth in the manufacturing sector
  - Boost in EXIM trade from improved logistics due to infrastructure upgradation
- Development of Coastal Economic zones

With all the above factors cargo volumes at the ports can potentially increase to 2500 MTPA by 2025 (Exhibit 2.9). While POL, coal and containers will continue to account for majority of the volume, share of coal can grow from 24 per cent to ~40 per cent. Development of Coastal Economic Zones can contribute ~341 MTPA of cargo to ports – both bulk and discrete.

EXHIBIT 2.9

Cargo volume growth at Indian ports by commodities

MTPA

Commodity	2014	2025 Base	2025 Optimistic	2025 Total
POL	351	460	80	540
Coal	231	850	128	978
Containers	115	323	53	375
Others	275	527	80	607
Total[1]	972	2,160	341	2,500

1 Numbers may not add up due to rounding error

Much of the growth will likely come from coastal shipping of bulk commodities. While the EXIM cargo will double over the next decade to ~1,670 MTPA, share of coastal shipping can increase 5 times taking its share in port traffic from current 15 per cent to over 33 per cent (Exhibit 2.10).

EXHIBIT 2.10

EXIM and domestic shipping cargo growth

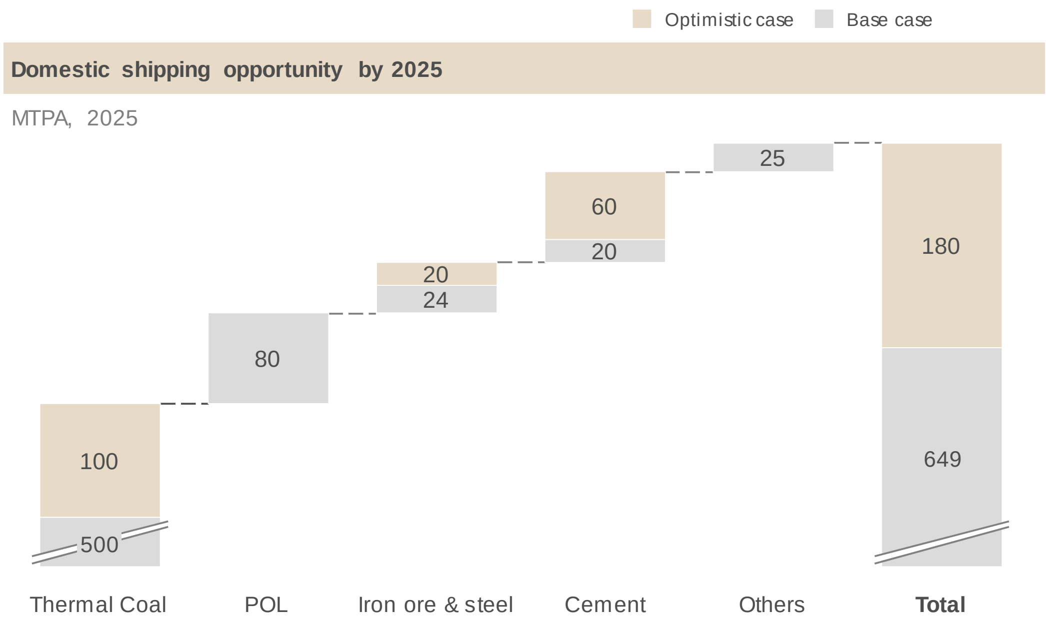
MTPA

Commodity	2014	2025 Base	2025 Optimistic	2025 Total
EXIM	820	1,511	161	1,671
Domestic shipping	150	649	180	829
Total	970	2,160	341	2,500

Thermal coal would grow from 50 MTPA to 600 MTPA by 2025 driving volumes of coastal shipping (optimistic case). Most of this thermal coal will be evacuated from MCL mines through Paradip port to serve the requirement of the thermal power plants in the coastal states. Other bulk commodities like cement, steel can also leverage coastal shipping to reduce the overall logistics cost. Setting up of bulk clusters in Coastal Economic Zones will also add to the overall potential (Exhibit 2.11).

EXHIBIT 2.11

Thermal coal will drive the domestic shipping volumes



2.2.2 Potential opportunities for port modernisation

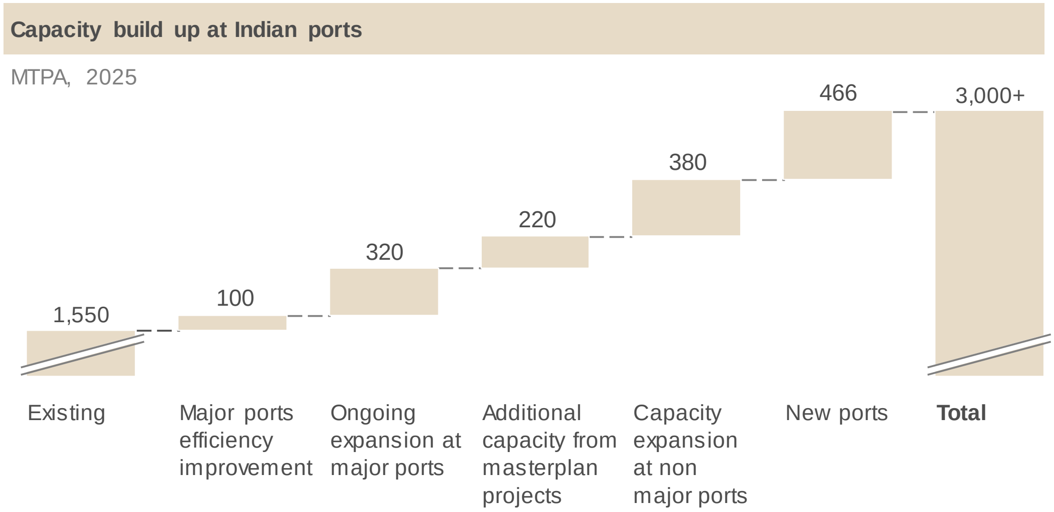
Catering to the increasing traffic over the next 10 years will require augmenting capacity. Cargo traffic at the ports is expected to be 1,650 MTPA in 2020 and reach 2,500 MTPA by 2025.

To cater to this demand, the ports will need to create additional capacity (Exhibit 2.12) by:

- Unlocking 100 MTPA capacity at existing terminals through improved efficiency
- Increasing capacity at existing ports through mechanisation and building new terminals
- Building new greenfield ports

EXHIBIT 2.12

Capacity build up at the ports to meet the 2025 demand



- **With the planned projects, there will be sufficient capacity at port to handle projected volumes**
- **More than total capacity, it is critical to have adequate capacity at the right place**

Efficiency improvement for major ports is undertaken by PDC working on "Benchmarking and Operational Improvement Roadmap for Major Ports in India".

As part of Sagarmala, detailed master plans have been developed for the 12 major ports. For non-major ports, existing capacities and expansion announcements have been accounted for in arriving at traffic potential. Competitive dynamics between ports located within the same cluster have been taken into account.

Development of new ports could add additional capacity of 450 - 500 MTPA. Six locations have been identified as potential new port locations (Exhibit 2.13; Exhibit 2.14) based on

- Existing port saturation
- Non-availability of a port on the coastline stretch

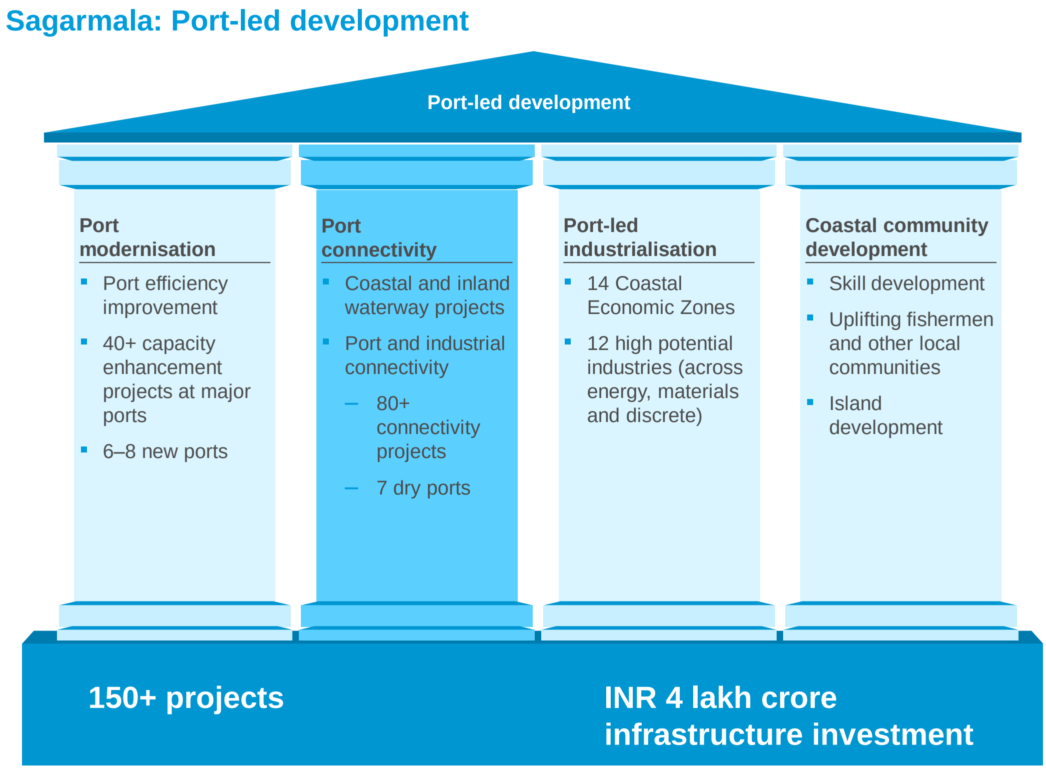
- Strategic location

Further details on six locations of new ports have been included in a separate report on new port.

3 Port Connectivity

Port connectivity is the second pillar of the port-led development model under Sagarmala (Exhibit 3.1). It aspires to provide the most optimal mode of evacuation to and from ports for both EXIM and domestic cargo. The study compared possible modes of connectivity from domestic production/demand centers to ports. Pipelines, coastal and inland waterways, railways and road networks were studied to provide recommendations on efficient evacuation.

EXHIBIT 3.1



Connectivity is one of the critical enablers for ports as it is the end to end effectiveness of the logistics system that drives competitiveness for industry. For example, intermodal transportation network of rail, inland shipping, road, short sea and pipelines gives the port of Rotterdam the best possible connections to the rest of Europe – transit times to most destinations is less than 24 hours. Superior connectivity has helped Port of Rotterdam to become the largest sea port in Europe handling more than 450 MTPA of cargo.

Connectivity challenges exist in India and even new ports that have world class equipment can see their turnaround times hamstrung because of poor connectivity. This chapter discusses the main challenges to port connectivity that constrain India's trade competitiveness and increase industrial production costs. The key challenges are underleveraging of domestic waterways, severely constrained rail infrastructure along key routes, sub optimal modal mix for container freight, connectivity to west coast ports through the Western Ghats, lack of coordinated end to end planning for bulk logistics and last mile connectivity to ports and key industrial hinterlands.

India's hinterland connectivity is mainly based on road and rail networks. Domestic waterways, both coastal shipping and inland routes, so far have played a limited role. This chapter suggests ways of reinventing the modal mix through pipelines, waterways, roads and railways.

Pipelines are an effective means of transporting liquid cargo to and from ports. Cost of transporting the product by pipeline could be about 10–15 per cent of that by rail. Currently, many of the pipelines are operating at utilisation level of more than 90 per cent, therefore any increase in refineries capacity has to be matched by pipeline expansion. With this in mind, potential pipelines projects have been outlined for capacity enhancement and expansion. Development of pipeline from Paradip to Hyderabad and expansion of Salaya Mathura pipeline are some of the high potential projects. Slurry pipelines could also be considered for transporting iron ore from the mines in Chattisgarh and Odisha to the nearest port. NMDC is already building a pipeline from Bailadila to Vizag.

Freight transportation by waterways is highly underutilised in India as compared to US, China and EU. For example the Yangtze River system is one of the most developed inland waterways navigation system with 13 waterways and 92 ports. Port of Shanghai is located in the vicinity of Shanghai, at the confluence of Yangtze, Huangpu and Qiantang rivers and handled 35 mn TEUs in 2014, most of which originates in the industrial clusters located in the Yangtze valley. Similarly in India, National Waterways 1, 2, 4 and 5 can be developed to play an important role in cargo movement.

Railways is the mainstay for carrying long lead distance and bulk cargo. But the expansion of rail network has not been able to keep up with the growing demand – in the past 5 years, rail network has only grown at 0.7 per cent. Most of the routes carrying bulk cargo (like thermal coal) are constrained and running at high utilisation. Evacuation capacity in Odisha and Chhattisgarh is much lower than projected requirement. There is also an issue of constrained infrastructure between receiving ports and demand centres especially around the Western Ghats. Development of Heavy Haul Rail corridor, decongesting RV line, Hospet-Vasco da gama line are some of the high potential rail projects. High freight rates due to cross subsidisation and low priority for goods trains have made railways uneconomical for container movement. Because of this, shippers prefer moving even long distance containers on road. Western DFC with linkages to ports of Hazira, Kandla and Mundra through spur lines can result in modal shift from road to rail for containers generated in the northern hinterland.

Road is economical compared to rail for covering distances up to 500 to 1,000 km from the port, however the current condition of highway stretches is inconsistent. Moreover, the Indian coastline does not have a coastal road network. To make roads more effective as a mode of cargo movement, ten potential highway stretches have been analysed as freight friendly expressways. In addition to this the Government of India has undertaken the Bharatmala programme which would also help in joining coastal regions through road links. Policy related interventions can help reduce the overall cost and time for freight movement.

3.1 Overarching connectivity challenges

Connectivity is one of the critical enablers for ports as it is the end-to-end effectiveness of the logistics system that drives competitiveness for industry. With infusion of new technology and capacity building, the cumulative or total capacity available at ports could meet the requirements. However, when evacuation of cargo is slow, then despite adequate capacity and modern handling facilities, ports will not able to ensure a quicker turnaround of ships. This could undermine the competitiveness of Indian trade. It is important that connectivity of ports with the hinterland is augmented not only to ensure smooth flow of traffic at present levels but also to meet the requirements of a projected increase in traffic.

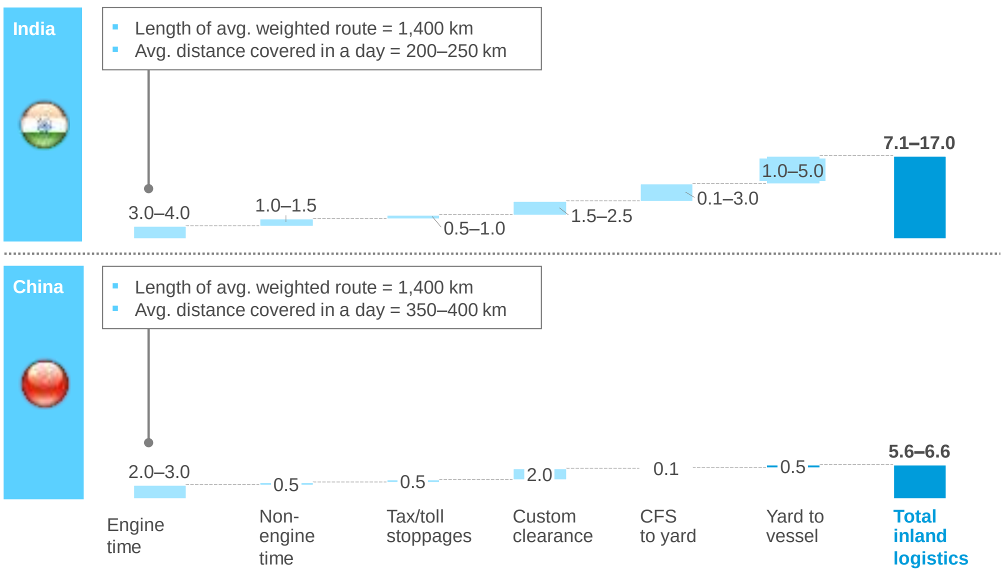
A comparison between India and China for time taken to transport a container by road on similar routes suggests that there is a significant variability in time for inland transportation in India (Exhibit 3.2). Compounding this problem is the long logistics lead distance of India versus comparable countries. While this is good for balanced regional development, it also means logistics costs are structurally higher.

EXHIBIT 3.2

Comparison of end-to-end time of transporting a container in India and China by road on similar routes

BOTTOM-UP ANALYSIS FOR ROAD TIME

Days/TEU



1 Ocean distance = 6,658 NM

SOURCE: Interviews with truck companies; CTOs; freight forwarders; importers; exporters; port management; World Bank

This section covers key port connectivity stretches in India for coal, container traffic, petroleum, oil and lubricants (POL), iron ore, steel, fertilisers, cement and food grains, identified through origin–destination (OD) studies.

Energy-focused commodities

- Around 80 per cent of the crude requirement in India is imported and moves through pipelines to refineries. Domestically produced crude from Bombay High is transported via coastal shipping.

- Approximately 75 per cent of the product (MS/HSD) movement from PSU refineries takes place via pipelines while the remaining 25 per cent is transported via road or rail. Product from private refineries is largely exported due to price regulation in the past or is coastally shipped to south in case of a deficit.

- Thermal coal movement is predominantly by rail. While domestic coal is mostly transported directly by rail from mines to power plants, there is some movement to ports as well, e.g., from Mahanadi Coal fields in Odisha to Paradip port. Imported coal-based generation is mostly located in the immediate vicinity of ports with a few exceptions in Rajasthan and Maharashtra. The proposed impetus to coastal shipping could significantly alter connectivity needs for coal movement.

Materials-focused commodities

- Coking coal is mostly imported by steel plants by rail from receiving ports of Visakhapatnam, Gangavaram, Dhamra, Paradip and Haldia to steel clusters in Odisha, Jharkhand, Chhattisgarh and West Bengal.

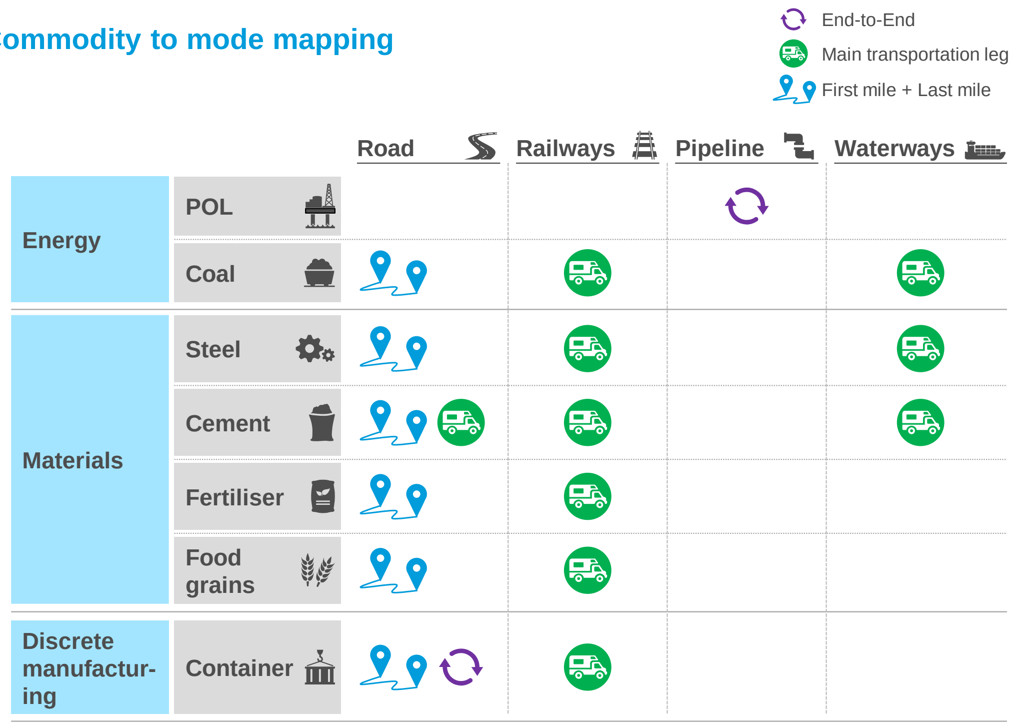
- There is also significant opportunity for movement of coastal cargo especially in steel, cement, fertilisers and food grains apart from coal. Key movement of food grains is mainly by rail from Andhra Pradesh to Tamil Nadu and Kerala. Similarly, steel and cement moves from the east coast of India to south and west. Apart from re-routing existing cargo from rail to coastal movement, there is also potential to set up mega cement cluster in AP and steel clusters in Tamil Nadu, Maharashtra and Gujarat.

Discrete manufacturing

- Container traffic is the heaviest from the northern states, i.e., Delhi, Punjab, Haryana and Uttar Pradesh, to ports in Gujarat, e.g., Mundra and Pipavav and Maharashtra (JNPT). The cargo movement on these stretches is skewed in favour of road at 62 per cent as compared to rail at 38 per cent. Other high density stretches, mainly from the southern cities of Bangalore, Coimbatore and Hyderabad, are considerably shorter and better suited for road than rail. The upcoming dedicated freight corridors will have a significant influence on the rail–road mix, especially for the northern hinterland. Exhibit 3.3 shows the current mapping of commodities to different modes.

EXHIBIT 3.3

Commodity to mode mapping



Projections of cargo traffic create the need to further strengthen connectivity projects so that future demand is met through easing of bottlenecks in the choked rail and road systems and effective shifts in the modal mix toward inland waterways and coastal shipping, which are both cost-effective and environment friendly.

Later sections discuss some of the key connectivity challenges for movement of EXIM cargo. The implications for key cargo and a corresponding list of initiatives for meeting the projected cargo traffic and connectivity challenges have been identified.

The following section detail out the main challenges to port connectivity, constraining both country's export competitiveness as well as increasing industrial production costs.

3.1.1 Waterways

India has around 7,500 kilometers (km) of coastline and 14,500 km of navigable rivers. In spite of this, cargo movement in India through domestic waterways is negligible.

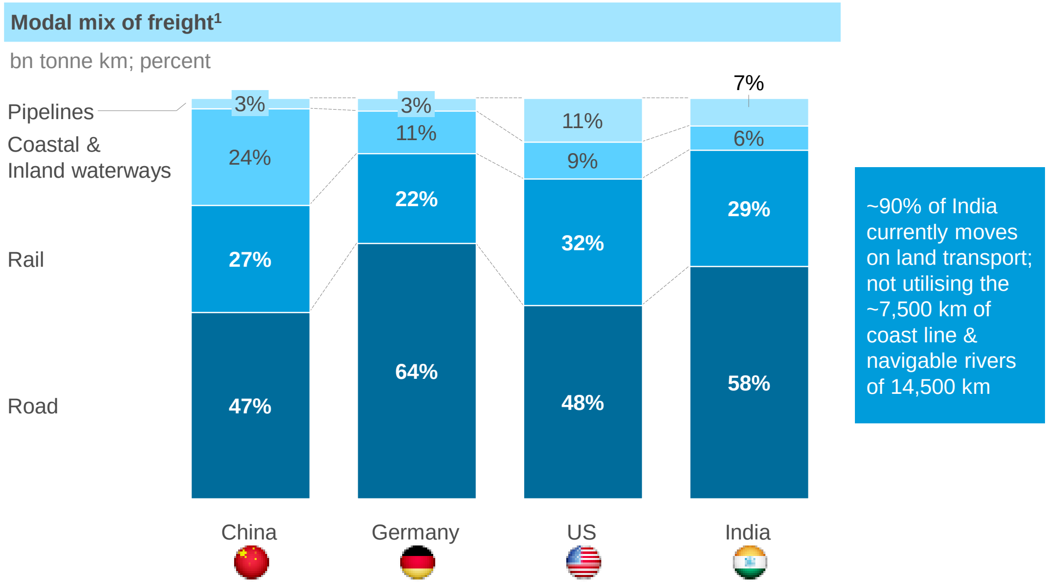
Globally, domestic waterways are seen as cost-effective as well as environmentally friendly means of transporting freight. For instance, the cost of moving coal via coastal shipping is significantly cheaper than cost of moving it by the currently preferred means of railways (for coastal plants).

Exhibit 3.4 below shows a comparison of the modal mix of cargo movement in China, the US, Germany and India. It can be seen that while China ships as much as 24 per cent of its freight via waterways, India's utilisation of waterways for freight movement is less than 6 per cent.

By contrast, in the US, waterways are utilised in a much more effective manner. The Mississippi waterway became operational in the 1930s and has a minimum navigable depth of 9 feet, carrying roughly 126 MTPA of traffic every year. The overall inland waterways system in the US has nearly 12,000 miles of navigable rivers with more than 9 feet depth with 192 locks moving more than 600 MTPA of cargo. Underused waterways constitute a major challenge in optimising connectivity to ports in India. This is all the more significant, given that the railway network is heavily constrained, as discussed subsequently.

EXHIBIT 3.4

Waterways have a significant potential to increase share in freight transport



1 2012

SOURCE: China statistical yearbook 2012; CEIC; OECD database
Total transportation study, RITES, NTDPC

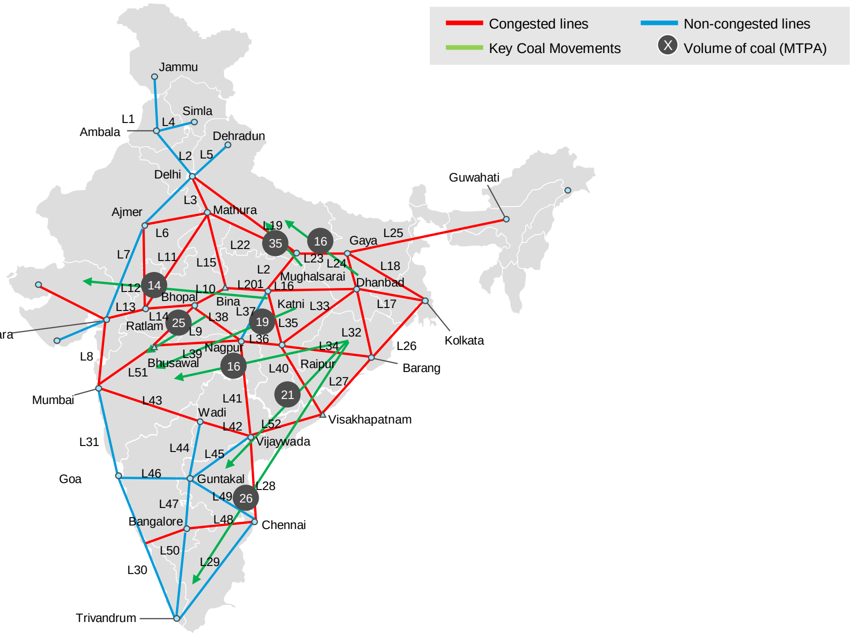
3.1.2 Railways infrastructure bottleneck on key routes

Rail is the primary mode for transporting bulk freight bound to and from ports. Railways carry nearly 60 per cent, i.e., 356 MTPA of the total domestic coal volume moved in India. Chronic underinvestment in infrastructure, however, has resulted in rail capacity failing to keep pace with demand, especially on trunk routes. For example, the stretch from Talcher coalfield to Paradip port is highly constrained and unable to handle the demand from coal traffic. In 2013–14, coal movement in the country was ~740 MT, including domestic production and imports. Though coal production is concentrated mostly in the eastern and central parts of India, it is transported for power generation to nearly all corners of the country. Coal production is currently growing at a rate of 6 to 7 per cent per annum, but infrastructure for its evacuation has lagged behind with an annual growth rate of 3.5 per cent, which needs to be augmented to keep pace with production.

This has resulted in congestion, high dwell time and an average freight speed of only 25 kmph. More than 90 per cent of rail routes handling coal movement are operating at over 100 per cent utilisation as shown in the Exhibit 3.5. Severe shortage of rolling stock causes overstocking of coal at the ports hampering port productivity and increasing the inventory cost.

EXHIBIT 3.5

Current rail network is congested and will likely not be able to support future volumes

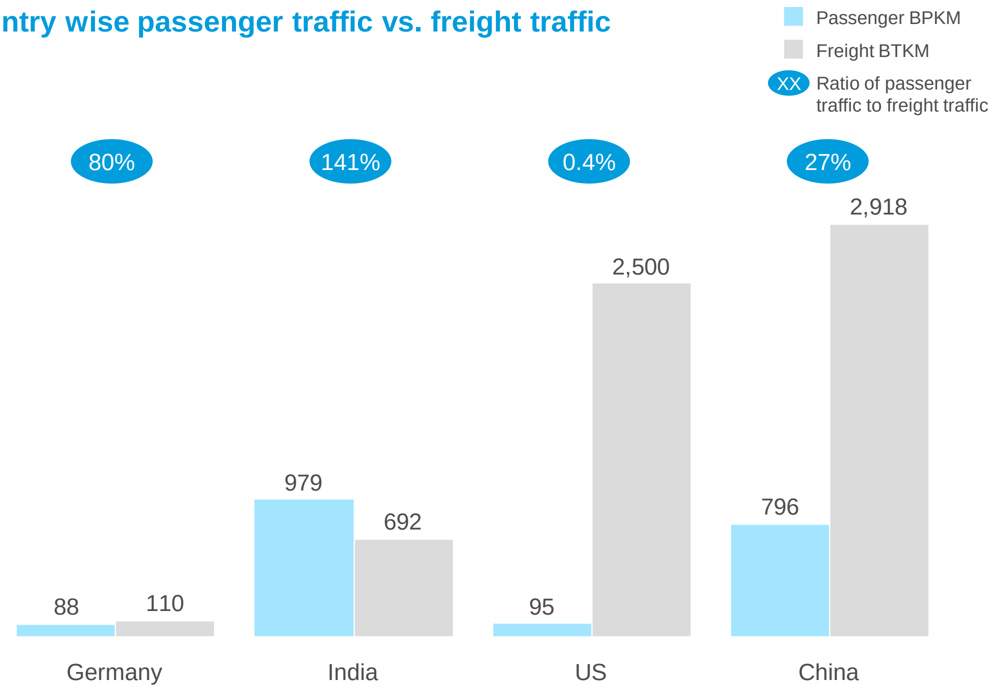


SOURCE: Indian Railways

The Delhi–Mumbai rail route is the most important corridor for container freight in the country. The route, also known as the “Western Corridor”, services the movement of container cargo from prime manufacturing hubs in the northern region, namely Delhi NCR, Punjab and Haryana, to Mumbai and Mundra ports. It is the one of the busiest and most congested passenger route in the country, with capacity utilisation between 115 and 150 per cent. Indian Railway policies have traditionally been passenger-centric with cargo being a second priority. Freight trains are given the seventh preference in terms of track availability in the railways which further slows down the already congested movement on key trunk routes. This is also reflected in terms of the proportion of the passenger traffic to the freight traffic in which India leads the major industrial countries by a large distance in terms of passenger dependence (Exhibit 3.6).

EXHIBIT 3.6

Country wise passenger traffic vs. freight traffic



SOURCE: OECD and World Bank database

3.1.3 Connectivity to west coast ports through the Western Ghats

India's west coast runs parallel to the Western Ghats. The Western Ghats are steep, creating technical challenges in construction and adding to project costs. The rich yet fragile ecology of the area poses significant environmental challenges. These challenges particularly impact two ports, Mormugao and New Mangalore, as well as potential port locations in north Karnataka, such as Belekeri, Pavinkurve and Tadadi. These ports are severely constrained by the lack of adequate road and rail connectivity to their natural hinterlands, especially power plants and steel clusters located across the Western Ghats to the east.

While several projects have been proposed in the past, none have been successfully completed. The Castle Rock–Kulem stretch is one of the most challenging rail stretches in the country with a gradient of 1 in 30, 16 narrow tunnels and around 15 bridges. Additionally the Tinaighat–Castle Rock stretch and the Hubli to Ankola line to connect potential new ports in north Karnataka have been delayed due to environmental issues. The Kulem–Vasco railway doubling is a part of the Tinaighat–Vasco doubling sanctioned by Indian Railways in 2010–11, for which land acquisition is required at isolated locations like major bridge approaches, deep cuttings, high bank locations and station yards.

Currently, if a passenger train travels from Castle Rock to Kulem (which is downhill), no other goods train is allowed to move in this section, even though the goods trains are well equipped with supplementary braking power in the event of a brake failure (Exhibit 3.7 and 3.8).).

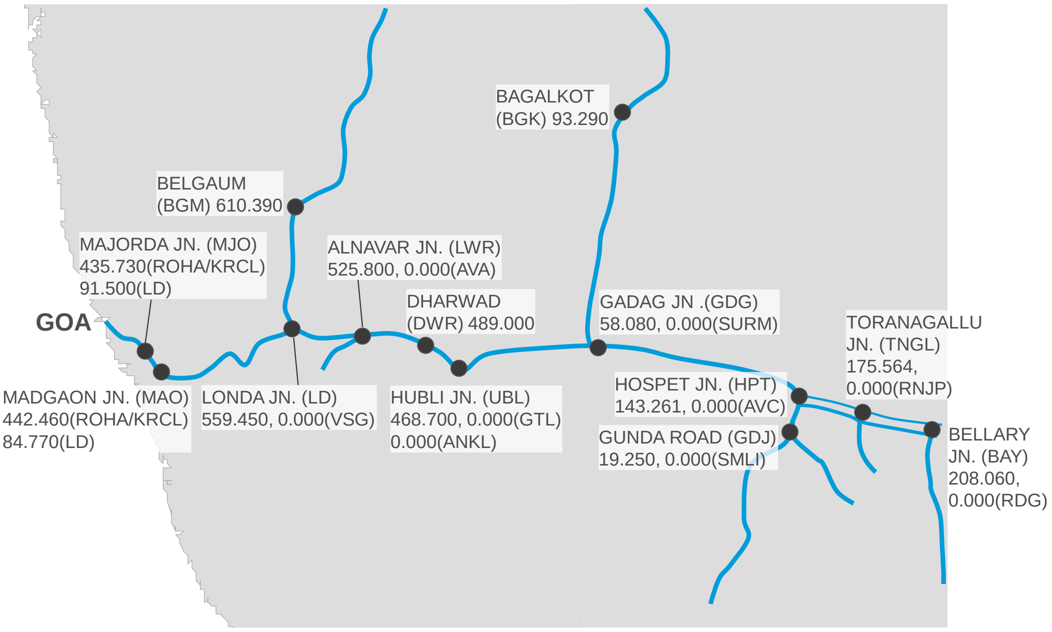
EXHIBIT 3.7

Railway line in western ghats

The rocky ghats run close to the railway tracks and laying an additional line next to the existing line poses the challenge of having to blast through hard rock at many places. The estimated time for completion of this 26 km stretch could be between five and 10 years from now.

EXHIBIT 3.8 BELLARY-MADGAON RAILWAY LINE

Bellary – Madgaon railway line

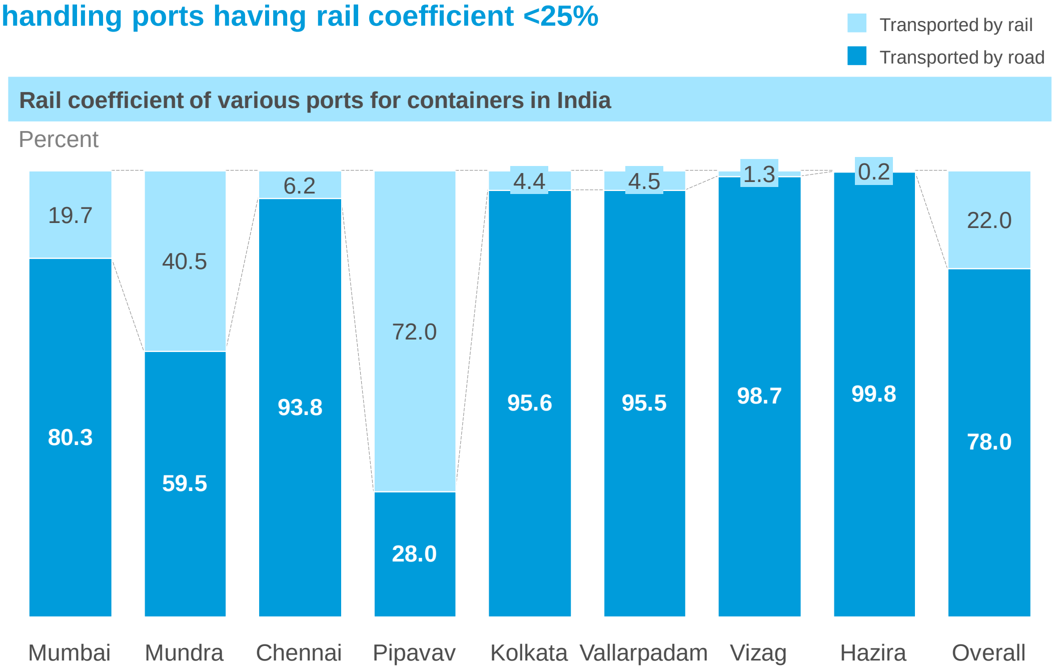


3.1.4 Sub-optimal modal mix for container freight

Roads are the predominant mode for transporting containers in India despite the superior cost economics of railways. As seen in the Exhibit 3.9, less than 25 per cent of India's total container evacuation to ports is handled by rail and of the eight major ports handling containers, only two ports, i.e., Mundra and Pipavav, have appreciable rail coefficients (40 and 72 per cent respectively), while Visakhapatnam and Hazira depend heavily on roads.

EXHIBIT 3.9

Hinterland evacuation is dominated by road with 6 out of 8 major container handling ports having rail coefficient <25%



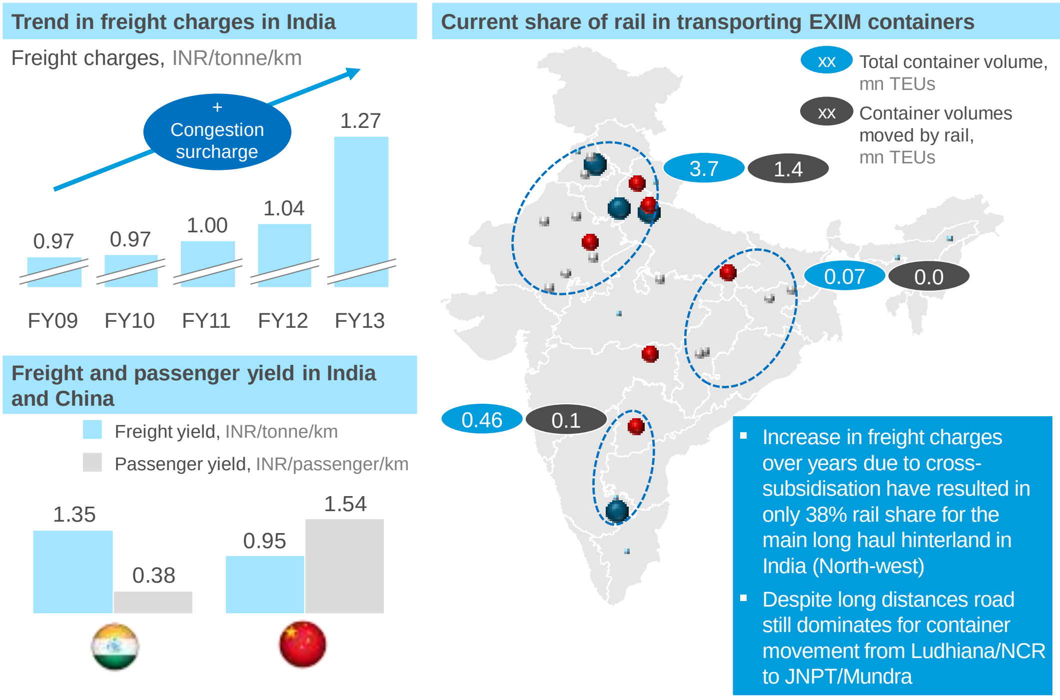
The highest container volume in the country is generated in the northern region, namely, Punjab, Rajasthan, Uttar Pradesh and Delhi NCR. Of the 3.7 mn tonnes of container freight currently generated, only 1.4 mn tonnes of container freight is moved by rail and the rest by road.

This is despite the fact that not only is rail faster, but also has economies of scale as a result of its consolidated end-to-end logistics, while container traffic by road is run by private transporters at the current de-regulated diesel prices.

One of the reasons behind roads having a larger share in India is the cross-subsidisation of passenger traffic by container freight. This has led to reduction in the economic viability of transporting containers by rail. The top panel in the Exhibit 3.10 below shows the steep increase in freight charges that is driving container traffic away from rail. The bottom panel highlights the significant differential between freight and passenger yield for railways, as well as a comparison with China, where the railways keeps freight yield much below passenger yield.

EXHIBIT 3.10

Current performance of Indian freight rail in India

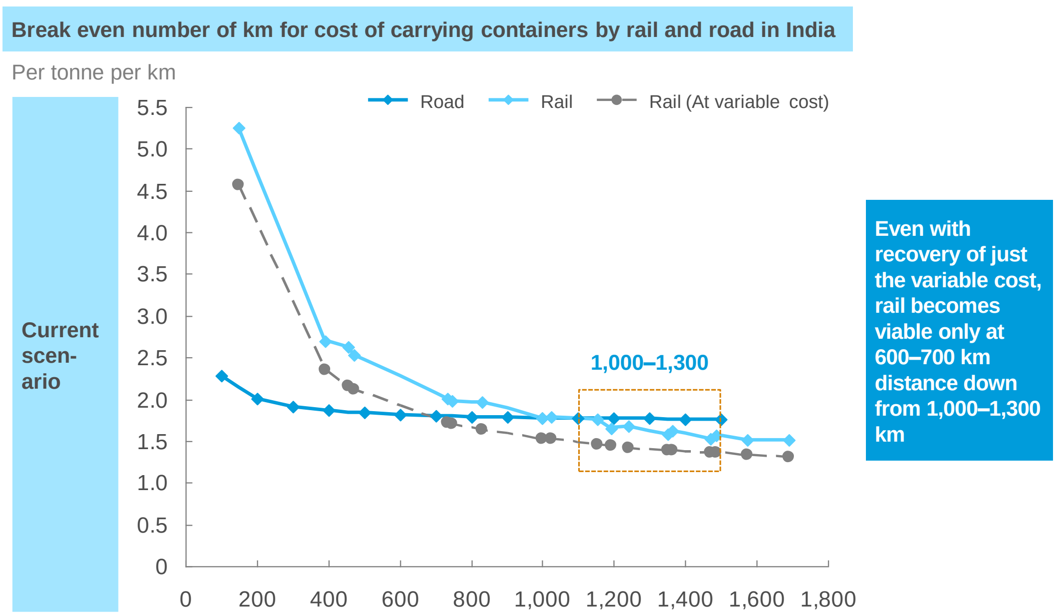


SOURCE: APMT; Khambadkones; IPA statistics; Stakeholder interviews, White paper – Indian Railways

Due to the cross-subsidy to passenger charges with the high cost of container freight, the distance at which the cost of rail transportation of containers breaks even with road is currently between 1,000 and 1,300 km (Exhibit 3.11).

EXHIBIT 3.11

High freight charges making rail uncompetitive



SOURCE: CONCOR; transporter interviews

3.1.5 Lack of coordinated end-to-end planning for multimodal bulk logistics

Bulk cargo in India is naturally amenable for centrally planned logistics networks because of certain characteristics:

- Typically bulk movements are concentrated among a few players in India. For example, in coal there are only a few generating companies and Coal India is the largest coal miner. This means the corresponding logistics network also involves fewer players

- Bulk logistics can be projected with relative accuracy as compared to variable container flows. Projections of power and steel capacity under development and construction, for example, can accurately inform logistics infrastructure capacity

- However, the current logistics system is unbalanced due to multiple other challenges. Compared to the complex rail-sea-rail route movement, the railways provide a door-to-door single-window service through a transparent and smooth process. The railways can also charge a higher price for the convenience over coastal shipping (Exhibit 3.12)

EXHIBIT 3.12

What needs to happen to capture the coastal shipping opportunity

Stakeholder involvement & enabling port infrastructure is required	
1	On-boarding of PSU players (Power utilities, SAIL, DCI) and private players (Steel producers, cement producers) to initiate coastal shipping
2	Creation of supporting transport infrastructure (e.g., Talcher-Paradip railway line), slurry pipelines
3	Dedicated berths, bunkering & storage capacities at relevant ports
4	Aggregation services: Identifying or setting-up aggregation agency to handle small parcel sizes & operate logistics
5	Dedicated capacity fleet under Shipping Corporation of India
6	Appropriate ship-repairing/ship-building facilities on key ports; currently most of the ship repairs happen outside the country

3.1.6 Challenges faced in road transport

Despite the push to expand the highway network, multilane roads (4+ lanes) in India is low. In addition, incomplete stretches in NHDP and lack of city bypasses on key corridors add to congestion in the road network. Lack of standardisation in documentation requirements across different states hinders inter-state freight transportation. In addition, lack of digitisation, with requirement of manual documentation at a few states results in higher waiting time for clearance at inter-state borders. Also, the differences in entry taxes across states increases the complexity in documentation requirement, resulting in higher freight transit times. In addition, differences in entry restrictions across different cities increases complexity in route planning

3.1.7 Last-mile connectivity to ports and key industrial hinterlands

A large number of ports still lack basic connectivity through rail and road. Even if ports are connected via these modes, there are multiple issues pertaining to congestion which cause exporters and importers to pay the price for using these ports. It is of utmost importance under the programme that all last-mile/gate-related issues are addressed so that the overall supply chain functions in the manner it is intended to.

3.2 Mode wise projects

To address the above challenges, a detailed study of all modes of evacuation was undertaken to come up with detailed list of mode wise projects and initiatives to ensure efficient port evacuation.

3.2.1 Pipelines

Pipelines are the primary means of transport for liquid cargo to and from ports. Broadly, this can be split into crude, which is imported by refineries, and products which moves from refineries to the hinterland.

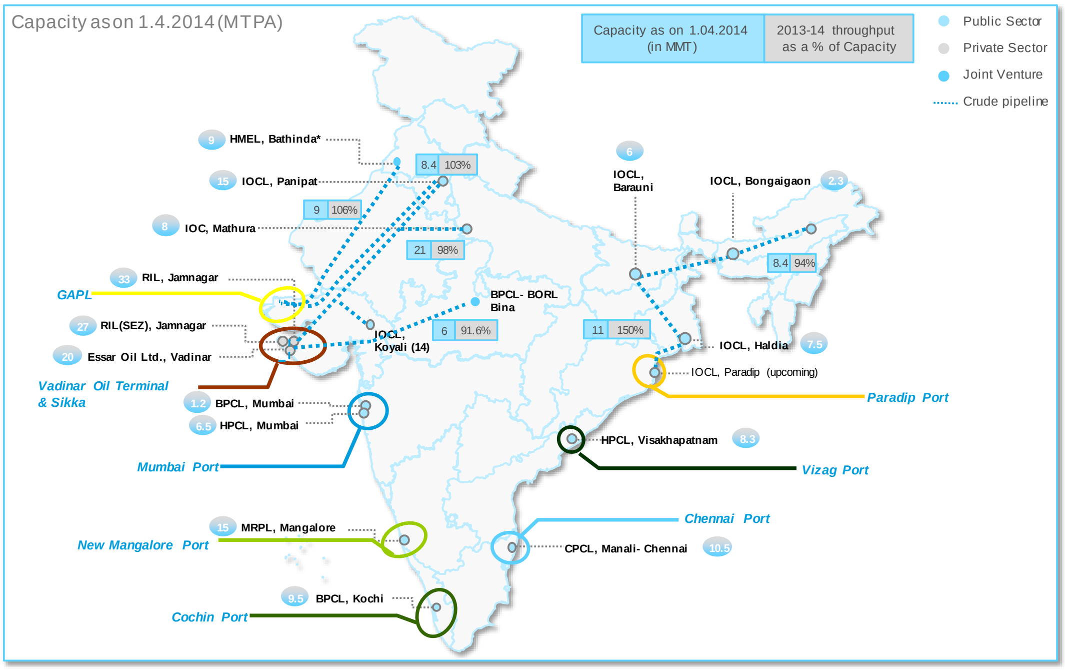
3.2.1.1 Crude oil

India currently consumes around 227 MTPA of crude oil, of which 189 MTPA is sourced through imports and 38 MTPA through domestic production. The imported product is handled by seven port clusters—the Gujarat cluster, Paradip, New Mangalore, Mumbai, Chennai, Cochin and Visakhapatnam, with the Gujarat cluster handling around 65 per cent of the total crude imports. Mumbai, New Mangalore and Paradip account for 7 to 8 per cent each, while the rest handle 4 to 5 per cent each of the total import.

Significant percentage of refinery capacity is coastal, largely optimising the movement of crude. Around 34 per cent of the crude landed at the Gujarat cluster is transported inland through pipelines to the Bhatinda, Panipat, Mathura and Bina refineries. Similarly crude landed at Paradip port is moved inland to serve Paradip, Haldia, Barauni and Bongaigon refineries (Exhibit 3.13). Some part of the domestically produced crude (around 13 to 16 mn tonnes) is also shipped coastally. Emergency coastal shipping of crude also takes place in cases of disruption of the regular supply.

EXHIBIT 3.13

Current crude pipeline network in India



1. Does not include refineries relying primarily on domestic crude such as ONGC Tatipaka, IOC Digboi, IOC Guwahati and Numaligarh
Note: Map is Indicative only, not to scale

Most current crude pipelines operate at over 90 per cent utilisation and any plans to expand the existing refineries will also need to factor in a capacity increase for the relevant pipeline. For example the IOCL refineries in Panipat and Mathura get their crude from Mundra and Vadinar ports in Gujarat via pipelines (Exhibit 3.14). These pipelines currently operate at near-capacity utilisation levels. As the refineries expand, corresponding augmentation will be required in the crude pipelines as well. The current capacity of the Salaya to Mathura pipeline, which feeds crude to the refineries in Koyali, Mathura and Panipat (partially), is around 21 MTPA, and IOCL has plans to augment its capacity to 25 MTPA. There is a proposal for further augmentation of the pipeline to around 40MTPA to align with future expansion of the Panipat, Mathura and Koyali refineries[8]

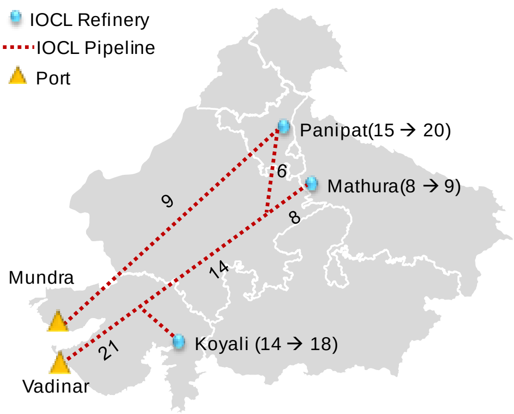
Some of the other projects could include upgradation/replacement of old crude pipelines serving CPCL Manali from Chennai port.

[8] Discussion with IOCL and Kandla port

EXHIBIT 3.14

Salaya – Mathura pipeline could be expanded to cater to future expansion of Matura, Koyali and Panipat refineries

Current IOCL Pipeline Network



- Panipat refinery plans to expand to 20 MTPA
- Mundra – Panipat pipeline operating at 100%+ utilisation supplies 9 MTPA crude currently
- Remaining 6 MMPTA comes from Salaya – Mathura pipeline operating at full capacity

Mundra-Panipat versus Salaya Mathura Pipeline

SBM Utilisation

- IOCL's captive SBM at Mundra port is currently underutilised
- IOCL's 2 SBMs at Vadinar port will operate at near 100% utilisation post expansion

Cost

- Mundra to Panipat distance is 100 km less than Salaya Panipat pipeline distance
- Salaya to Mathura pipeline CAPEX and OPEX could be higher
- Port charges are higher at Mundra as compared to Vadinar

Strategic sense

- Mundra to Panipat pipeline will be augmented for only one refinery
- Augmentation of Salaya Mathura pipeline can serve future expansion of three refineries

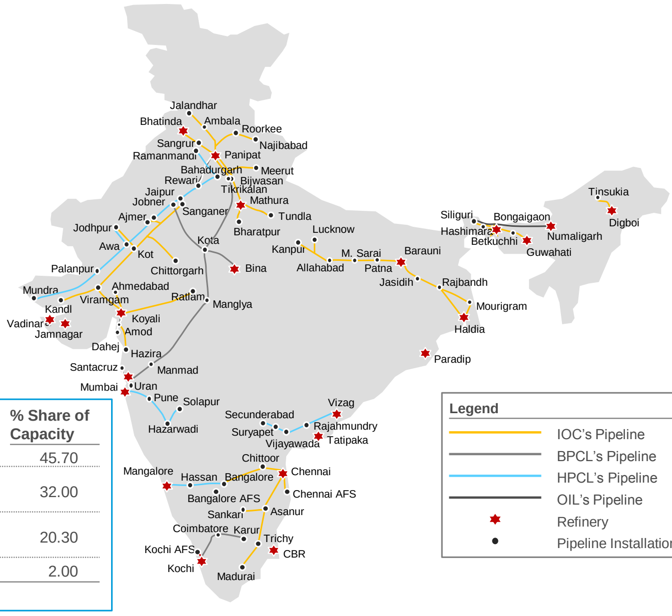
3.2.1.2 Product

Refineries rely on the pipeline network for domestic evacuation of products, since the cost of transporting the product by pipeline comes to around INR 0.14 to 0.18 per tonne km compared to INR ~1.2 per tonne km by rail. India has ~12,000 km of product pipeline with a total capacity of ~86 MTPA (Exhibit 3.15). Approximate 75 per cent of the MS/HSD evacuation currently happens through pipelines. Pipelines dominate distribution from the refineries to the depots, with the balance moving via road or rail.

EXHIBIT 3.15

Current product pipeline network in India

Existing Petroleum Product Pipelines Network



PSU	Length km	Capacity MMTPA	% Share of Length	% Share of Capacity
IOC	6,359	39.39	52.50	45.70
HPC+ PMHB	2,898	27.55	23.90	32.00
BPC+ PCCK	2,201	17.44	18.20	20.30
OIL	654	1.72	5.40	2.00
Total	**12,112**	**86.1**		

Note: Map is Indicative only, not to scale

SOURCE: IOC: Indian Oil Corporation Ltd., | HPC: Hindustan Petroleum Corporation Ltd., | BPC: Bharat Petroleum Corporation Ltd., | OIL: Oil India Ltd., PCCK: Cochin-Coimbatore-Karur Petronet Ltd., | PMHB: Mangalore-Hassan-Bangalore Petronet Ltd.,

IOCL has proposed the construction of a new product pipeline:

Product pipeline from Paradip to Hyderabad: By 2025, the eastern region's demand for MS/HSD will be around 21 MTPA and production will be around 27 MTPA, creating a surplus of 6 MTPA. This will primarily be due to capacity expansion of the Paradip refinery to 15 MTPA. On the other hand, the AP region is expected to face a deficit of around 6 MTPA, even after the Visakhapatnam refinery expansion. Hence, a 4 MTPA pipeline connecting Paradip to Hyderabad will be needed to meet the AP and Telangana demand (Exhibit 3.16). The pipeline is already part of IOCL's plans and the construction should not be delayed.

EXHIBIT 3.16

Product pipeline proposed by IOCL with ~5MTPA capacity from Paradip to Hyderabad will cater to the AP deficit

Proposed product pipeline

Rationale

- Product pipeline from Paradip to Hyderabad
  - By 2025, demand for MS/HSD in East would be ~21MTPA and production would be ~27MTPA
  - On the other hand, AP region is expected to face deficit of ~6MTPA
  - Pipeline from Paradip to Hyderabad with ~5MTPA capacity will help meet this deficit

SOURCE: IOCL, Press Research

List of pipeline projects

Project name	Agency	Concerned state	Investment required (INR cr)	Timeframe
Enhanced pipeline capacity to CPCL Manali, increasing diameter from 30" to 42"	MoPNG	Tamil Nadu	500	24 months
Expansion of Salaya Mathura Pipeline	MoPNG	Gujarat, UP	1,000	60 months
Pipeline from Paradip to Hyderabad	MoPNG	Odisha and AP	3,000	120 months

3.2.2 Waterways

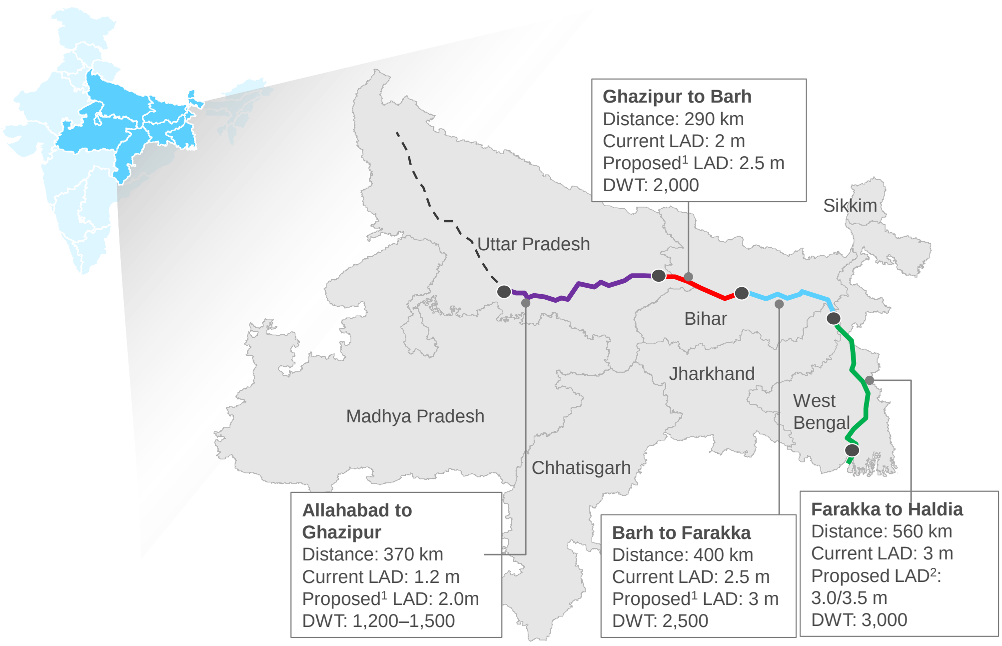
India has an extensive network of inland waterways in the form of rivers, canals, backwaters and creeks. Of the total navigable length of 14,500 km, 5,200 km of the river and 4,000 km of canals can be used by mechanised craft. Freight transportation by waterways is highly underutilised in the country as compared to the US, China and the European Union (EU). India has five recognised national waterways and 106 other waterways. Indian parliament has recently passed a bill to convert these 106 waterways to national waterways. Economic viability of a waterway to carry traffic as an alternative to rail and road depends on its length, which should be a minimum 500 km and 250 km for both cases respectively. Apart from this, it should have a large hinterland coverage area and potential in order to generate enough traffic on routes. Considering this, National Waterways 1, 2, 4 and 5 could be developed to play an important role in transportation.

3.2.2.1 National Waterway 1

With a length of 1,620 km, the National Waterway 1 (NW1) is the longest waterway in India passing through four states, i.e., UP, Bihar, Jharkhand and West Bengal (Exhibit 3.17). It was declared a national waterway in October 1986. NW1 is a stretch of the Ganga Bhagirathi–Hooghly river system starting from Allahabad in UP, extending up to Haldia in West Bengal, and is navigable by mechanical boats up to Patna. Key opportunities in the region lie in 11 major power plants located on the banks of NW1 with a cumulative capacity of 12,000 MW as well as multiple chemicals and food exporters in UP and West Bengal.

EXHIBIT 3.17

NW1 is 1,620 km navigable stretch of the river Ganga from Allahabad to Haldia with a minimum channel width of 45 m



1 Proposed LAD by 2018
2 Farakka - Tribeni: 3.0m; Tribeni – Haldia: 3.5m

Commodities like thermal coal and food grains from the hinterland of UP to various South and East Indian states, automobiles in containers as well as containers to be exported from UP to the port of Haldia/Kolkata and imported steel from the Kolkata/Haldia port into UP and Bihar along with by-products like fly ash can be catered to by the waterway provided issues related to high sedimentation of the river, maintenance of constant draft of 3 m throughout the system and possibility of high-capacity barges plying on the river can be addressed successfully. Other challenges include the high rate of waste dumping from industrial cities along the Ganga as well as the difficulties faced in creating barrages along a religious river like the Ganga. Additionally, light manufacturing clusters could be developed around NW1.

3.2.2.2 National Waterway 5

National Waterway 5 (NW5) (Exhibit 3.18) runs through the states of Odisha and West Bengal along the Mahanadi River. The main rationale for NW5 is its proximity to the Talcher–Paradip region, which is abundant in resources and provides opportunities for evacuation of coal as well as other commodities like coking coal and iron ore.

An external study conducted on NW5 established a potential of 80 to 90 MTPA of coal and about 12.5 MTPA of coking coal in back haul in addition to some potential for iron ore transport. While the capacity of the waterway is limited to around 20 MTPA using a conventional system, it can be enhanced if barge trains are used. The viability of using tugged barges, however, would need to be established through a detailed technical study.

Based on high-level estimates, the investment to operationalise NW5 could be INR 5,000 cr for dredging purposes, INR 900 cr for terminal development at Talcher and Paradip and INR 200 cr for annual maintenance. For tugged barges, the overall capital expenditure will be higher.

The revenues to the developer—assumed to be the Inland Waterways Authority of India (IWAI)—would consist of a usage fee of INR 1 per tonne km, vessel berthing fee of INR 750 per terminal and cargo-handling fees of INR 1 per tonne at each terminal.

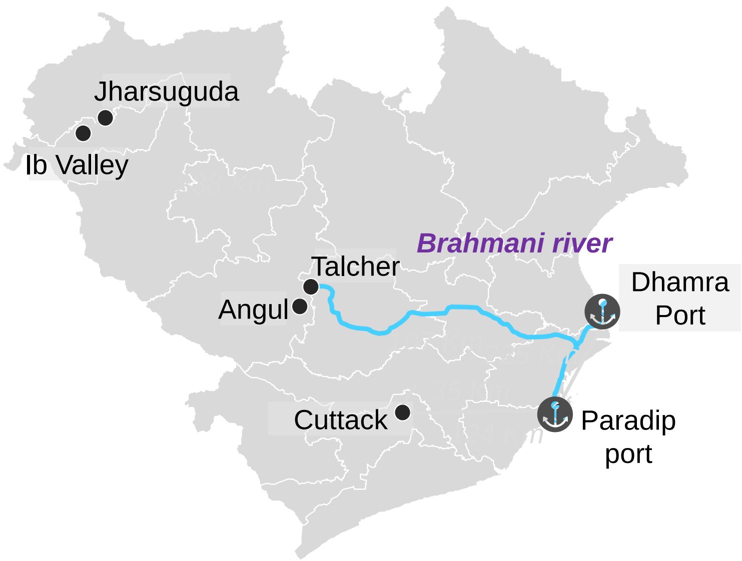
For barge operators, this revenue would be an operating cost. In addition, they would incur INR 2.4 cr per barge towards fuel, manning and repair and maintenance. On the capex front, operators will need to invest about INR 700 cr. The revenue for barge operators is assumed to be INR 1.2 per tonne km, based on benchmarking with alternative modes of transport.

Based on a single barge configuration of 20 MTPA with a draught of 2.5 metres over 55–60 km with five navigational locks and three barge terminals. This yields an estimated return of 13 per cent to the IWAI as the developer, whereas barge operators would earn 18 per cent.

These initial estimates would need to be revalidated based on a detailed feasibility report.

EXHIBIT 3.18

National waterway – 5



3.2.2.3 National Waterway 4

National Waterway 4 (NW4) is a 1,095 km-long waterway connecting several South-Indian states through parts of the Krishna and Godavari rivers. It also connects Tamil Nadu via the Buckingham Canal (Exhibit 3.19).

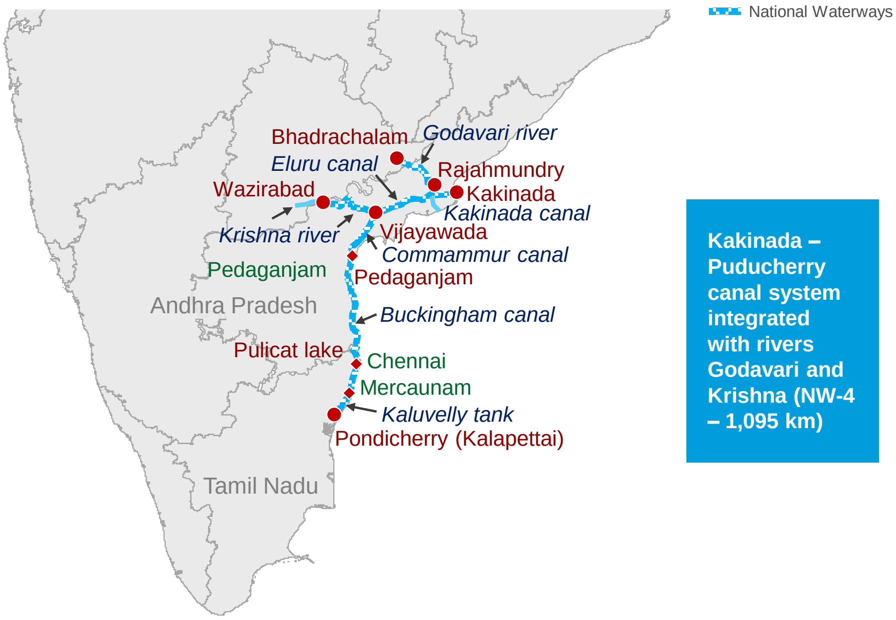
A two-phased development of the project has been proposed at a total cost of INR 1,515 cr. Phase I of the project envisages the development of a stretch comprising the Godavari and Krishna rivers and Kakinada and Eluru canals, which has maximum cargo potential, at an estimated cost of INR 390 cr and land acquisition for remaining stretch at an estimated cost of INR 219 cr. Phase II of the project involves development of the North and South Buckingham Canals, Commamur canal, and Kaluvelly tank at an estimated cost of INR 906 cr.

However, the stretch with the highest potential would be between Amaravati, the new capital of Andhra Pradesh, and the new proposed ports along the coast, such as Machilipatnam and Vodarevu. The stretch may have potential to transport 3 to 5 MTPA of bulk commodities by 2020. It may also be possible to transport containers using a multimodal hub along the riverfront near Amaravati.

While it has preliminary potential, the viability of the NW4 project needs to be assessed through a more detailed project report to estimate project cost and validate the estimated traffic potential.

EXHIBIT 3.19

National Waterway 4



3.2.2.4 National Waterway 2

National Waterway 2 (NW2) is an 891-km long waterway connecting Dhubri on the Bangladesh border with Sadiya in Assam. It currently has nine fixed terminals and one floating terminal (Exhibit 3.20).

The Brahmaputra, along with its continuous water routes leading up to the ports of Kolkata and Haldia, is a very important traditional IWT route. Under an agreement with the Government of Bangladesh, the Central Inland Water Corporation Limited and other Indian vessel operators are plying their cargo vessels between the Assam and Kolkata regions using IWT transit facilities through Bangladesh.

The waterway has a potential to cater to the traffic in the northeastern region of the country and relieve pressure on the already congested Siliguri corridor Instead of travelling by road or rail, goods from the Northeast can instead travel by waterway down the Brahmaputra (Jamuna) river into Bangladesh and Chittagong port from where they can be either exported or coastally shipped to other states of India. Several basic commodities, including food grains and fertilisers, could be transported more efficiently through this route. Exports from this region, such as handicrafts, spices and rubber, could also be exported using this waterway.

EXHIBIT 3.20

A more detailed project report needs to be prepared to validate the traffic potential, assess the capital and operating costs and determine feasibility.

3.2.3 Railways

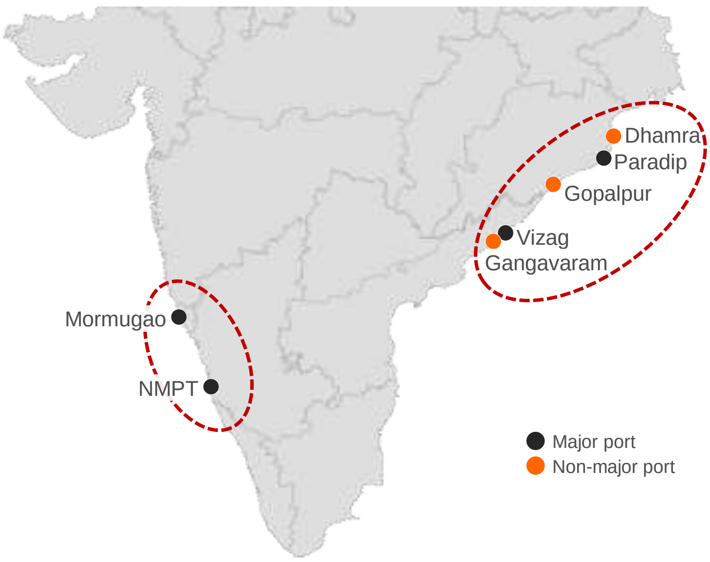
3.2.3.1 Basic infrastructure creation

Indian railways is the mainstay for the freight transportation in the country. Major commodities moving on rail include thermal coal, coking coal, iron ore, steel as well as EXIM containers from the Northern hinterland. The growth in the network of railways has not been able to keep pace with the economic and cargo growth, putting pressure on the existing network creating multiple bottlenecks.

Two pockets have been identified where the rail infrastructure would need to significantly ramp up - resource rich region of Odisha and Chhattisgarh for movement of bulk cargo, and Northern Karnataka and Southern Maharashtra lying to the east of Western Ghats (Exhibit 3.21).

EXHIBIT 3.21

Railway infrastructure bottlenecks



As mentioned in Chapter 2, 150 to 180 MTPA of coal can be shifted from the conventional rail mode of transport to coastal shipping by 2020. However, for such a shift to take place, large capacity augmentation at the ports will have to be accompanied by expansion of port connectivity to the hinterland which produces and consumes coal. Given that mine to port movement of coal in India is entirely by rail, increasing the capacity of the relevant railway lines is an essential prerequisite.

The most important stretch for coastal shipping of coal is the Ib/Talcher to Paradip route. A total potential of approximately 150 to 180 MTPA of thermal coal movement from Ib/Talcher to Paradip by 2020 as well as about 20 MTPA of coking coal/imported coal in backhaul is identified across commodities. Added to this is the increased opportunity for iron ore/coking coal traffic as a result of the installation of new steel plant/steel pelletisation clusters.

COAL VOLUMES EXPECTED ON ORISSA-CHHATTISGARH RAIL LINE

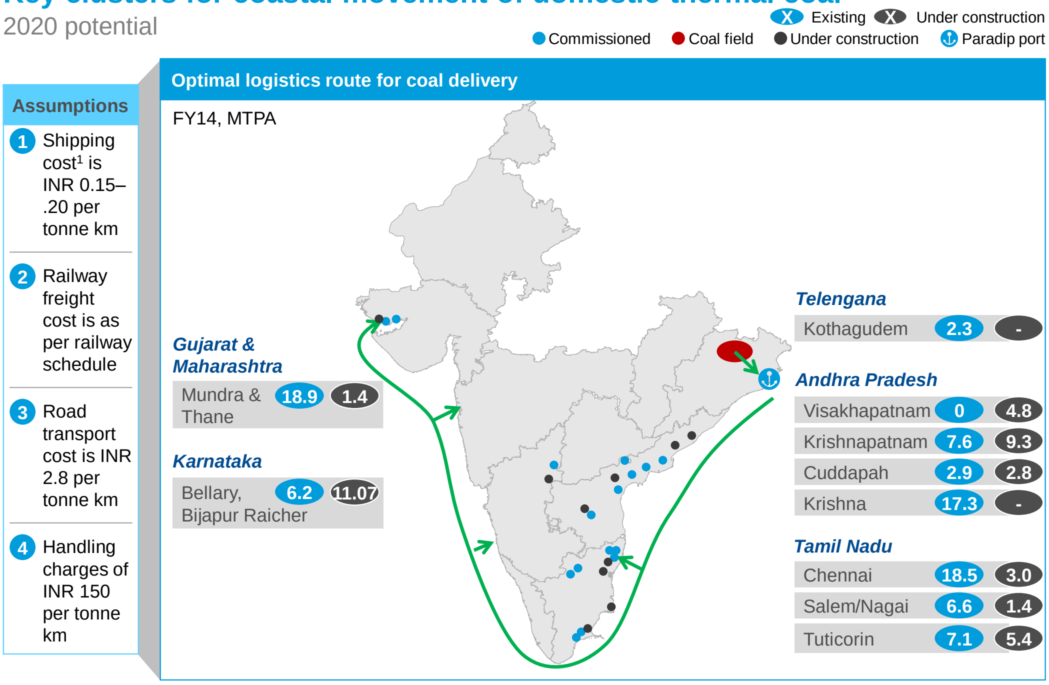
Commodity	Location	**Volume** (MTPA)
Thermal coal	MCL mines (Talcher/Ib valley)–Paradip	150–180
Imported coal	Paradip–Odisha/Chhattisgarh power plants	5
Coking coal	Paradip–SAIL Rourkela, Bhushan Steel Sambalpur, TISCO Kalinganagar	15

As most receiving plants for thermal coal are situated in the coastal regions of Andhra Pradesh, Tamil Nadu and Gujarat and are close to the ports, greater focus will be on strengthening supply-side connects from mine to port and onwards in connectivity projects (Exhibit 3.22).

EXHIBIT 3.22

Key clusters for coastal movement of domestic thermal coal

2020 potential



1 Excluding handling cost which is considered separately

SOURCE: Sigma Insights; coal optimisation model

Currently, only about 17 rakes on an average move daily from Talcher to Paradip. There are many sectors within these routes between Talcher/Ib Valley and Paradip/Dhamra where the line capacity utilisation is quite high (Table below). At present, although the entire Talcher-Paradip line is doubled and electrified, the heavy freight traffic on that line makes it imperative to expedite 2 critical initiatives between Talcher – Paradip – Automatic Signalling and Intermediate Block Signalling projects on the entire Talcher-Paradip route, and 3rd and 4th line from Budhapank to Salagaon. Similarly, in case of the rail corridor towards Dhamra port, there is heavy congestion on the stretch between Kapilas Road and Bhadrak on the main Howrah to Chennai line, with utilisation as high as 130-140 per cent on the ~85 Km long Kapilas Road—Bhadrak stretch. On the Ib Valley side, there is heavy congestion on the railway lines from Jharsuguda up to Angul and Titlagarh.

IB VALLEY/TALCHER TO PARADIP/DHAMRA RAIL LINK

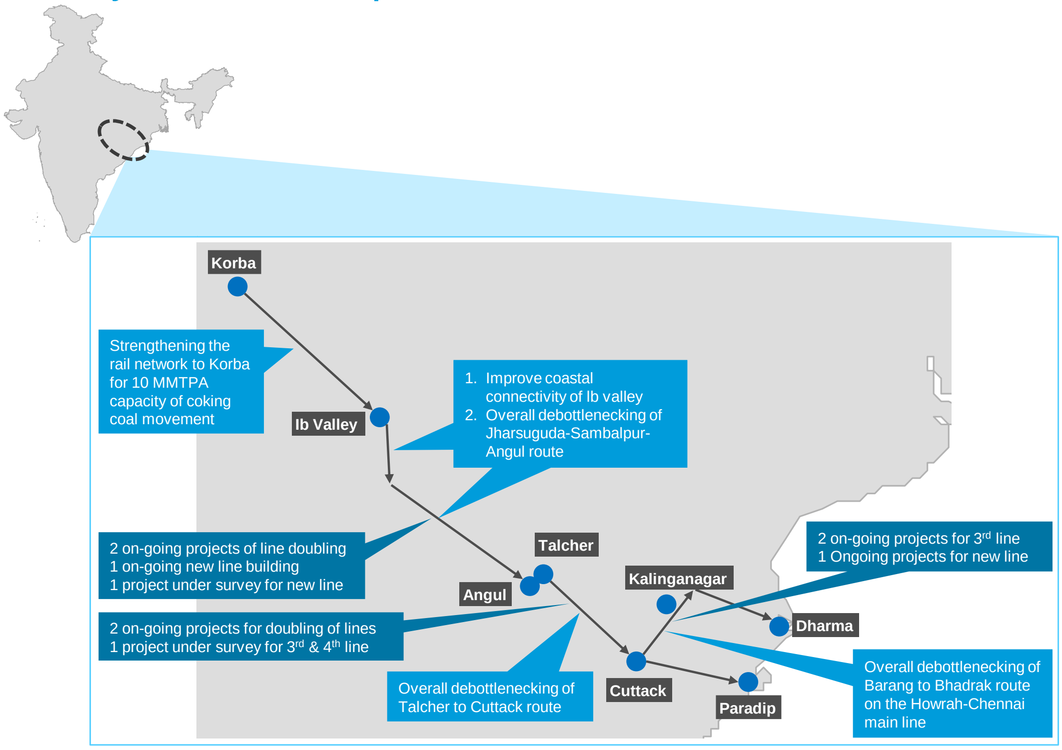
S No.	Section	Div./Rly	Distance (km)	Line capacity	Capacity utilisation (%)
1	Talcher–Budhapank	Khurda Road–ECOR	11	61	100
2	Budhapank–Rajatgarh	Khurda Road–ECOR	62	52	117
3	Rajathgarh–Salagaon	Khurda Road–ECOR	23	56	92
4	Salagaon–Nirgundi	Khurda Road–ECOR	3	61	47
5	Nirgundi–Cuttack	Khurda Road–ECOR	9	60	134
6	Cuttack–Paradip	Khurda Road–ECOR	83	43	89

As per the projected volumes of coastal shipment of thermal coal, the required daily movement could potentially increase almost five to seven times demanding up to 120 rakes per day. Therefore, alongside the heavy haul rail system, certain line strengthening/expansion interventions would be required in many sectors for realising the full opportunity.

Exhibit 3.23 present the ongoing and upcoming projects of the Indian Railways, which in the near and medium term (by 2020) would lead to a capacity increase of roughly 60 to 70 MTPA. Expeditious and smooth execution would enable quick ramp up of coastal cargo from the state.

EXHIBIT 3.23

IB Valley/Taclher to Paradip/Dhamra rail link



To service the demand of blast furnace-based steel production, around 60 to 65 MTPA of coking coal is transported in the country and around 54 MTPA is consumed for the production of steel. Around 80 per cent of the coking coal consumed is imported. Key challenges faced by the industry are related to congested railway lines and shortage of rolling stock and locomotives. The current rail network is already congested and may not be sufficient for the projected freight load due to the growth caused by programmes like “Make in India” and anticipated increase in steel production. Over 90 per cent of rail routes relevant for the movement of coking coal have more than 100 per cent utilisation, such as the Howrah–Bilaspur, Visakhapatnam–Bhilai, Dhamra/Paradip–Bhilai/Rourkela and Dhamra/Paradip–Durgapur/IISCO lines. This causes delays in transporting coking coal from the ports to the plants. For example, the travel time for coking coal from Visakhapatnam port to Bhilai plant is approximately 1.5 times the average.

Keeping these factors in mind, capacity augmentation on multiple routes would be required to solve port evacuation issues on the eastern side of the country.

While the Ib/Talcher to Paradip/Dhara capacity augmentation and Eastern DFC will solve many of the mentioned capacity issues, the other major route is between Chhattisgarh steel belt and Visakhapatnam port which is quite important for steel-related connectivity.

Projects for the Eastern coast

Project name	Agency	Port	Investment required (INR cr)
Rail connectivity between proposed Port at Sagar Island and Kashinagar Rail station.	IPRCL/Port Trust	Sagar	270
Northern Rail Link connecting north of Minjur to KPL	IPRCL	Ennore	244
Doubling of rail line from Bhadrak to Dhamra Port	Private port	Dhamra	1,500
IB signalling for RV line	Indian Railways	Vizag	50
Decongesting RV line (Vizag & Gangavaram port) - 2nd line	Indian Railways	Vizag	4,200
Heavy Haul railways corridor from Salegaon to Paradip port	Indian Railways	Paradip	3,000
Third line from Jakhapura to Haridaspur	Indian Railways	Paradip	150
3rd line from Bhadrak to Nergundi	Indian Railways	Paradip	837
3rd and 4th line from Budhapank-Salegaon via Rajatgarh	Indian Railways	Paradip	1,200
Doubling of line from Rajatgarh to Barang	Indian Railways	Paradip	276
Doubling of line from Sambhalpur to Talcher	Indian Railways	Paradip	679
Doubling of line from Titlagarh to Sambhalpur	Indian Railways	Paradip	1,351
New Line from Angul to Sukhinda Road	Indian Railways	Paradip	679
New Line from Haridaspur to Paradip	Indian Railways	Paradip	1,118
Third line from Sukhinda Road to Jakhapura	Indian Railways	Paradip	56
New line from Jharsuguda to Barpalli	Indian Railways	Paradip	1,000
Double rail track from Gopalpur Port to Chatarpur	IPRCL/Port Trust	Gopalpur	140

Even if all the rail projects proposed in the area were to be developed in the next five years, the lines would still be running at 100 per cent utilisation, assuming the base case of 80 to 90 MTPA of coal being coastally shipped. In the event that all power plants, for whom coastal shipping works out to be cheaper than rail, were to opt for the coastal route, the volume of coastally shipped coal would reach around 130 MTPA by 2020. Additionally, in case port-based linkage enabled smaller non-power players to take coastally shipped coal, an additional capacity of 50 MTPA will be required on this line.

Hence, in the longer term, larger solutions are required to cater to the demand on this route. In this regard, a heavy haul rail system between Talcher-Ib Valley and Paradip could be considered. A heavy haul system has a number of advantages:

- Higher capacity wagons and more wagons per rake resulting in lesser number of rakes required

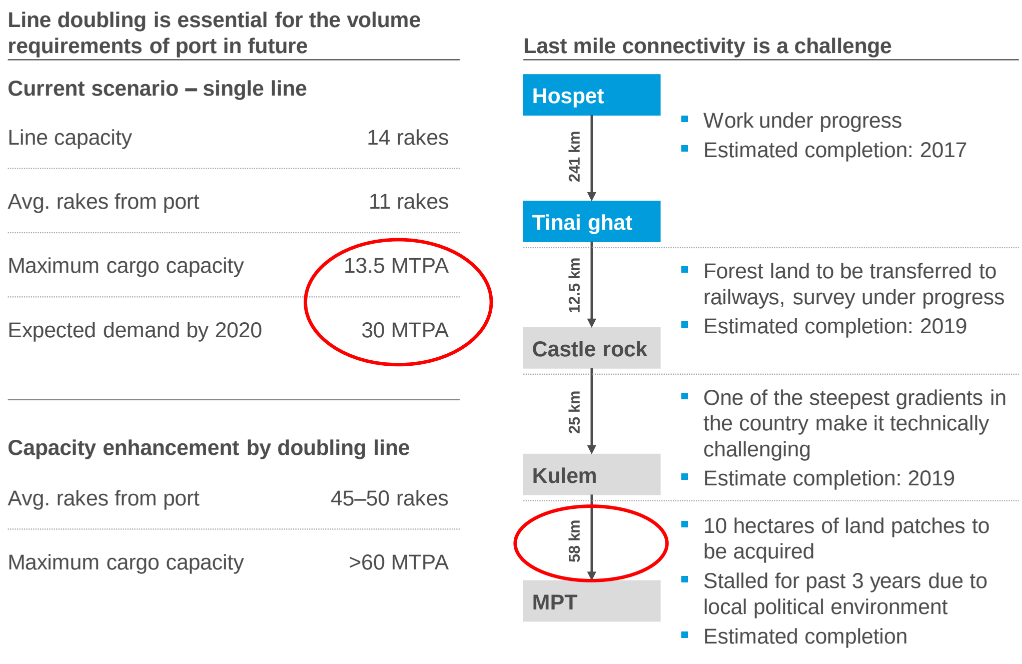
- Decrease in the number of loading and unloading streams required due to fewer rakes

The current connectivity between the Goa and Bellary clusters is running at critical utilisation, with very limited scope for increasing capacity, hindering the development of new ports in North Karnataka, e.g., Belekeri, Tadadi and Pavinkurve.

Hospet–Vasco is a key line which connects the Mormugao port with the steel clusters located in Bellary and Tornagallu and with the power plant clusters situated in Kudgi, Belgaum. The average daily rake frequency of 10 to 11 transports mainly thermal coal and imported coking coal at a current effective capacity utilisation of around 95 per cent[9]. Efforts to improve connectivity would need be taken keeping in mind the expected increase in demand of coking coal and thermal coal to amount to 30 MTPA from the existing 13.5 MTPA (Exhibit 3.24).

EXHIBIT 3.24

Hospet – Mormugao connectivity improvement



The commissioning of double line on the entire Hospet–Vasco route would need to be considered with a long-term view of boosting rail line capacity post 2025. Expediting

[9] South Western Railway Headquarters, Hubli

construction of the section passing through the Western Ghats on the Castle Rock–Kulem stretch would require significant technical expertise.

In the short to medium term, two strategies could be considered to boost the capacity on this line:

- Exploring the feasibility of using heavy haul rail system by strengthening the existing line and making it 25T axle load compliant. This would lead to an increase of 25 to 30 per cent in capacity.
- Allowing goods trains to run simultaneously with passenger trains from Castle Rock to Kulem. Currently, as per the order of the Railway Commissioner (Safety), if a passenger train travels downhill on that route, no other goods train is allowed to move in this section even though the goods trains are well equipped with supplementary braking power in the event of a brake failure. If allowed to run simultaneously, there could be a potential to increase the rakes per day by 15 to 20 per cent.

As a result of brisk doubling of the Hospet–Tinaighat section, there is also a “risk” of passenger trains getting augmented on the Mumbai–Bengaluru route (via Londa junction). The long-term impact of this on the freight route between Hospet–Vasco needs to be assessed.

Key projects

Project name	Agency	Port	Investment required (INR cr)
Hospete-Hubballi-Londa-Tinaighate-vasco da gama at Mormugao	Railways	Mormugao	1,458
Bellikeri port to Ankola railways line	Railways	Mormugao	1,420
Rail evacuation from port to Hospet and Bellary (Hubli–Ankola link)	Railways	Mangalore	2,200

3.2.3.2 Last mile connectivity

In addition to the sending ports, it is important to improve the connectivity of the receiving ports to the final consuming power plants in the country. Krishnapatnam is a port that need to be connected to power plants to ensure that the end-to-end landed cost of this mode is cheaper than a mine-to-plant rail connect.

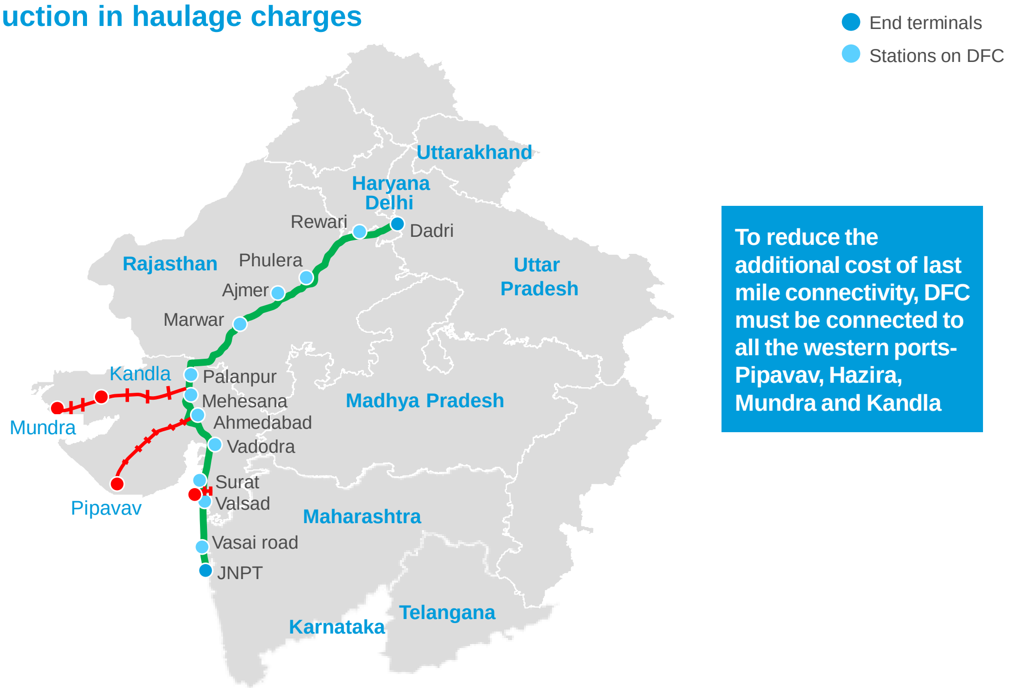
Last mile connectivity projects

Project name	Agency	Port	**Investment required** (INR cr)
New rail line between Obulavaripalle and Krishnapatnam	Railways	Krishnapatnam	1185
Doubling of Krishnapatnam–Venkatachalam	Railways	Krishnapatnam	87

Last-mile connectivity of the western Dedicated Freight Corridor (DFC) to Gujarat/Maharashtra port is critical for EXIM container evacuation. To avoid at least last mile connectivity charges, DFC stations need to be connected to the nearest ports. Three spur line projects, which connect the ports to the western DFC, have been proposed (Exhibit 3.25).

EXHIBIT 3.25

DFC can make rail economically more viable due to reduction in haulage charges



SOURCE: DFCCIL

Proposed spur lines for railways

Project name	Agency	Port	**Investment required** (INR cr)
Connection of western DFC to Hazira	Railways	Hazira	3,500
Connection of western DFC to Pipavav	Railways	Pipavav	2,500
Connection of western DFC to Mundra	Railways	Mundra	300

3.2.3.3 New multi modal hubs

Setting up multimodal hubs at the right locations enables the overall transportation grid of the country to function efficiently and also reduce the cost and time taken to export, making the exporters competitive in the global market. In order to address this challenge, seven locations have been identified, as potential sites for multimodal hubs, through the multi-model optimisation model where the total EXIM traffic at each container generating point in the country and the traffic required for daily service were analysed. These container generating points were superimposed on the existing multimodal hub network in the country to locate regions where containers have to travel long distances to reach an aggregation point. Some of the shortlisted locations were later removed due to their proximity to ports. An illustration of the process can be seen in Exhibit 3.26. Isolated pockets and locations for proposed multimodal hubs are shown in Exhibit 3.27 and 3.28. In this section, ICDs refer to land based multimodal hubs and have been used interchangeably.

EXHIBIT 3.26

Methodology used to come up with hypothesis for the locations of new ICDs

Traffic

- Analysis of the total EXIM traffic of each container generating hinterland in the country
- Traffic required for a daily service ~30,000 TEU/annum

\+

Current locations

- Additionally we also superimposed the existing ICD locations in country which can cater to the traffic generate by these hinterlands
- Maximum allowable aerial distance to nearest ICD taken as 100 KM

Shortlisted locations

First set of shortlisted locations

- Central Telangana
- North Chhattisgarh
- Central Chhattisgarh
- South Gujarat
- Rajkot
- North Western Odisha
- Bikaner-Bhilwara belt in Rajasthan
- Coastal Central TN
- Bordering areas of Uttarakhand and UP
- North WB

Proximity to ports (direct road access)

Proposed location

- North Chhattisgarh
- Central Chhattisgarh
- Central Telangana
- North Western Odisha
- Bikaner-Bhilwara belt in Rajasthan
- Bordering areas of Uttarakhand and UP
- North WB

The seven proposed multimodal hubs lie in the states of Madhya Pradesh, Chhattisgarh, Rajasthan, Odisha, Uttarakhand and West Bengal. All the multimodal hubs are situated in regions of high potential for traffic with important industrial clusters, which makes their presence advantageous for the transport of containerised commodities. The presence of these multimodal hubs reduces the distance that the commodities have to travel in order to be aggregated for formal transport. For instance, the proposed ICD in West Bengal reduces the distance for perishable commodities, such as pineapples, mangoes, litchis and tea, to reach an ICD. ICDs in Chhattisgarh, Odisha and Telangana would ideally be linked to container terminal at Visakhapatnam port for optimising the movement. Specific details about the seven ICDs are given in the following Exhibit 3.29, 3.30, 3.31, 3.32 3.33 and 3.34.

EXHIBIT 3.27

Based on the above analysis we have shortlisted 7 new ICD locations where significant traffic can be foreseen

New network of ICDs going in future

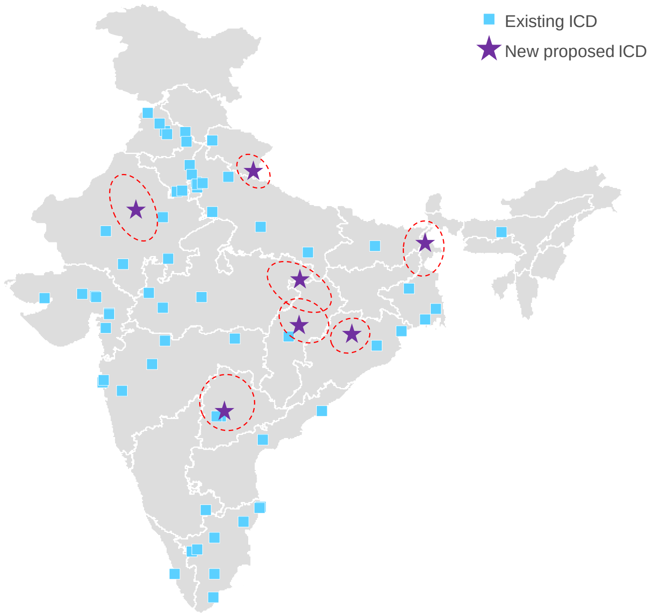


EXHIBIT 3.28

There are 6-7 isolated pockets with limited ICD connectivity in the country

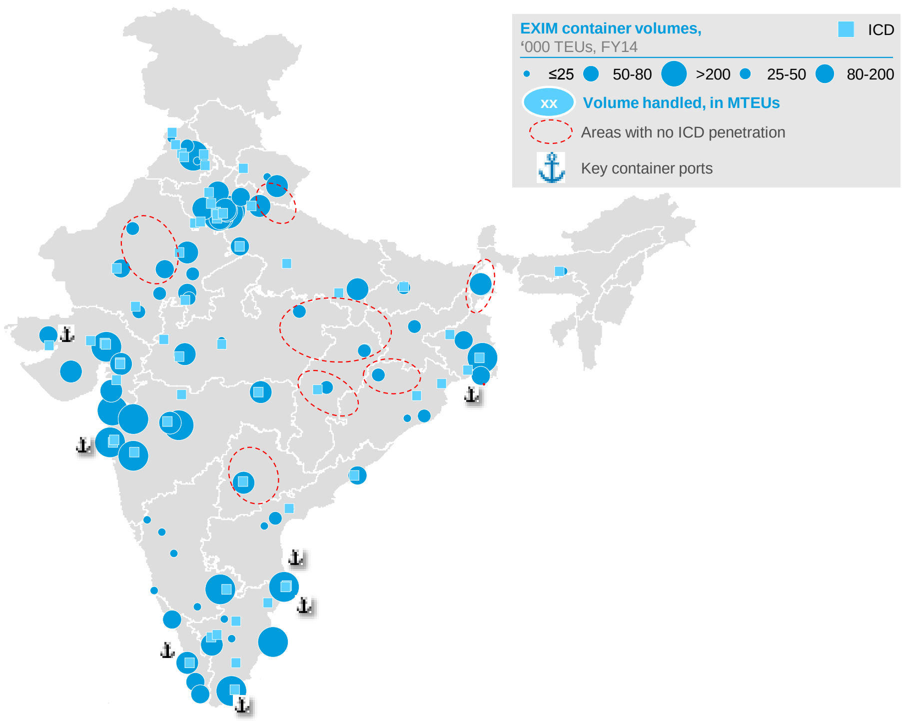


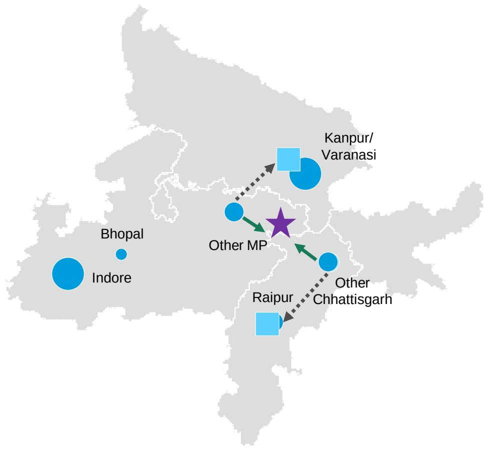
EXHIBIT 3.29

Location justification for East MP/North Chhattisgarh

EXIM container volumes, '000 TEUs, FY14

- ≤25
- 25-50
- 50-80
- 80-200
- >200
- ICD
- Proposed location

Hinterland for ICD



Rationale and impact

Rationale

- Key Hinterland
  - Korba/Bilaspur belt in Chhattisgarh
  - Katni, Jabalpur, Satna region (Cement production)
  - South East UP
- Nearest alternate: Madhosingh and Raipur

Impact

- Distance reduction: 150 km
- Capacity required in 2020: 104,000

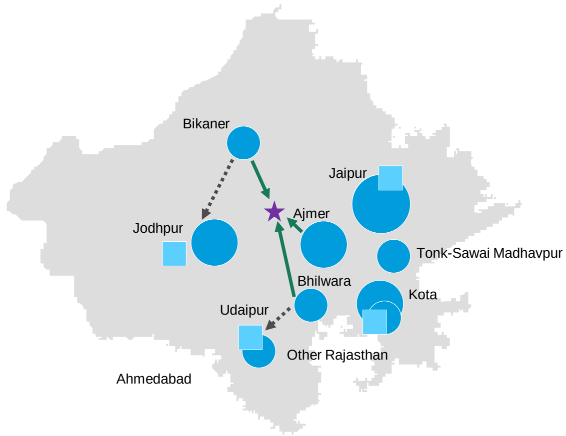
EXHIBIT 3.30

Location justification for Central Rajasthan ICD

EXIM container volumes, '000 TEUs, FY14

- ≤25
- 25-50
- 50-80
- 80-200
- >200
- ICD
- Proposed location

Hinterland for ICD



Rationale and impact

Rationale

- Key Hinterland
  - Bikaner
  - Ajmer
  - Bhilwara
- Nearest alternate: Bhagat ko Kothi and Kankpura

Impact

- Distance reduction: 130 km
- Capacity required in 2020: 200,000

EXHIBIT 3.31

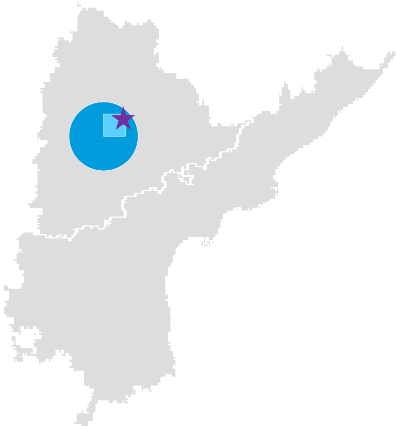
Location justification for Telangana ICD

EXIM container volumes, '000 TEUs, FY14

≤25 | 25-50 | 50-80 | 80-200 | >200

ICD | Proposed location

Hinterland for ICD



Rationale and impact

Rationale

- Key Hinterland
  - Hyderabad
- Nearest alternate: Sanatnagar (which is already congested and does not have linkages to VPT)

Impact

- Capacity required in 2020: 100,000

EXHIBIT 3.32

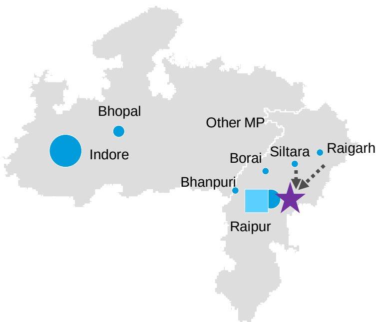
Location justification for Central Chhattisgarh ICD

EXIM container volumes, '000 TEUs, FY14

≤25 | 25-50 | 50-80 | 80-200 | >200

ICD | Proposed location

Hinterland for ICD



Rationale and impact

Rationale

- Key Hinterland
  - Raipur
  - Raigarh
  - Siltara
  - Borai
  - Bhanpuri
- Nearest alternate: Raipur ICD

Impact

- Capacity required in 2020: 40,000

EXHIBIT 3.33

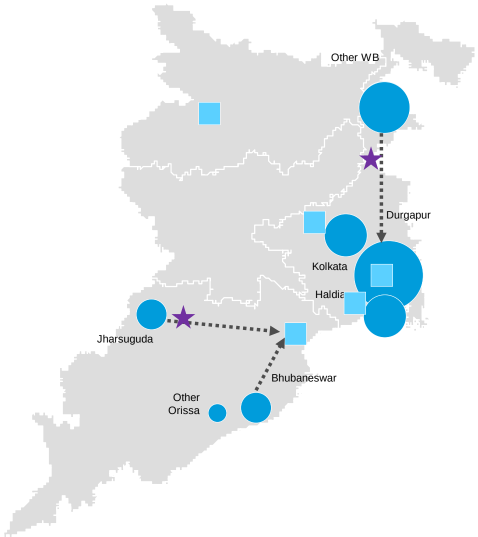
Location justification for Bengal and Odisha ICDs

EXIM container volumes, '000 TEUs, FY14

≤25 · 25-50 · 50-80 · 80-200 · >200

ICD · Proposed location

Hinterland for ICD



Rationale and impact

Rationale

- Key Hinterland
  - Darjeeling
  - Bhubaneshwar
  - Jharsuguda
  - Farraka
- Nearest alternate: Balasore or Kolkata

Impact

- Distance reduction: 300 km (Jharsuguda) and 300 km (North Bengal)
- Capacity required in 2020: 45,000 Bhubaneswar and 120,000 Northern Bengal

EXHIBIT 3.34

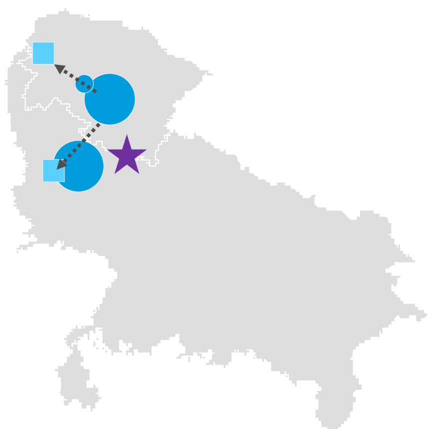
Location justification for Uttarakhand/UP ICD

EXIM container volumes, '000 TEUs, FY14

≤25 · 25-50 · 50-80 · 80-200 · >200

ICD · Proposed location

Hinterland for ICD



Rationale and impact

Rationale

- Key Hinterland
  - Western UP
  - Eastern Uttarakhand
- Nearest alternate: Baddi or Moradabad

Impact

- Distance reduction: ~100 km for UP and Uttarakhand hinterlands (except Baddi and Moradabad)
- Capacity required in 2020: 200,000

Key projects

Project name	Agency	Concerned state	Investment required (INR cr)
New ICD Development in Raipur	CONCOR	Chhatisgarh	207
New ICD Development in North Bengal(Darjeeling)	CONCOR	West Bengal	85
New ICD Development in Hyderabad	CONCOR	Telangana	120
New ICD Development in Central Rajasthan(Nagaur)	CONCOR	Rajasthan	85
New ICD Development in North MP/CG border(Singrauli)	CONCOR	Madhya Pradesh	85
New ICD Development in South Uttarakhand	CONCOR	Uttarakhand	120
New ICD Development in Jharsuguda	CONCOR	Odisha	100

3.2.3.4 Initiatives

3.2.3.4.1 Aggregation of ICDs through milk runs

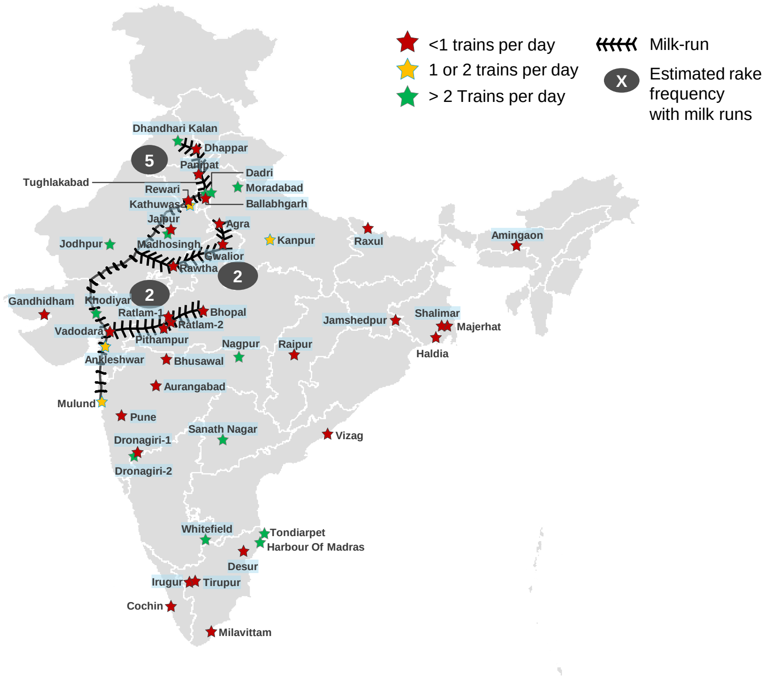
Many ICDs in India currently suffer from infrequent and unpredictable train schedules. Aggregation of ICDs in the form of a “milk-run” would mean the same train going through different ICDs to aggregate containers to improve frequency of trains at different ICDs. Some ICDs which can be inter-connected to finally connect to a DFC station include (Exhibit 3.35):

- Dhandhari Kalan → Dhappar → Panipat → Tughlakabad
- Agra → Gwalior → Rawtha
- Bhopal → Ratlam → Pithampur → Vadodara

EXHIBIT 3.35

A “milk-run” service connecting ICDs will improve rail rake frequency

FY14



3.2.3.4.2 Increasing priority for freight trains on railways network

One of the major reasons for the slow movement of the freight trains on the rail network is the fact that freight traffic is given the lowest priority in terms of right of way on the tracks. Given that freight is one of the biggest revenue generators for the railways, due weightage should be given to freight while deciding the right of way on the tracks.

3.2.3.4.3 Integrated pricing for first and last mile stretch

For an efficient multi modal model, it is important to have an integrated system for all the legs of transport. Currently, railways charges separately for the first and last mile of connectivity, based on their slab rates. Having an integrated pricing for the total distance including the first and last mile will have a huge impact on reducing the cost as well as integrating the multi modal model. Exhibit 3.36 shows an illustrative example of integrated rail freight charges. For instance rail freight charge for Talcher to Krishna with first mile (Talcher to Paradip) and last mile (Kakinada to Krishna) taken separately would be significantly higher than the freight charge in case of integrated pricing for first and last mile.

EXHIBIT 3.36

Build a true multimodal system by having integrated rail freight charges for first and last mile connectivity

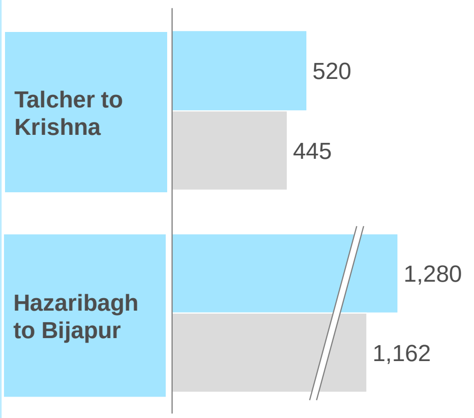
Coastal shipping supported by first and last mile connectivity

Current – separate charges for first and last mile

Integrated charges for first and last leg

Railway fare comparison

INR per tonne



3.2.4 Roads

Road is economical compared to rail for covering distances up to 500 to 1,000 km from the port and is convenient for final exporters or importers as it provides delivery at the doorstep without additional handlings. But the current condition of highway stretches is inconsistent. In addition, the Indian coastline does not have a coastal road network.

The following interventions have been proposed for highways.

3.2.4.1 10 highway stretches to be developed as freight friendly expressways

Freight friendly lanes would be needed to improve road transit time from factory to port. Exhibit 3.37 outlines potential road corridors based on traffic intensity. These corridors could to handle approximately 6 mn TEUs by FY 2025.

EXHIBIT 3.37

Current and potential critical road routes for containers

Road	EXIM volumes '000 TEUs FY14	FY25
1 Ahmedabad/Surat/Vadodara/Vapi-JNPT	552	1,597
2 Pune-JNPT	576	1,551
3 Coimbatore-Colachel	0	167
4 Ahmedabad-Mundra	234	678
5 Bangalore/Trichy-Enayam	0	483
6 Durgapur-Haldia	227	439
7 Ahmedabad- Pipavav	145	432
8 Hyderabad-JNPT	60	147
9 Hyderabad-Amravati-Central Andhra port	60	139
10 Bangalore-Chennai	141	136
Total	**1,997**	**5,768**

- **Probable case for construction of 10 freight friendly road corridors expected to handle ~6 mn TEUs by FY25**

SOURCE: APMT

Project name	**NH**	**Description**	**Status**	**Cost** (INR cr)
Ahmedabad to JNPT (Concerned State: Gujarat)	■ NE1 from Ahmedabad to Vadodara ■ NH8 from Vadodara to Ghodbunder ■ State highway 42 from Ghodbunder to Thane ■ NH4 from Thane to JNPT	■ 6-laning from Ahmedabad to Vadodara completed recently ■ 6-laning of Vadodara–Surat section under construction ■ 6-laning of Surat–Dahisar section completed ■ 4-laning of NH4B connecting JNPT to Mumbai–Pune Expressway under way ■ Mumbai–Vadodara Expressway project: 2 phases under construction; 1 phase scrapped due to land acquisition	■ 6-laned from Ahmedabad to Ghodbunder except Vadodara–Surat section ■ 4-laning underway rom Mumbai–Pune Expressway to JNPT	18,000
Pune to JNPT (Concerned State: Maharashtra)	■ SH50 from Dighi ICD to Mumbai–Pune Expressway ■ NH4 from Talegaon to Panvel NH4B from Panvel to JNPT	■ Mumbai–Pune Expressway is an access controlled 6-lane Expressway ■ 4-laning of NH4B connecting JNPT to Mumbai–Pune Expressway underway	■ 6-laned up to Panvel ■ 4-laning underway from Mumbai-Pune Expressway to JNPT	4,500
Coimbatore to Enayam (Concerned State: Tamil Nadu)	■ SH172 to Kangayam ■ NH67 to Vallaikoil ■ SH84c to Aravaakurichi ■ NH7 to Kavalkinary ■ NH47 to Enayam	■ 4-laned from Aravakurichi to Kavalkinaru ■ 2-laned road from Kavalkinaru to Enayam	■ 4-laned from Aravakurichi to Kavalkinaru ■ 2-laned road from Kavalkinaru to Enayam	13,000
Ahmedabad to Mundra (Concerned State: Gujarat)	■ NH947 from Sarkhej to Maliya ■ NH8A from Maliya to Mundra	■ 6-laning in projects from Samakhiyali to Mundra in 2 packages	■ 4-laned; 6-laning partly in progress	10,000

Project name	NH	Description	Status	Cost (INR cr)
Bangalore to Enayam (Concerned State: Karnataka, Tamil Nadu)	■ SH45 from Whitefield to Attibele ■ NH45 from Attibele to Krishnagiri ■ NH7 from Krishnagiri to Kavalkinaru ■ NH47 from Kavalkinaru to Enayam	■ 6-laned up to Krishnagiri ■ 4-laned from Krishnagiri to Kavalkinaru ■ 2-laned road from Kavalkinaru to Enayam	■ 6-laned up to Krishnagiri ■ 4-laned from Krishnagiri to Kavalkinaru ■ 2-laned road from Kavalkinaru to Enayam	20,000
Panagarh (Durgapur) to Haldia (Concerned State: West Bengal)	■ NH2 From Panagarh to Dankuni ■ NH6 from Dankuni to Kolaghat ■ NH41 from Kolaghat to Haldia	■ Entire stretch has been 4 lanes NHAI has identified Kolkata–Dhanbad as one of 7 Expressway projects but feasibility to be revisited Panagarh–Dankuni also identified as a 6-laning project under NHDP 6	■ 4-laned	9,000
Ahmedabad to Pipavav (Concerned State: Gujarat)	■ NH 8A from Sarkhej to Bagodara ■ SH 40, 6 and 36 from Bagodara to Budhel ■ NH 8E from Budhel to Pipavav	■ 4 laning from Budhel to Pipavav balance for award for 4 laning under NHDP IV	■ 4 lane road from Sarkhej to Budhel ■ 2 lane road from Budhel to Pipavav	9,000
Hyderabad to JNPT (Concerned State: Andhra Pradesh, Maharashtra)	■ NH8 from Sanathnagar to Solapur ■ Mumbai–Pune Expressway to Panvel ■ NH4B from Panvel to JNPT	■ Mumbai–Pune expressway is an access controlled 6-lane Expressway ■ 4-laning of NH4B connecting JNPT to Mumbai–Pune Expressway underway	■ City roads from Sanathnagar to Sangareddy ■ 4-laning underway from Sangareddy to Maharashtra–Karnataka border ■ 4-laning underway from Maharashtra–	22,000

Project name	NH	Description	Status	**Cost** (INR cr)
			Karnataka border to Solapur ■ 4-laning underway from Solapur to Pune ■ 6-laned from Pune up to Panvel, Mumbai–Pune Expressway ■ 4-laning underway from Mumbai Pune Expressway to JNPT	
Hyderabad to Vodarevu[1] (Concerned State: Andhra Pradesh)	■ City roads from Saanthnagar to LB Nagar ■ NH9 from LB Nagar to Vijayawada ■ NH5 from Vijayawada to Chilakuripeta ■ Local road from Chilakuripeta to Vodarevu	■ 6-laning underway from Vijayawada to Chilakuripet on NH5	■ 4-laned up to Vijayawada ■ 4-laned from Vijayawada to Chilakuripeta	10,000
Bangalore to Chennai (Concerned State: Karnataka, Tamil Nadu)	■ SH45 from Whitefield to Attibele ■ NH45 from Attibele to Maduravoyal Poonamallee High Road to Chennai Port	■ 6-laning from Attibele to Walajahpet Completed ■ 6-laning underway from Walajahpet to Poonamalle The stretch is identified as one of the 7 proposed expressways	■ 6-laned up to Walajahpet ■ 4-laned up to Maduravoyal	10,000

1 Central Andhra port – Location subject to change

3.2.4.2 Last-mile connectivity and Bharatmala

Apart from containers, all other types of cargo utilise road primarily for their first and last mile movement. As part of the Sagarmala study last-mile road connectivity projects have been identified.

Port connectivity projects

Project name	Agency	Port	Investment (INR cr)
Upgrading of the existing four lane road connecting to NH16 at Gajuwaka to Gangavaram Port in to six lane road in the State of Andhra Pradesh	NHAI	Gangavaram	50
Flyover for GTI Entry/Exit Over the Rail Tracks at JNPT	Port Trust	JNPT	70
Improvement of road Connectivity to facilitate the trade and Port users at KOPT	Non-NHAI/Port trust	KoPT	24
Road circulation plan for ease of movement of break bulk cargo at Mormugao	Non-NHAI/Port trust	Mormugao	50
Road Connectivity to Hare island (Tuticorin Port)	Non-NHAI/State Highways/Port Trust	Tuticorin	12
Development of roads connectivity to Cuddalore Port	Non-NHAI/State Highways/Port Trust	Sirkazhi	100
Development of 7.2Km green field road connecting NH 65 to Machilipatnam Port in the State of Andhra Pradesh.	AP Ports Dept/MoS	Machilipatnam	175
Construction of RoB cum Flyover at Ranichak level crossing at Kolkata Port	NHAI - SPV	KoPT	128
Azhikkal Port - Proposed NH – Bypass and widening of 2 km.	Non-NHAI/Road and Bridges Development Corporation of Kerala	Azhikkal	61
Evacuation road for proposed standalone Container Terminal (330m extension to DPW terminal) at JNPT	Port Trust	JNPT	54

Project name	Agency	Port	Investment (INR cr)
Flyover at Y Junction for Decongestion of Traffic Flow at JNPT	NHAI	JNPT	200
Upgrading existing B.T Road in to C.C. pavement from Burmah Shell area to security gate near Sakthi Gas Plant at Kakinada Anchorage port, AP	NHAI	Kakinada	15
Development of greenfield bypass road for better connectivity of Gangavaram port in Visakhapatnam District (Lanes to be specified)	NHAI	Gangavaram	80
Formation of a New by pass parallel road west of NFCL and CFL in Kakinada Port (Kakinada), AP	NHAI	Kakinada	70
RoB at Dummalapeta and Old Port Area (Kakinada)	NHAI	Kakinada	80
Development of 5 km Greenfield road connecting north and south industrial cluster of Khandaleru Creek near Krishnapatnam port	NHAI	Krishnapatnam	90
Upgrading of Manginapudi Beach Road to a 4 lane road to connect to cater to Machilipatnam	Non-NHAI/Port trust	Machilipatnam	60
Development of Four Lane green field road from Machilipatnam North Port to NH-SH-46 in the State of Andhra Pradesh	Non-NHAI/Port trust	Machilipatnam	232
Connectivity of Vizag port to NH-16 (Phase II)	NHAI - SPV	Vizag	99
Road Connectivity From Outer Harbour To Port Connectivity Junction (B) at Vizag port	Port Trust	Vizag	13.5
Construction of grade separator from H-7 area to Port connectivity Road by passing Convent Junction - Vizag Port	NHAI - SPV	VIzag	90
RoB on Kandla-Kutch Road	Port Trust	Kandla	125
	Port Trust	Chennai	63

3.2.4.3 Initiatives

3.2.4.3.1 Reduction of cost and time by policy initiatives

Currently, India ranks 54th on the logistics performance index (LPI) issued by the World Bank. There are potential options for policy-related actions that could help reduce the overall cost and time for export. The details of these interventions are given in Exhibits 2.38 and 2.39. The numbers in these examples have been taken for a sample Delhi-to-Mumbai route, which is currently one of the major trunk routes of the country.

EXHIBIT 3.38

Possible levers identified for transit time reduction

Element	Levers for time reduction	Time impact (hrs saved per 100 tonne transported)	Rationale
A Reduction stoppage time during transit	1 Integrating dynamic weighbridges, toll nakas and RTO check points 2 RFID enabled seals on vehicles to enable 'zero' stoppage at RTO check posts	2–3	30 min per RTO x 5 RTO points (MAH o/b, AHM- i/b and o/b, Rajasthan i/b and o/b)
	3 Integrated online sales tax platform fed through RFID seal detection on vehicles	3–5	1 sales tax per State x 2.5 hrs per sales tax point
	4 Moving 100% tolling counters to electronic tolling	3–4	15 min per naka x 15 naka per way
	5 Implement chain linking/ double driver models to ensure continuous travel	40	Double driver expected to do away with nearly 90% of resting time currently
B Loading/ unloading centers	6 DP norms for warehousing/ loading centres to mandate for necessary parking lots and sufficient approach roads to avoid truck lines	8–10	Ideally considered 1–2 hrs per truck
C Overall travel speed	7 SLA defined on timely delivery; performance based incentives on % SLA achievement 8 Control tower operations to debottleneck issues enroute	20–25	Potential speed of 45–50 km/hr can be achieved from current 25–30 km/hr
	Total time impact	**60–80**	**Hrs per 100 tonne**

SOURCE: Expert interviews

EXHIBIT 3.39

Four levers identified for cost reduction

Element	Levers for time reduction	Cost impact INR PTPK	Rationale
A RTO expense	9 100% containerisation of vehicles leading to minimal overloading/ tampering possibilities 10 Cashless transactions enabled through fuel cards/online sales tax systems/ electronic tolling, etc. 11 Rationalizing of state wise entry taxes for goods with state GST	Up to 0.1	TBD
B Fuel cost	12 Reduction in time stops (as described in next section) Infrastructure initiatives to improve % of paved surface roads	0.1–0.15	13% increase in vehicle mileage (from ~3.5 to 4 km/L of diesel)
	Total cost impact	0.15–0.2	INR per tonne per km

SOURCE: Expert interviews

3.2.4.3.2 Logistics efficiency programme

As a part of Logistics Efficiency Enhancement Program, following key initiatives could be explored to help improve India's Logistics Performance Index (LPI) ranking

1. Logistics Park Development

   A master plan for logistics parks would need to be developed to facilitate freight aggregation and disaggregation at key locations, based on assessment of freight flows in the country. In addition, there is a need to focus on enabling improvements in multimodal freight movement in the country. Quick win opportunities to improve efficiencies and capacity utilisation of existing logistics infrastructure (railway freight terminal, transport nagars, etc.) through asset light interventions would need to be identified and evaluated.

2. Freight Corridor Upgradation

   Corridors would need to be identified and prioritised for development/ upgrade based on assessment of freight flows and existing road infrastructure. In addition, there is a need to identify bottlenecks around existing road infrastructure (lack of city bypasses, road over bridges, etc.) on key corridors resulting in congestion and a roadmap needs to be developed to remove these bottlenecks.

3. Procedural Complexity Reduction

There is a need to look at opportunities for consolidating documentation requirements and to standardise documents across states. Reduction, standardisation and digitisation of documentation required can be explored to enable easier inter-state freight movement. In addition, there is a need to standardise processes for enabling EXIM cargo, in line with global best practices

4. Development of Information and Communication Technology backbone

   There is a need to design a comprehensive Information and Communication Technology (ICT) backbone to facilitate efficient freight movement. Opportunities to connect various government departments to enable process standardisation through an ICT backbone would need to be explored. Investments in ICT infrastructure to improve freight tracking and traceability would need to be considered.

5. 3PL service provider ecosystem development

   Existing landscape of 3PL service providers would need to be mapped to assess the nature of organisations, reach, and services provided, etc. In addition, a compelling business case could be explored for 3PL service providers/ other partners to partner and operate the logistics parks

3.2.4.4 Simplification of Customs processes

Simplifying customs procedures could help in reducing the time taken in custom clearances. Initiatives like rollout of EDI, implementation of en-block movement in selected ports, introduction of Risk Management System (RMS) etc. have greatly improved India's perception as a facilitator of international trade. There is further scope for improvement in terms of requirement for documents and signatures indicating immediate need for automated and integrated systems.

Based on multiple interactions with Port authorities, Importers, Exporters, Shipping lines, Transporters, Freight forwarders, Customs Handling Agents, Container Freight Station officials and Ex-Customs officials, following five issues have been identified.

1. Manual filing of IGM/ EGM/SMTP even after electronic filing/generation in ICE GATE and separate submission of documents to different authorities

Current process

The IGM form asks for 84 inputs to be filled including ~30 mandatory fields and need manual filing, e.g., 8 hard copies need to be submitted at various customs section at JNPT

Sub-Manifest Transshipment Procedure (SMTP) generated automatically in ICE GATE and transmitted automatically to all concerned parties still needs to be printed and signed by customs officials and couriered to ICD operators by shipping lines (Each vessel has >20 hard copies of SMTP)

The current Electronic Data Interchange (EDI) system has limited provisions of attaching supporting documents because of which physical copies of Bill of Entry along with supporting documents are submitted to multiple parties including customs house, port authority, regulators like FSSAI, etc. leading to delays in the clearance process

Proposed solution

Submission of hard copy to be dispensed with through development of a robust Electronic Signature (ES) module in the ICE GATE

Activate all modules of ICE GATE especially Generation of rotation number and Port clearance modules

Provision for submission of all documents online with access to all concerned authorities including different ministries, regulators, ICD operators etc.; Eventually move towards a Port community system with integrated access to Shipping lines, Port authorities, Marine Department, Customs and Traders, e.g., HAROPA system developed by SOGET in France.

Ensure qualified and committed manpower and infrastructure with the DG systems in the CBEC (Central Board for Excise and Customs) to ensure robust automation of Customs clearance procedures

2. Long and manual procedure for rectification of errors in filing EGM/IGM

Current process

Physical application along with fee to be submitted to Customs for any modification to IGM/EGM for all kinds of fields. Customs further needs verification from Port of Landing after which BoE has to be re-submitted

Proposed solution

Classification of fields into sensitive and non-sensitive with provision for modification of non-sensitive fields online without any permission from Customs or need for re-submission

3. Submission of Form 13 at port gate

Current process

In ports where en-block movement has been identified (eg. JNPT), Form 13 has to be submitted in the presence of CFS agent and customs officer for gate movement of goods. This leads to congestion of up to 6-8 hours at the gates

Proposed solution

Use of OCR technology to avoid paper form submission while still allowing for tracking of vehicles and containers in and out of port

4. Lack of specialised clearance system for accredited importers/exporters and requirement of large number of documents to become an accredited importer/exporter

Current process

Accredited importers have to go through the normal method of movement of cargo till it reaches the CFS after which they are able to clear the cargo immediately through customs green channel procedure

Requirement of ~200 documents to become an accredited player

Proposed solution

Earmarking a separate area in the Port premises to enable faster delivery of cargo of accredited importers/exporters

Simplification of process, e.g., history of trade, number of containers imported and exported to be taken into account to become an accredited player to register for factory stuffing and self-sealing of containers

5. Limited resources for scanning and provision for factory stuffing for accredited importers/ exporters

Current process

Number of scanners inadequate for the increased quantity of containers needed to be scanned

Proposed solution

Ports should supplement CBEC in providing necessary scanning equipment according to guidelines issued by CBEC

6. Same rules for checking coastal cargo as EXIM cargo

Current process

Customs treat coastal cargo the same way as EXIM cargo which is time consuming and coastal cargo is given the last preference as customs consider it as non-important cargo

India is part of the World Customs Organisation, under which coastal cargo is not subject to the same clearances as EXIM cargo; The Indian customs act also doesn't force coastal cargo to undergo the same scrutiny as EXIM cargo

International examples of ports exists where coastal and EXIM cargo have segregate much like the airports system (e.g., Port of Antwerp)

Proposed solution

Treatment of coastal cargo to be done as per World Customs Organisation (of which India is a part) and Indian Customs Act both of which dictate different scrutiny for coastal and EXIM cargo

Benchmarking based on international examples like Port of Antwerp where coastal and EXIM cargo are segregated as is done on Airports.

This is an indicative list of some directional areas that require intervention and actions by various stakeholders of handling customs procedures.

Alignment and coordination between the stakeholders involved is critical for the transformation, and therefore the immediate action plan involves creating working groups with representation from key stakeholders such as Central Board for Excise and Customs, Port Authorities, Ministry of Shipping, Indian Railways, CONCOR and other CTOs, Port Rail Company, etc.

Annexure I – Multi-modal transportation model

Introduction

The multi-modal transportation model analyses the current transportation model of containers and bulk cargo from given sources to all major ports in India and then compares it with the optimum model to calculate savings. It also shows which rail/road routes, ICDs or ports will be congested if we follow the optimum model. To access the model, click http://maptool.saverisk.com/dashboard.aspx.

The main objective of the model is to identify the road and rail routes, ICDs and ports which need to be developed to handle existing and future capacity. Various parameters inside the model can be changed to see how these affect the optimum output.

Parameters that can be added or changed are:

1. Cost assumptions for container and bulk cargo movement via road or rail
2. New ports in the existing infrastructure
3. New ICDs in the existing infrastructure (new ICD location is limited to the location of existing railway stations in India)
4. New sources for cargo movement to check how future capacity additions will affect the existing model

Static data required to run the model includes:

1. A list of sources for container/bulk cargo movement
2. A list of existing ICDs and their container handling capacity
3. Transportation cost for container and bulk cargo movement via road and rail
4. A list of existing ports and their container/bulk cargo handling capacity
5. Capacity of road and rail routes

Along with the static data points mentioned above, there are also a few dynamic data points such as road/rail route and distance between source points, ICDs and ports. These are required when parameters inside the model are manually changed.

Road data is taken from Google Maps and rail route data is take from Indian Railway website on a real-time basis. In some cases, when these sources do not provide the requested data, calculations are based on aerial distance instead.

Stage 1: Create new model/load existing or default model

Open the link mentioned in introduction and log in with the credentials provided. Click at the top left corner of the webpage. A dialogue box will open, offering two options (Exhibit 1). To select existing/default model click **Load** to open that model or enter a name to create a new model. Click **Save** and **Next** to continue.

EXHIBIT 33

Stage 2: Change cost assumptions

The next screen contains the cost assumption for road and rail as modes of transport (Exhibit 2). Based on the type of goods, the cost of rail transport is divided into three categories:

- Coal and fertiliser (150)[10]
- Iron ore (170)
- Containers

Similarly, road transport is divided into 2 categories

- Break-bulk cargo
- Containers

10 150 and 170 are the numbers given by Indian Railways to respective categories

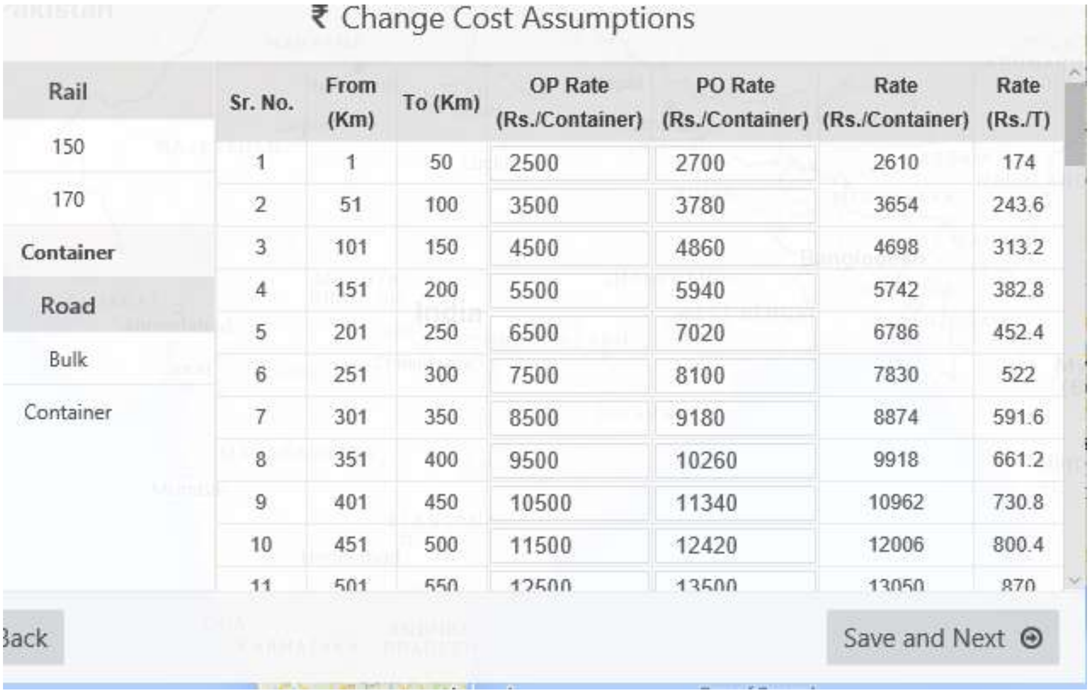
EXHIBIT 34

Click on the tabs in the first column (**150, 170, Container**, etc.) to view/change cost assumptions for the categories mentioned above (Exhibit 3). To change the cost assumptions for a particular km range for coal, fertilisers or bulk cargo, edit the value of column **Rate (Rs/T)** shown in Exhibit 3.

To change the cost assumption for containers, enter values in two columns:

- **OP Rate,** i.e., cost of movement from Origin to Port
- **PO Rate**, i.e., cost of movement from Port to Origin

EXHIBIT 35



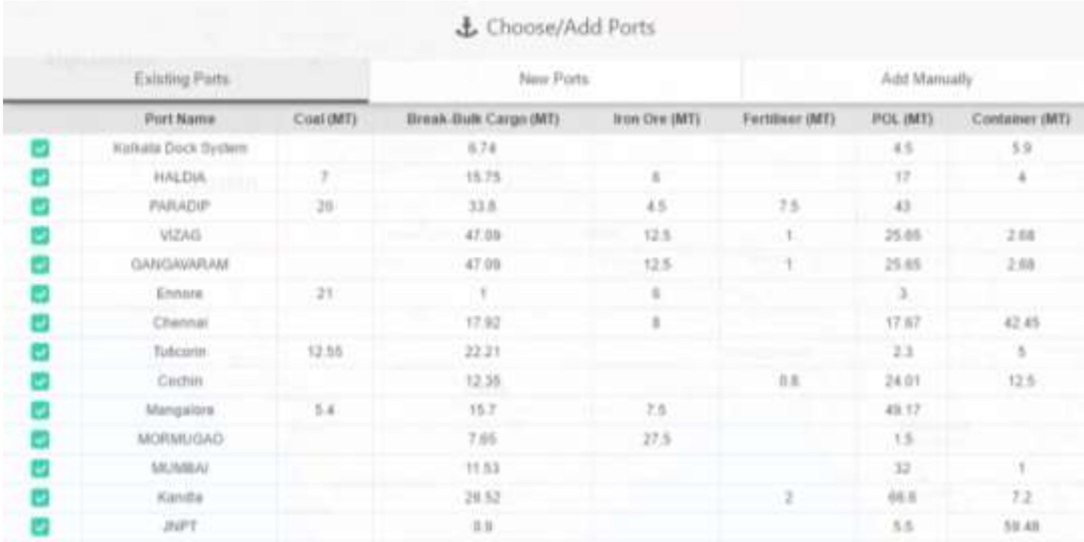
Sr. No.	From (Km)	To (Km)	OP Rate (Rs./Container)	PO Rate (Rs./Container)	Rate (Rs./Container)	Rate (Rs./T)
1	1	50	2500	2700	2610	174
2	51	100	3500	3780	3654	243.6
3	101	150	4500	4860	4698	313.2
4	151	200	5500	5940	5742	382.8
5	201	250	6500	7020	6786	452.4
6	251	300	7500	8100	7830	522
7	301	350	8500	9180	8874	591.6
8	351	400	9500	10260	9918	661.2
9	401	450	10500	11340	10962	730.8
10	451	500	11500	12420	12006	800.4
11	501	550	12500	13500	13050	870

The final value is calculated by assuming 40 per cent export traffic and 60 per cent import traffic for containers, assumed for both road and rail traffic for containers. Click **Save** and **Next** to continue.

Stage 3: Choose/add ports

Existing ports: This tab contains the list of all ports in the database considered for calculation of the optimum route. The handling capacity for different commodities are given in corresponding columns (Exhibit 4).

EXHIBIT 36



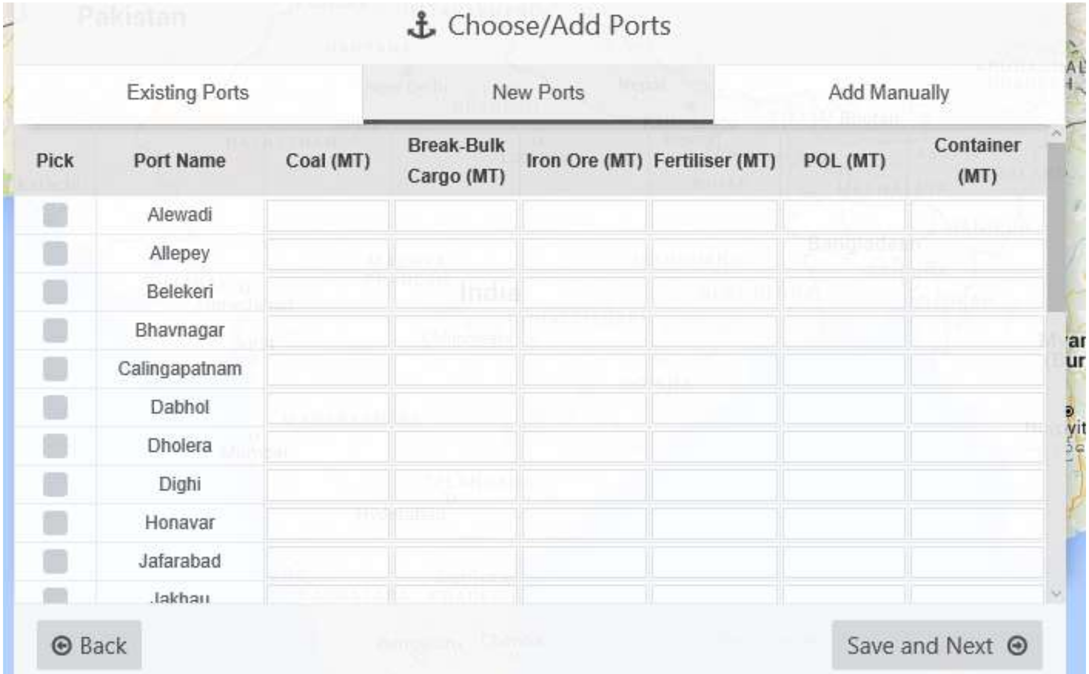
Choose/Add Ports

Existing Ports | New Ports | Add Manually

	Port Name	Coal (MT)	Break-Bulk Cargo (MT)	Iron Ore (MT)	Fertiliser (MT)	POL (MT)	Container (MT)
☑	Kolkata Dock System		6.74			4.5	5.9
☑	HALDIA	7	15.75	6		17	4
☑	PARADIP	20	33.8	4.5	7.5	43	
☑	VIZAG		47.09	12.5	1	25.65	2.68
☑	GANGAVARAM		47.09	12.5	1	25.65	2.68
☑	Ennore	21	1	6		3	
☑	Chennai		17.92	8		17.67	42.45
☑	Tuticorin	12.55	22.21			2.3	5
☑	Cochin		12.35		0.8	24.01	12.5
☑	Mangalore	5.4	15.7	7.5		49.17	
☑	MORMUGAO		7.65	27.5		1.5	
☑	MUMBAI		11.53			32	1
☑	Kandla		28.52		2	66.8	7.2
☑	JNPT		0.9			5.5	59.48

New ports: Exhibit 5 lists the new ports identified and mapped in the database but not used for calculation. These can be added if required by clicking the corresponding check box in the **Pick** column.

EXHIBIT 37



Choose/Add Ports

Existing Ports | New Ports | Add Manually

Pick	Port Name	Coal (MT)	Break-Bulk Cargo (MT)	Iron Ore (MT)	Fertiliser (MT)	POL (MT)	Container (MT)
☐	Alewadi						
☐	Allepey						
☐	Belekeri						
☐	Bhavnagar						
☐	Calingapatnam						
☐	Dabhol						
☐	Dholera						
☐	Dighi						
☐	Honavar						
☐	Jafarabad						
☐	Jakhau						

Back | Save and Next

Enter the handling capacity of mentioned commodities for the ports added. This can be left blank if the port does not handle that commodity.

Add manually: It is possible to **Add manually** those ports that are not mentioned in the database (Exhibit 6). Port location can be selected directly from the map. To add a new port click the checkbox in the **Pick** column, and a map will open up (Exhibit 7).

EXHIBIT 38

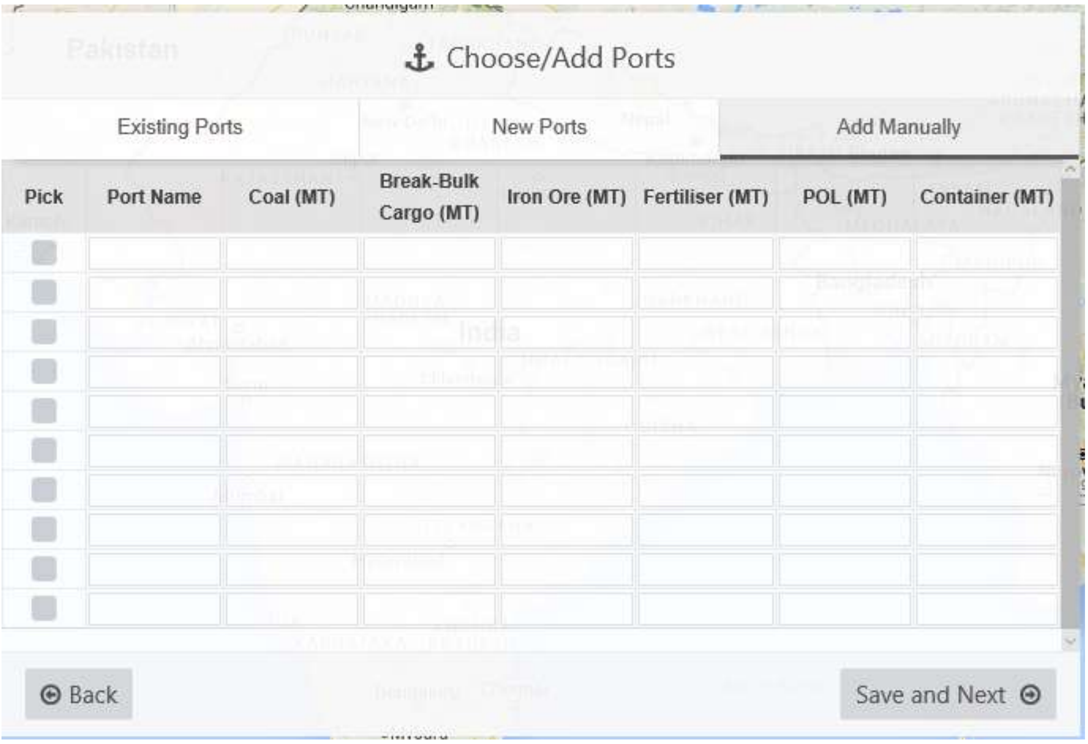
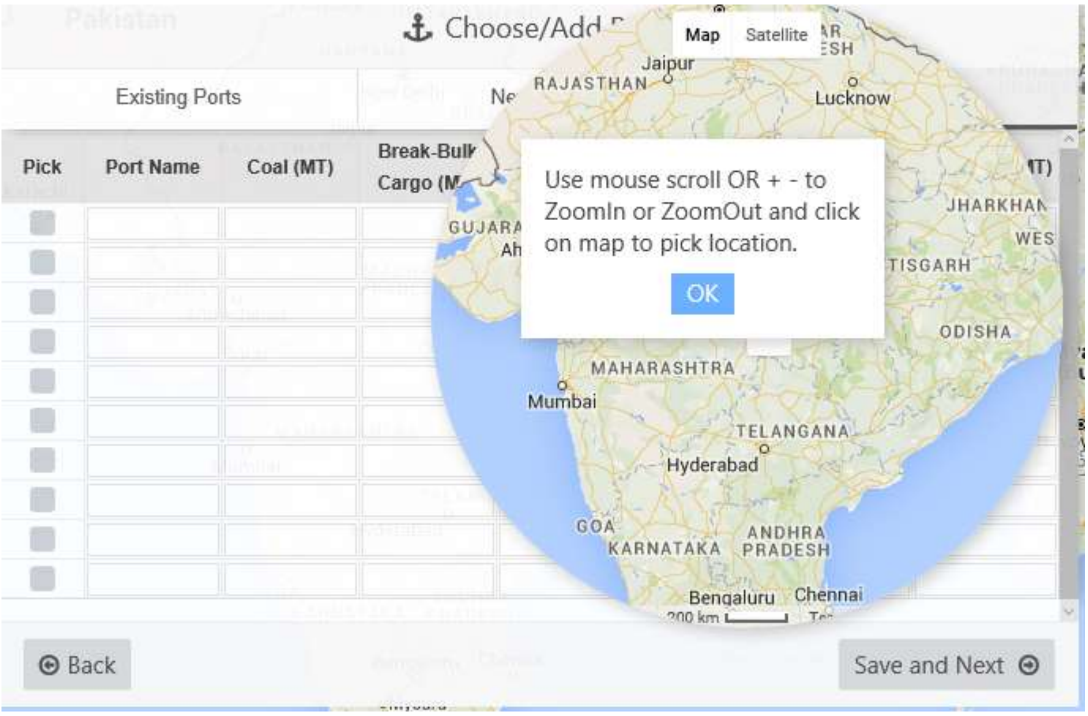


EXHIBIT 39



Click **OK** and use **+/-** sign to **Zoom in** and **Zoom out** of the map. Select the location of the new port on the map and click **OK**. Add the port name and capacity for mentioned commodities. Add more ports if required and click **Save** and **Next**.

Stage 4: Add new ICD

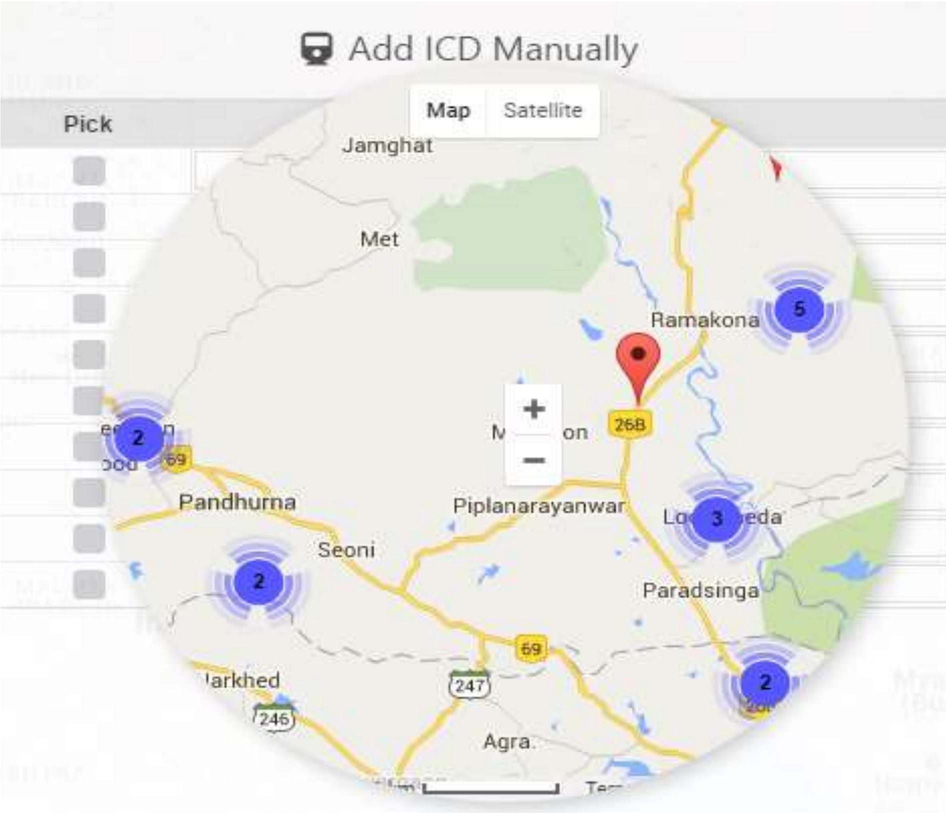
It is possible to **Add ICD manually** using the tab shown in Exhibit 8.

EXHIBIT 40

Similar to adding new ports, click the checkbox in the **Pick** column to open up a map (Exhibit 9). It is assumed that a new ICD can only be added near existing railway stations.

More than 10,000 railway stations are marked on the map in groups, represented by a number that indicates the count of stations in each group. Click on the numbers to view the stations within that group. Zoom in/out to check the stations marked on the map. Select the desired station and click **OK** to choose it as an ICD.

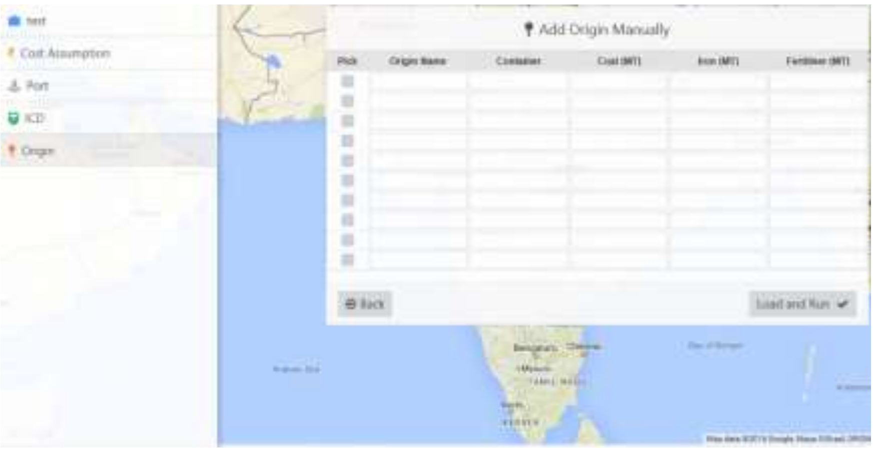
EXHIBIT 41



Stage 5: Add Origin Manually

The tab shown in Exhibit 10 is used to add any new origin in the database.

EXHIBIT 42



Similar to Ports and ICDs, click the checkbox in the **Pick** column to open up a map. Click **OK** and use the **+/-** signs to **Zoom in** and **Zoom out** of the map (Exhibit 11).

EXHIBIT 43

Select the desired point to set it as a new origin point. Add the **Origin Name** and fill its capacity in the corresponding columns.

Previous stages can be accessed with the help of the back button to make any changes. Click **Load and Run** to run the scenario. It may take 20 to 30 minutes for the process to complete.

Output

Output contains two major sections: **Savings** and **Congestion**.

Savings: Exhibit 12 contains the list of all origin points matched to the destination ports for which the cost of transportation is optimum. Savings for each route are calculated by comparing the optimum transportation cost to the existing cost.

EXHIBIT 44

DEFAULT MODEL

Savings

Sr. No.	Origin	Current Destination	Total Saving (Cr)
1	Delhi	Kandla	1676
2	Other parts of UP	Kolkata Dock System	915
3	Mumbai region (MMR)	MUMBAI	735
4	Faridabad	Kandla	506
5	Bangalore	Chennai	473
6	Noida	Kandla	451
7	Gurgaon	Kandla	441
8	Vapi	Dahanu	417
9	Karnataka	MANGALORE	396
10	Greater Noida	Kandla	383
11	Tisco Jamsh-edpur	HALDIA	366
12	Other Tamil Nadu	Tuticorin	365
13	Kanpur/Lucknow/Varanasi	Kolkata Dock System	315
14	Surat	HAZIRA	308
15	Other parts of Uttaranchal	Kandla	304
16	Other parts of Haryana (Karnal, Kurushetra, Kaithal, Hisar)	Kandla	283
[illegible]	[illegible]	DHARAMTAR	[illegible]

Click on the savings for each route to get a breakup along with detailed information on the earlier destination, volume and cost. Exhibit 13 shows how cargo was moving to three different locations from Delhi. The model changed the destination to Kandla as that route incurs the minimum cost of transportation from Delhi.

EXHIBIT 45

Kandla - Delhi   Savings : ₹ 1676 (Cr.)

Sr. No.	Origin	Earlier Destination	Current Destination	Earlier Volume (MT)	Earlier Cost (Cr)	Final Cost (Cr)	Savings (Cr)
1	Delhi	JNPT	Kandla	6.2	2192	1317	875
2	Delhi	Mundra	Kandla	6.98	2052	1482	570
3	Delhi	Pipavav	Kandla	2.33	725	494	231

Congestion: Exhibit 14 shows the capacity load on all ports, rail routes, road routes and ICDs if the optimum plan is followed.

EXHIBIT 46

Congestion

Port | Rail | Road | ICD

Sr. No.	Port Name	Container Handling (MT)	Bulk Handling (MT)
1	Kandla	66.37	8.11
2	Kolkata Dock System	15.11	16.09
3	MUMBAI	27.54	1.85
4	Chennai	26.75	
5	VIZAG	4.52	11.22
6	Tuticorn	13.96	1.73
7	HALDIA	2.54	13.09
8	MORMUGAO	0.6	12.6
9	JNPT	11.32	
10	PARADIP	2.79	5.58
11	DHAMRA	0.06	8.11
12	GANGAVARAM		7.4
13	Cochin	6.14	
14	Kakinada	2.41	3.27
15	DHARAMTAR ISPAT		5.54
16	Dabhol	5.41	

The **Port** tab will show the list of ports with their container handling and bulk handling. Click on any port on the table to view it on the map along with all the sources from where that port will receive goods.

The **Rail** tab will show the top rail routes sorted in descending order based on the amount of **Container movement** and **Bulk movement**. Click on any rail route to view the source and ports connected via that route (Exhibit 15).

EXHIBIT 47

Sr. No.	Rail Route	Container Movement (MT)	Bulk Movement (MT)
1	Samakhiali Jn.-KANDLA PORT CONTAINER SIDING	14.66	5.02
2	Andal Jn.-New Alipore (Calcutta)	5.1	12.54
3	Asansol Jn.-Andal Jn.	5.1	10.94
4	Tatanagar Jn.-HALDIA DOCK COMP. GENL.	0.99	13.09
5	Sitarampur-Asansol Jn.	5.1	8.84
6	Dhanbad Jn.-Sitarampur	4.2	8.84
7	Gadiganuru-Da-Gama-MarmagoA Harbour		12.6
8	Bhildi Jn.-Samakhiali Jn.	8.86	3.25
9	Kottavalasa-Visakhapatnam Port		11.22
10	Phulera Jn.-Bhildi Jn.	7.71	3.25
11	Varanasi Jn.-Dhanbad Jn.	4.2	4.74
12	Patel Nagar-Phulera Jn.	5.3	3.25
13	Mandir Hasaud-Kottavalasa		8.5
	SUKINDA ROAD-M/s		

The **Road** tab will show the top busy routes in India along with the highways on that route. Click on any road route to view the source and ports connected via that route (Exhibit 16).

EXHIBIT 48

The **ICD** tab contains the list of all ICDs sorted in descending order on the basis of the number of containers passing through each depot (Exhibit 17).

EXHIBIT 49

Click on any ICD to view its location on the map along with the location of the port to which the containers are transported from that ICD.

Annexure II – Shelf of projects

Table 1 lists down projects identified as part of Sagarmala programme.

Table 1

Sl. No	Project name	Cost (Cr.)
1	Development of Oil Jetty 7 at Kandla Port	45
2	LNG Import Terminal at Ennore	5,151
3	LNG Import Terminal at Kakinada	3,000
4	LNG Import Terminal at Mundra	4,000
5	Oil terminal at Shalukhali (LPG and Chemicals) at Haldia	150
6	Expressway from Ahmedabad to JNPT	18,000
7	Expressway from Dighi Industrial Cluster (Pune) to JNPT	4,500
8	Petrochemical cluster in Ennore	420
9	Petrochemical cluster in Gujarat	420
10	Petrochemical cluster in Kakinada	420
11	Petrochemical cluster in Mangalore	420
12	Upgrading of the existing four lane road connecting to NH16 at Gajuwaka to Gangavaram Port in to six lane road in the State of Andhra Pradesh	50
13	Port-based Mega food processing park in Kakinada	185
14	Port-based Mega food processing park in Southern Maharashtra	140
15	Power cluster in AP	7,350
16	Power cluster in Maharashtra	7,350
17	Power cluster in Tamil Nadu	7,350
18	Setting up of fertilizer bagging facility at Cochin	50
19	Setting up of food grain import terminal at Cochin	120
20	Additional Oil Jetty along-with OR1 and OR2 at Vizag	100
21	Finger Jetty at Vasco Bay for Liquid Cargo, Passenger and Fishing at Mormugao	80
22	Redevelopment of berths 8 and 9 – Coal Terminal	400

Sl. No	Project name	Cost (Cr.)
23	JNPT North Anchorage at JNPT	50
24	Flyover for GTI Entry/Exit Over the Rail Tracks at JNPT	70
25	Road connectivity between proposed Port at Sagar Island and Muriganga bridge & between Muriganga bridge and proposed Rail yard at Kashinagar.	171
26	Development of an integrated export based leather and footwear cluster in Muzaffarpur	1,880
27	Rail connectivity between proposed Port at Sagar Island and Kashinagar Rail station.	270
28	Improvement of road Connectivity to facilitate the trade and Port users at KOPT	24
29	Development of an integrated export based leather and footwear cluster in Perambur	1,880
30	Development of an integrated export based leather and footwear cluster in Kolkata (Bantala)	1,880
31	Development of bamboo based furniture hub in Assam	2,258
32	Development of an integrated wooden furniture export cluster in Kerala	2,258
33	Development of an export based apparel cluster in Saurashtra	3,321
34	Development of an export based apparel cluster in central AP	3,321
35	Development of an export based apparel cluster in Vidarbha	3,321
36	Development of an export based electronic cluster in Tamil Nadu/AP	3,542
37	Development of an export based electronic cluster in North Maharashtra	3,542
38	Cement Cluster in Gujarat	735
39	Steel cluster in Southern Maharashtra/Goa	10,500
40	Refinery and petchem cluster in Tamil Nadu	4,200
41	Refinery and petchem cluster in Maharashtra	4,200
42	Expansion of Salaya Mathura Pipeline	1,000
43	Development of Gujarat Maritime University	268
44	Maritime cluster in Gujarat	450
45	Northern Rail Link connecting north of Minjur to KPL	244
46	Four laning of Kakinada Anchorage Port Uppada beach road connection upto NH-16 in East Godavari District of Andhra Pradesh state	980
47	Development of Fishery Harbour at Kulai (at the estimated cost of Rs.230 crores.)	230
48	Pipeline from Paradip to Hyderabad	3,000
49	Expressway from Sanathnagar industrial cluster (Hyderabad) to JNPT	22,000
50	Additional Stackyard for VGCB at Vizag	150

Sl. No	Project name	Cost (Cr.)
51	NCB 1 – Utilisation of its full capacity at Tuticorin	10
52	Expressway from Panagarh (Durgapur) to Haldia	9,000
53	Upgradation of inner harbour – Barge berths for food grains at Tuticorin	100
54	Upgradation of inner harbour – North Container Terminal at Tuticorin	400
55	Upgradation of Existing Coal Jetty (CJ2) at Tuticorin	250
56	Expressway from Sarkhej (Ahmedabad) to Mundra	10,000
57	Expressway from Sanathnagar industrial cluster (Hyderabad) to Vodarevu	10,000
58	Expressway from Tirupur industrial cluster (Coimbatore) to Enayam	13,000
59	Development of IWT Terminal at Paradip Port	200
60	Expressway from Sarkhej (Ahmedabad) to Pipavav	9,000
61	Expressway from Whitefield industrial cluster (Bangalore) to Enayam	20,000
62	Expansion of the MCHP stackyard for additional coal storage at Paradip	150
63	Expressway from Whitefield industrial cluster (Bangalore) to Chennai	10,000
64	Development of Outer harbour at Paradip port	4,179
65	Development of marble based furniture hub in Kutch	2,258
66	Development of mega-cruise terminal in Mumbai	200
67	Handling of Steel Cargo at OCT-Mumbai Port	100
68	Redevelopment of Indira Dock – Mumbai Port	150
69	Floating dry docking facility at Indira Dock – Mumbai Port	50
70	Road circulation plan for ease of movement of break bulk cargo at Mormugao	50
71	Mechanisation of Berth 3 at Haldia Dock Complex	150
72	Building Barge Jetties to Support the Anchorage Operations at Haldia	120
73	Construction of New Exclusive Berth (OT 2) outside North of Dock for Edible Oil and Chemicals at Haldia	190
74	Development of Multipurpose Berth (OT 1) outside the Dock Basin at Haldia	450
75	Mechanisation of Barge Unloading Facility at Kandla	100
76	Development of Tuna Tekra Container Terminal at Kandla – Phase 1	1,500
77	Development of Tuna Tekra Additional Bulk Terminal at Kandla – Phase 1	1,050
78	Mechanisation of Fertiliser Handling Facility at Kandla	200
79	Mechanisation of Food Grains Handling Facility at Kandla	155
80	Development of coastal food export berth at Kakinada	150
81	Restructuring of JNPT Yard for Optimal Yard Utilisation	200
82	Terminals in Nhava Creek at JNPT	600

Sl. No	Project name	Cost (Cr.)
83	JNPT Multipurpose Cargo Terminal in Uran Mudflats	1,000
84	Utilisation of Coastal Berth of Liquid Cargo at JNPT	20
85	Integrated Common Rail Yard at JNPT	200
86	Multi-User Liquid Terminal-II at Ennore	320
87	Setting of Edible Oil Terminal at Cochin	10
88	SBM terminal at Chennai port	600
89	Dredging of Ro – Pax Ferry Services between Gogha and Dahej in Gulf of Cambay	234
90	Maritime cluster in Ennore	500
91	Steel cluster in Ennore	10,500
92	Cement cluster in AP	735
93	Connection of western DFC to Hazira	300
94	Connection of western DFC to Pipavav	2,500
95	Connection of western DFC to Mundra	3,500
96	Road Connectivity to Hare island (Tuticorin Port)	12
97	Development of roads connectivity to Cuddalore Port	100
98	Development of 7.2Km green field road connecting NH 65 to Machilipatnam Port in the State of Andhra Pradesh.	175
99	Auto cluster in Sanand	4,465
100	Setting up of 2nd Railway Line from Durgachak take off point to ‘A’ cabin at Durgachak at HDC, Haldia.	100
101	Construction of RoB cum Flyover at Ranichak level crossing at Kolkata Port	128
102	Azhikkal Port – Proposed NH – Bypass and widening of 2 km.	61
103	Four Lane green field road to Krishnapatnam Port from Naidupeta in the State of Andhra Pradesh	670
104	Mechanised Food Grain Handling Facility at Mangalore	120
105	Mechanised Fertilizer Handling Facility at Mangalore	155
106	Evacuation road for proposed standalone Container Terminal (330m extension to DPW terminal) at JNPT	54
107	Flyover at Y Junction for Decongestion of Traffic Flow at JNPT	200
108	Up gradation of SH 164 (Nivli to Jaigad) to connect Jaigad Port to NH 17 at Nivali	333
109	Providing alternative Road from Bhavnagar to Sosiya – Alang Ship Recycling Yard	70
110	Four lane road from Northern gate of port to Thachur, outer ring corridor – 6 laning with service roads – Ennore	271
111	Connectivity to NH – 17 – Upgrading of SH 92, 96, 97 to connect NH17 to North and	600

Sl. No	Project name	Cost (Cr.)
	South banks of Dighi Port	
112	Doubling of rail line from Bhadrak to Dhamra Port	1,500
113	New ICD Development in Raipur	207
114	New ICD Development in North Bengal(Darjeeling)	85
115	New ICD Development in Hyderabad	120
116	New ICD Development in Central Rajasthan (Nagaur)	85
117	New ICD Development in North MP/CG border (Singrauli)	85
118	Enhanced pipeline capacity to CPCL Manali, increasing dia from 30" to 42"	500
119	Upgrading existing B.T Road in to C.C. pavement from Burmah Shell area to security gate near Sakthi Gas Plant at Kakinada Anchorage port, AP	15
120	Development of greenfield bypass road for better connectivity of Gangavaram port in Visakhapatnam District (Lanes to be specified)	80
121	Formation of a New by-pass parallel road west of NFCL and CFL in Kakinada Port (Kakinada), AP	70
122	RoB at Dummalapeta and Old Port Area (Kakinada)	80
123	Up grading of existing R&B road from Chilakaru cross (NH-16) to Power Plants	300
124	Development of 5 km Greenfield road connecting north and south industrial cluster of Khandaleru Creek near Krishnapatnam port	90
125	Up grading of 24 km road to a 4 lane, that connects Nellore city to the Krishnapatnam port to NH 5 in SPSR Nellore District of AP	300
126	Upgrading of Manginapudi Beach Road to a 4 lane road to connect to cater to Machilipatnam	60
127	Development of Four Lane green field road from Machilipatnam North Port to NH-SH-46 in the State of Andhra Pradesh	232
128	Development of Four lane green field road from Machilipatnam South Port to NH-9 in the State of Andhra Pradesh	458
129	Setting up logistics and Maritime University at Kakinada	300
130	New ICD Development in South Uttarakhand	120
131	Conversion of IOHP berth to coal handling facility at Paradip	100
132	IB signalling for RV line	50
133	Decongesting RV line (Vizag & Gangavaram port) – 2nd line	4,200
134	Connectivity of Vizag port to NH-16 (Phase II)	99
135	Heavy Haul railways corridor from Salegaon to Paradip port	3,000
136	Third line from Jakhapura to Haridaspur	150
137	3rd line from Bhadrak to Nergundi	837

Sl. No	Project name	Cost (Cr.)
138	3rd and 4th line from Budhapank- Salegaon via Rajatgarh	1,200
139	Doubling of line from Rajatgarh to Barang	276
140	Doubling of line from Sambhalpur to Talcher	679
141	Doubling of line from Titlagarh to Sambhalpur	1,351
142	New Line from Angul to Sukhinda Road	679
143	New Line from Haridaspur to Paradip	1,118
144	Rail evacuation from port to Hospet and Bellary (Hubli – Ankola link)	2,200
145	Bellikeri port to Ankola – railways line	1,420
146	Rail connectivity between Krishnapatnam and Venkatachalam	87
147	Rail connectivity between Krishnapatnam to Obulavaripalle	1,185
148	Hospete-Hubballi-Londa-Tinaighate-vasco da gama at Mormugao	1,458
149	Third line from Sukhinda Road to Jakhapura	56
150	New line from Jharsuguda to Barpalli	1,000
151	Development of Cuddalore/Sirkazhi port	3,000
152	New Port at Vodarevu/Machilipatnam	5,000
153	New Port at Vadhavan	9,267
154	New Port at Sagar	1,161
155	New Port at Enayam serving as a transshipment hub	6,575
156	Road Connectivity From Outer Harbour To Port Connectivity Junction (B) at Vizag port	13.5
157	Construction of break water at Mandwa	72
158	Development of lighthouse in Kanhoji Angre Island	47
159	Development of fish landing centre in AP – Appikonda	39
160	Construction of grade separator from H-7 area to Port connectivity Road by passing Convent Junction – Vizag Port	90
161	Connectivity to Enayam through Nagarcoil	86
162	4 Laning of Shiradi Ghat Road – Concretizing for smoothening of traffic road.	1,200
163	Double rail track from Gopalpur Port to Chatarpur	140
164	RoB on Kandla-Kutch Road	125
165	Strengthening of Existing revetment at eastern seashore of Chennai Port	63
166	Proposal for Fisheries Growth Center for development of fisheries at Uppada in East Godavari District, AP and Majali in Uttara Kannada, Karnataka	40
167	JNPT 5th Container Terminal	5500

Sl. No	Project name	Cost (Cr.)
168	Fisherman Capacity building and skill development. (CIFNET – Two Modules)	1
169	Training Program for skill development/capacity building of workers involved in ship recycling activities at Alang	30
170	Skill upgrading of fisher folks in hygienic fish handling and high end products development (NIPHATT)	1
171	Freezing and fish segregating facilities for TUNA and other catch near Krishnapatnam port	40
172	Modernisation of Sassoon Dock Fishing Harbour	52
173	Develop NW5 to augment capacity from Talcher to Paradip	5,000
174	New Railway line bridge between Jajpur and Sukinda Road stations	56
175	Road Connectivity from Gopalpur Port to NH-5 from Chhatrapur	49
176	Southern port Access road for connectivity to Ennore port	200
177	NH-169 – conversion of two lane roads into 4 lane from Mangalore to Mudabidri	280
178	JNPT – 6 to 8 laning of NH-4B, SH-54 and Amra Marg	1,821
179	Road Connectivity to Dhamra Port (Four laning of Jamujhadi-Dhamra road)	600
180	Development of dedicated Container Corridor to NHAI road for quick evacuation, Chennai	100
181	Shifting of Fishing Harbour towards north opposite to Lighthouse from the existing location at Kakinada Anchorage Port in the State of Andhra Pradesh.	200
182	Revamping the mindi connectivity to get wagons at Vizag	276
183	Providing broad Gauge Rail linkages to Old Bedi Port	27
184	Upgradation of the track nos – 10,12,14,16,18,19,20,21, 22 and 23 at EJC yard of Kolkata port	37
185	Doubling of Rail Connectivity from Millavittan to Tuticorin Port 17.5 km of track	100
186	Jaigad port to Dighni railway station 160km, New line Double line electrified (Central railways,MoR,GoI)	775
187	Belagavi – Panjim (NH-4A) Upgrading to 4 lane	1,332
188	6 lane road from Hubli to Ankola	2,538
189	Upgrading of NH 65 from Vijayawada to the Machilipatnam Port	650
190	NH-206: Tumakuru -Honnavar Port. Existing two lane, proposed to be widened to 4-lane	500
191	Flyover/RoB over ADB road (Kakinada Deep water port from Kumbhabhishek Temple to fishing Harbour) at Kakinada to avoid 6-7 level crossing in a span on 1 km which causes huge congestion	350
192	SH-2:Haveri-Yekambi (54km),SH-69:Yekambi-Kumta/Belekere	1,451

Sl. No	Project name	Cost (Cr.)
193	Development of adequate road connectivity from Vizag Port-connectivity from Sheela Nagar junction to Anakapalli-Sabbavaram/Pendurti – Anandapuram road i.e. NH-16 (Former NH-5)	505
194	6 laning for NH-4 from Kalamvoli to Mumbra	45
195	Linking of NH-4 & NH-8 by-passing Mumbra	72
196	Six laning of Paradip Chandikhole road	500
197	Karungulam (NH – 44) – Nagappattinum – 427 km	1,400
198	Connectivity to Katupalli through Ponnani	200
199	Puducherry (NH-32) – Marakkanam – Sadaras – Kovalam – Coromandel – Chennai (NH -32)	1,440
200	Development of river side port road to Beypore port	50
201	Widening of road connecting from Kollam port to NH	50
202	6 laning of Pune-Satara section of NH 4 (145 km)	1,725
203	Expansion from 2 lanes to 4 lanes of Panvel to Indapur section of NH 17 (Phase 3) – chainage 0.0 to 84.0km	943
204	Connectivity of Wadhavan to NH 8 through Tarapur-Boisar or Chinchani-Vangaon or Dahanu (25 km)	200
205	Four lane road connectivity from the existing two lane road from Achampeta Junction to joining NH 16 at Kathipudi in East Godavri District in AP	300
206	Four lane road connectivity from the existing two lane road from Kakinada port to NH 16 at Rajanagaram in Godavri District in AP	600
207	Formation of new road from L-Arm road Junction to Dummulapeta Beach Road at NCS storage system including construction of bridge on Dummulapeta Creek at Kakinada Anchorage Port	50
208	Upgrading of NH 216 from 2 lane to 4 lane Digamarru to Ongole	2,700
209	Formation of New Railway line from Kovvuru to Bhadrachalam Road	2,000
210	Rail Connectivity to South Port of Krishnapatnam Port from Guduru (Length 26 km)	300
211	Development of new railway siding at Kakinada Anchorage port	40
212	Development of dedicated Machilipatnam Port Rail Connectivity from Pedana Station	40
213	Development of Vishnupuram – Mellacheruvu Railway line	1,000
214	Development of rail siding with number of holding lines in Machilipatnam	250
215	Formation of new double line railway connectivity from Kotipalli to Narasapur	2,500
216	Doubling of Vijayawada- Machilipatnam Railway line	550
217	Doubling of Nidadhavolu -Bheemavaram -Narsapuram – Gudivada Railway line	1,500
218	Development of Fishing Harbour in Juvvaladinne for Coastal Community in SPSR	100

Sl. No	Project name	Cost (Cr.)
	Nellore District in the State of Andhra Pradesh.	
219	Establishment of World Class Fishing Harbour at Bandaruvani Peta, Srikakulam District in the State of Andhra Pradesh	450
220	Establishment of World Class Fishing Harbour at Konada, Vijayanagaram District in the State of Andhra Pradesh	400
221	Establishment of World Class Fishing Harbour at Bhyravapalem, East Godavari District in the State of Andhra Pradesh	400
222	Establishment of World Class Fishing Harbour at Nagayalanka, Krishna District in the State of Andhra Pradesh	400
223	Establishment of World Class Fishing Harbour at Kothapatnam, Prakasam District in the State of Andhra Pradesh	450
224	Establishment of World Class Fishing Harbour at Allur, SPS Nellore District in the State of Andhra Pradesh	400
225	Coastal Districts Skill Development Program – Phase I (DDUGKY)	6
226	Development of Pulicat Lake island in SPS Nellore District as Tourism Spot.	60
227	Development of Hope Island at Kakinada in East Godavari District as Tourist Spot	60
228	Four lane Beach Road of 30.00 Km connecting Gangavaram Port to the SEZ proposed at Atchuthapuram in Visakhapatnam District in the State of Andhra Pradesh	500
229	Upgradation of the hinterland road From Naidupeta (in Nellore District of Andhra Pradesh) to Krishnagiri (in Tamilanadu State)	3,000
230	Upgradation of the proposed NH-67 From Bellary (in Karnataka State) to Krishnapatnam (in Nellore District of Andhra Pradesh)	4,300
231	New ICD Development in Jharsuguda	100
232	Upgrading of existing dedicated port connectivity from Krishnapatnam Port to NH 5 in SPSR Nellore District of Andhra Pradesh State	350
233	Develop NW2 for inland waterway movement	1000
234	Develop NW4 for inland waterway movement	1515
235	Modernisation and upgradation of the existing railway network at Kolkata Dock System under KoPT	10
236	Providing railway connectivity from Tuticorin port to the power plants	300
237	Rail connectivity from Dighi port to Roha	721
238	Full rake wagon handling line with paving 24m wide at Mormugao	15
239	Extension of Eastern DFC to Kashinagar for connecting Sagar port to Dankuni	1240
240	Deep Draft Coal Import Berth at Paradip	479
241	Deep Draft Iron Ore Export Berth – Paradip	430
242	Development of Clean Cargo Berth – Paradip	430

Sl. No	Project name	Cost (Cr.)
243	Capital Dredging of BOT basin – Paradip	173
244	Mechanisation of EQ1-3 Berths – Paradip	1437
245	Mechanisation of CQ1-2 Berths – Paradip	1357
246	LPG Terminal at South jetty in Paradip	690
247	Creation of LNG facilities at Haldia port	200
248	Creation of Second Lock at HDC – Phase 1	1600
249	Creation of Second Lock at HDC – Phase 2	800
250	Setting up of mooring facilities at Sandheads for Transhipment of Liquid Cargo – KoPT	250
251	Additional liquid bulk terminal – Phase 1 – JNPT	570
252	Additional liquid bulk terminal – Phase 2 JNPT	385
253	JNPT Container T4 – Phase 1	4719
254	JNPT Container T4 – Phase 2	3196
255	Deepening and widening of JNPT and Mumbai Channel Phase -II	2029
256	Extension of Offshore container terminal berth by 300 m	100
257	Extension of Offshore container terminal berth by another 600 m	200
258	Floating Barge Jetty at Haldia port	73
259	Development of Marina at Princess Dock – Mumbai	200
260	Additional Crude Oil Jetty at Jawahar Dweep JD 5	811
261	Bunkering Terminal at Jawahar Dweep	50
262	Setting up of a Floating Storage & Regasification Unit (FSRU) – Mumbai	2740
263	Upgradation of Cruise Terminal at BPX – Mumbai	108
264	Development of Tuna Tekra Container Terminal – Phase 2	500
265	Development of Oil Jetty 8 for general oil cargo – Kandla	233
266	Development of 14th Multipurpose Berth – Kandla	512
267	Development of Container Terminal facility at Berth 11 & 12 – Kandla	159
268	Development of Tuna Tekra Additional Bulk Terminal – Phase 2	400
269	Development of Marine Liquid Terminal facilities at OOT, Vadinar on captive use basis	448
270	Development of Ro-Ro Terminal at Kandla Port	70
271	Development of Ro-Ro Terminal at Ennore port	150
272	Modification of existing Iron Ore Terminal to handle coal (SIOTL)	220
273	Capital Dredging Phase 4 at Ennore port	600

Sl. No	Project name	Cost (Cr.)
274	Construction of Coal berth 4 at Ennnore port	275
275	Construction of Container Terminal Phase 1 – Ennore Port	1270
276	Construction of Container Terminal Phase 2 at Ennore Port	2000
277	Additional TNEB Coal Berth CB 3 at Ennore Port	269
278	IOC-POL Captive Jetty at Ennore Port	350
279	Multi Cargo Terminal at Ennore port	151
280	Setting up of Bunkering Terminal at Chennai Port – Bharti Dock	35
281	Development of Dry Dock at Timber Pond/Boat basin at Chennai port or Development of Marina	500
282	Conversion of JD East into Multi cargo Berth at Chennai port	110
283	Development of coastal terminal with connectivity at Chennai port	80
284	Development of Bharti Dock II for Additional Container Storage – Chennai	50
285	FSRU for LNG handling at NMPT	710
286	Mechanisation of Berth 12 at NMPT	470
287	Utilisation of Berth 8 and Backup area as Container Terminal at NMPT	300
288	Deep water break bulk berth adjacent to ore berth at NMPT	150
289	Deepening of Eastern dock at NMPT	400
290	Development of Berth 10 for handling bulk cargo	600
291	Development of Berth 11 for handling bulk cargo	600
292	Additional Storage area for bulk cargo at NMPT	50
293	Development of 30 acres of stack yard and ancillary roads for parking of Ro-Ro cargoes and cars – NMPT	25
294	Upgradation of Inner Harbour – NCB3 and NCB4 – Tuticorin	775
295	Upgradation of Inner Harbour – SEPC Berths – Tuticorin	200
296	Upgradation of Inner Harbour- Deep draft bulk Berth1 – Tuticorin	470
297	Upgradation of Inner Harbour – Deep Draft Bulk/Container Berth – Tuticorin	470
298	Upgradation of Inner Harbour – Shallow Berths 1 – Tuticorin	106
299	Upgradation of Inner Harbour Tuticorin – Channel and Basin Deepening for Fully Loaded Panamax Ships	2500
300	Mechanization of Berth IX at Tuticorin	93
301	Redevelopment of berths 8 and 9 – Ore and multipurpose berths	685
302	Deepening of Approach Channel at Mormugao	193
303	Outer Harbour for Iron Ore & Coal Terminal	550

Sl. No	Project name	Cost (Cr.)
304	Multipurpose Terminal at Betul	1200
305	Development of 2 berths with connecting flyover for Indian Navy and Coastguard at Vasco Bay – Mormugao	500
306	Mechanization of existing berth EQ-7 to handle finished fertilizers – Vizag	217
307	New Container Terminal Adjacent to the Existing Container Terminal – Vizag	550
308	Conversion of existing berths EQ-2, EQ-3, EQ-4 and part of EQ-5 into two numbers of berths and development of new EQ-10 berth – Vizag	750
309	Iron Ore Handling – Phase 1 Upgradation of OB 1 & 2 – Vizag	800
310	Iron Ore Handling – Phase 2 – Mechanisation of WQ 1 – Vizag	400
311	Development of WQ N (WQ-7 and WQ-8) – Vizag	250
312	Upgrading Berth WQ 2-5 to handle fully loaded Panamax ships – Vizag	600
313	Development of New Berth EQ 1A – Vizag	320
314	Refurbishment and Capacity Enhancement of COT, NTB & STB at Cochin	45
315	Multi user Liquid terminal at Cochin Port	160
316	Setting up of barge Jetty at Tuna on BOT basis at Kandla	130
317	SEZ Phase – EPC Contract for infrastructure development – JNPT	468.82
318	Grant of Licence for deployment of floating cranes at port lighter age area – MbPT	35
319	Deployment of 2 floating cranes near Sagar – KoPT	75
320	Replacement of Fendering System at lead in Jetty – KoPT	28
321	Development of hardstand storage area of 1.13 Lakh sqm inside dock – KoPT	37
322	FTWZ – Ennore	850
323	Construction of Container Pre-Stacking Yard in the area of Port access road – Ennore	30
324	Replacement of two MHC in EQ 5&6 in Inner Harbour-Vizag	39
325	Deployment of Additional Harbour Mobile Cranes at III & IV berth – Tuticorin Port	28.5
326	Truck Parking Terminal – Tuticorin Port	23.77
327	Establishing Grain Silos at existing terminal – Cochin Port	52
328	Construction of berth no. 12 in western dock Arm	93.7
329	Construction of dry dock at Cochin Shipyard	1800
330	Procurement of 15 RTYGCs at port owned Container Terminal (10 in Phase I and 5 in Phase II) – JNPT	200
331	Offshore Container Terminal – Mumbai Port	100
332	Deployment of two Mobile Harbour Cranes – Kandla Port	60
333	Installation of 2 MHCs at Berth Nos. 13 – KoPT	50

Sl. No	Project name	Cost (Cr.)
334	Installation of RFID facilities at HDC – KoPT	15
335	Upgradation of Cruise terminal at WQ 4 – Chennai Port	17
336	RFID – Ennore	12
337	Container Mobile Scanner- 1 No. – Ennore	15
338	2 nos of Harbour mobile cranes – Paradip	80
339	RFID – Paradip	8.5
340	Supply, Erection, Testing and commissioning of 124 T HMCS at east quay berth – Vizag Port	39
341	Phase II of Multi Model Logistic Hub – Vizag Port	372
342	RFID system – Vizag Port	4
343	Container scanners – Vizag Port	5
344	Construction of North Cargo berth-II for handling bulk cargoes on DBFOT basis – Tuticorin	332
345	Conversion of 8th berth as container terminal on BOT basis for a period of 30 years – Tuticorin	312
346	Scanner – Tuticorin	30
347	RFID – Tuticorin	7.26
348	Installation, Commissioning and maintenance of RFID based gate access system for vehicle entry/exit – Cochin	10
349	Provision of Scanner – Cochin	15
350	Implementation of RFID – NMPT	4.5
351	Implementation of Container Scanner _NMPT	10
352	RFID Implementation – Mormugao	5
353	Modernization of Infrastructure at Kakinada Anchorage Port	50
354	Ro Ro service at Mandwa (Phase 2 of Mandwa port development)	63
355	Capital dredging of 5th Oil Berth – Mumbai	66
356	Capital Dredging Phase 3 at Ennore port	273
357	International Ship repair facility – Cochin Shipyard	970
358	Construction of Central Truck Parking Terminal at JNPT	200
359	New Port at Durgarajapatnam	3772
360	New Port at Belikeri	2783
361	Development of Rail Connectivity for BOT berths at Paradip	128
362	Vasco Yard Expansion at Mormugao	25
363	New 4 lane road connectivity in between Harbour Extension Road and National	36

Sl. No	Project name	Cost (Cr.)
	Highway 7A- Tuticorin Port	
364	Widening of harbour highway extension road (HHE Road) into 4 lane configuration (a section of about 5 km length)	30
365	Widening of VOC road into 8 lane configuration from Port Trust Circle to NH 45B junction	25
366	Construction of new ROB parallel to existing between TTPS to Check Post	20
367	Providing a direct connection between OEC and Western Sector jointing at NAD Curve from E.Co. Rly.	17
368	Connection of dead end line at North of R&D yard to Eastern Grid (Third line) from E.Co.Rlys.	9.3
369	Electrification of east yard revamped lines. 23.489 TKM	19.58
370	Electrification of VPT railway lines 45.143 TKM	30
371	Providing railway track between Marshalling Yard and Hare Island.	70
372	Extension of rail track No. 13, 14, & 15 at Kandla Port.	29.52
373	Providing rail connectivity to berth No. 13, 14, 15 & 16 from take-off point to west end of berth at Kandla Port.	101.29
374	Improvement to internal roads and gate complex in KPL – Ennore	30
375	Construction of ROB – Cochin	30
376	Extension of line No. 11 to 15 to full length at R&D yard.	30
377	Additional line No. 1E on the eastern side of the R&D Yard; b)Providing 3rd line near AKP level crossing of R&D Yard;	29.43
378	S&T works at R&D Yard, “B” Cabin, 14 lever goompty, dumper cabin and service building for VPT.	35
379	Elevated road above VOC road to take Traffic of Hare Island (about 2KM)	43
380	Last mile rail connectivity for development of Enayam Port in Kanyakumari district	300
381	Last mile road connectivity for development of Enayam Port in Kanyakumari district	350
382	Upgradation & modifications of ICD yards at the JNPT port	237
383	Single line rail connectivity project from Basulaia to Shalukkhali	83
384	Upgradation of platform no. 2 & 3 in the Port Marshalling Yard at NMPT	3.7
385	Upgradation of Railway line 1 & 2 at NMPT	3.7
386	3rd line rail connectivty from Jasai to JNPt, 14 km	120
387	Rail Connectivity to Dry Port at Jalna	100
388	Rail Connectivity to Dry Port at Wardha	100
389	Indore-Manmad And Manmad-Mumbai/JNPT Connectivity	5000
390	Jaisalmer-Gandhidham New rail connectivity	4000

Sl. No	Project name	Cost (Cr.)
391	Development of coastal jetty at Jakhau for cement	300
392	Development of CEU at Amravati	2500
393	Development of CEU at JNPT	2500
394	Development of CEU at Ennore	2500
395	Development of CEU at Kandla	2500
396	Laying of new railway track at west of western yard 1 and providing paving block platform in between new track and western yard I	12.68