F. No. CPAM-55020/10/2020-CPIAM-Part(2) (i)
Government of India
Ministry of Coal
(CPIAM Section)
***

Shastri Bhawan, New Delhi
Dated 29th June 2021

OFFICE MEMORANDUM

Subject: Seeking comments on Draft Coal Logistics Policy submitted by SBICaps/Primus Partners -reg.

The undersigned is directed to enclose herewith the Draft Coal Logistics Policy submitted by SBICaps/ Primus Partners.

2. All stakeholders are requested to provide their comments on the above draft report to this Ministry within 30 days from the date ofplacing on the website of this Ministry at e-mail id: hitlar.singh85@nic.in. Comments received thereafter shall not be considered.

Encl.: As above.

(Hitlar Singh)
Under secretary to the Government of India
Email: hitlar.singh85@nic.in

To,

1. NIC - for placing on website of MoC for stakeholder consultation
2. All Stakeholders (CIL and its subsidiaries/SCCL/NLCIL/Captive block allocatees)

Coal Logistics Policy

Prepared by

SBI Capital Markets Limited

And

Primus Partners Private Limited

Abbreviations

List of Abbreviations	
ARR	All Rail Route
BCCL	Bharat Coking Coal Limited
BOT	Build – Operate – Transfer
CCL	Central Coalfields Limited
CCO	Coal Controller's
CIL	Coal India Limited
DPR	Detailed Project Report
DRI	Direct Reduced Iron
DWT	Deadweight Tonnage
ECL	Eastern Coalfields Limited
EQ	Eastern Quay
FOIS	Freight Operations Information System
IBP	Indo – Bangladesh Protocol Route
ISA	Indian Steel Association
IWAI	Inland Waterways Authority of India
IWT	Inland Water Transport
LAD	Least Assured Depth
MCL	Mahanadi Coalfields Limited
MGR	Merry-Go-Round
MMTPA	Million Metric Tonnes Per Annum
MOR	Ministry of Railways
MoU	Memorandum of understanding
NCL	Northern Coalfields Limited
NTKM	Net Tonne Kilometre
NTPC	National Thermal Power Corporation Limited,
NUPPL	Neyveli Uttar Pradesh Power Limited
NW	National Waterway
O-D	Origin – Destination
PCS	Port Community System
PSPCL	Punjab State Power Corp Ltd.
ROW	Rights of Way
RRVUNL	Rajasthan Rajya Vidyut Utpadan Nigam Limited
RSR	Rail – Sea – Rail route
RVNL	Rail Vikas Nigam Limited
SECL	South Eastern Coalfields Limited
SPV	Special Purpose Vehicle
SRCPL	Sarguja Rail Corridor Pvt. Ltd
TAUA	Track Access & Usage Agreement
TDC	Target Date of Completion
TLC	Total Logistics Cost
TNEB	Tamil Nadu Electricity Board
TPS / TPP	Thermal Power Station / Thermal Power Plant
WBPDCL	West Bengal Power Development Corporation Limited
WCL	Western Coalfields Limited

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Introduction

Coal is the mainstay of Indian energy sector catering to 55% of the total generation capacity mix in 2019-20. Developing a thriving coal market would go a long way for reaching the targeted growth of the country. Creating transport infrastructures and managing logistics to transport coal from point of origin to consumption centres are major challenges for sustainable development of coal market. Since coal is still the bedrock of energy generation in the country, logistics associated with movement and transportation of coal in India is through various modes of transport. Coal is transported in bulk and the external dispatches of coal from the collieries are through a variety of modes.

In order to have efficient and optimal evacuation of coal considering multi-modal transport (road, rail and waterways), a Committee has been constituted by Ministry of Commerce and Industry with Ministry of Coal, Ministry of Ports, Shipping and Waterways, Ministry of Railways, Ministry of Power as its members. Consultations has happened with stakeholders, end-user industries in both public and private sector to understand the challenges in evacuation of coal and accordingly to address these concerns a coal logistic policy is drafted.

Objectives

The Key objectives of the coal logistic policy are :

- To ensure availability of adequate coal evacuation infrastructure
- To optimize total logistics cost of coal (time and transport price sensitive)
- To promote modal mix and greener transportation for movement of coal

Sector landscape

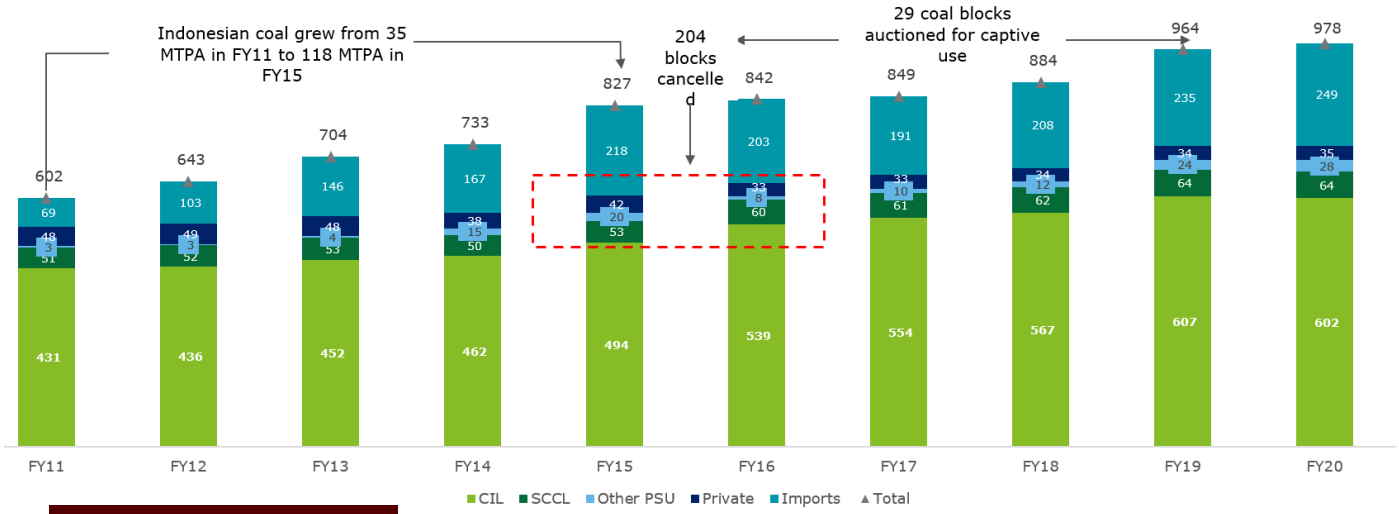
Sector landscape

Supply scenarios: Production and import Trends

Overall domestic supply of coal in India grew at 3.5% CAGR driven by CIL. CIL production growth was recorded at ~3.8% CAGR while SCCL production grew at 2.6% CAGR from FY11 to FY20. Recent PSU production growth was an outcome of initiation of production at high-capacity mines of RVUNL and NTPC. Cancellation of 204 coal blocks in FY15 derailed supply planned for future. Presently about 33 auctioned coal blocks are at production stage. Overall imports grew by ~15% CAGR from FY11 to FY20, while imports grew by ~33% CAGR from ~69 MTPA in FY11 to ~218 MTPA in FY15 in a span of just 4 years due to availability of cheap low ash thermal coal driven by Indonesia.

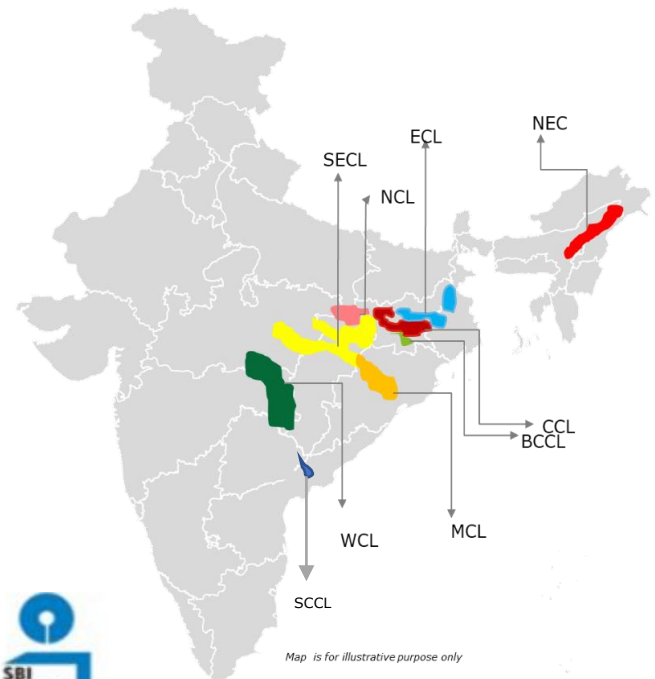
Coal India accounted for ~62% of the total supply and ~83% of the domestic supply portfolio. Rest production is from SCCL, other PSU and from coal blocks allocated to private players.

Figure 1: Coal supply scenario in India (Million Tonnes)



Production Centre

Figure 2: Geographical distribution of coal Production



Majority of coal reserve lies in the state of Jharkhand, Odisha, Chhattisgarh, West Bengal, Telangana and Madhya Pradesh. Other states having coal reserve includes Maharashtra and states in North East of India.

CIL has seven producing subsidiaries namely Eastern Coalfields Limited (ECL), Bharat Coking Coal Limited (BCCL), Central Coalfields Limited (CCL), Western Coalfields Limited (WCL), South Eastern Coalfields Limited (SECL), Northern Coalfields Limited (NCL)and Mahanadi Coalfields Limited (MCL) which accounts for more than 80 percent of coal production in the country. The coal mines in Assam and its neighboring areas are controlled directly by CIL under the unit North Eastern Coalfields Limited (NECL). Also in Telangana, Singareni Collieries Company Limited (SCCL) is a State government-owned coal mining company in India.

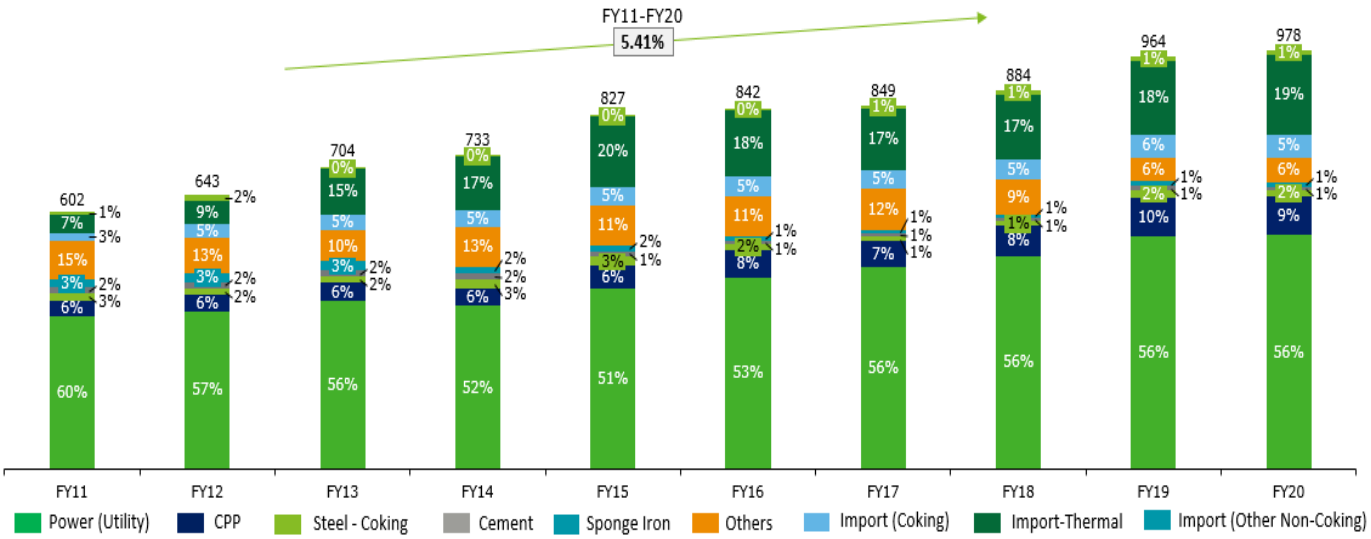
Source: Ministry of Coal Annual Reports, CIL Subsidiary Annual Reports, CMIE Database

Demand : Consumption Trends

Coal demand in India grew at ~5.4% CAGR over the past 10 years, mainly driven by power sector (utilities), which grew at 5% CAGR over the same period, although the share of Power sector consumption (excluding imports) in the overall portfolio dropped from 60% in FY11 to ~56% in FY20.

Out of the total coal imports of ~247 Million Tonnes, around 171 Million Tonnes was Non-Coking coal, out of which ~70 Million Tonnes was imported by power sector players. Therefore, Power sector (Utilities) consumed around ~584 Million Tonnes of coal in FY20 (including imports) which is ~60% of the total coal consumed in India.

Figure 3: Coal demand scenario in India (Million Tonnes)

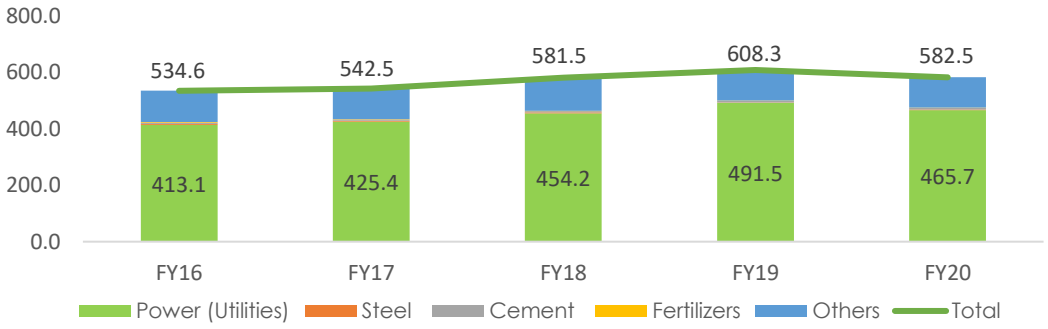


Sector wise off-take of coal

Power sector accounted for ~80% of the total offtake from Coal India, amounting to ~465.7 Million Tonnes per Annum in FY20. Out of ~465.7 million Tonnes, ~427.4 MTPA offtake was via the long term FSA route and the remaining ~38.3 MTPA was via various E-Auctions mode.

Others category mainly consists of sectors such as Captive Power Plants (constituting an estimated ~40-45 Million Tonnes), Sponge Iron (constituting an estimated ~10-15 Million Tonnes), and remaining dispatches to Bricks manufacturing and other sectors. Reduction in offtake from Coal India was mainly attributable to reduced offtake from power sector due to tepid Y-o-Y growth in electricity demand in FY20 and increasing imports from the power sector which replaced domestic CIL offtake.

Figure 4: Sector-Wise coal dispatch from Coal India



Source: Ministry of Coal Annual Reports, CIL Subsidiary Annual Reports, CMIE Database

Consumption Centre

Majority of the coal-based generation capacities are located and clustered in proximity to the Coal production centre. The upcoming coal-based capacities whether under construction or planned are also majorly located in northern India in proximity to coal India subsidiaries.

Around ~19 GW of under construction capacities have low probability of materialization due to Law & Order problems, financial crunch/NCLT issues, Lack of requisite clearances from MoP/MoEF and lack of signed PPAs (or other PPA issues like revoked PPAs) due to financial and market constraints.

Around ~17.43 GW of coal based assets located in coastal areas import around 60 Million Tonnes of coal annually. ~50% of the coal imports (~ 30 Million Tonnes) is imported by 2 major assets, TATA Mundra 4000 MW plant and Adani Mundra 2640 MW Plant.

Figure 5: Geographical Distribution of Coal Based Power Plants

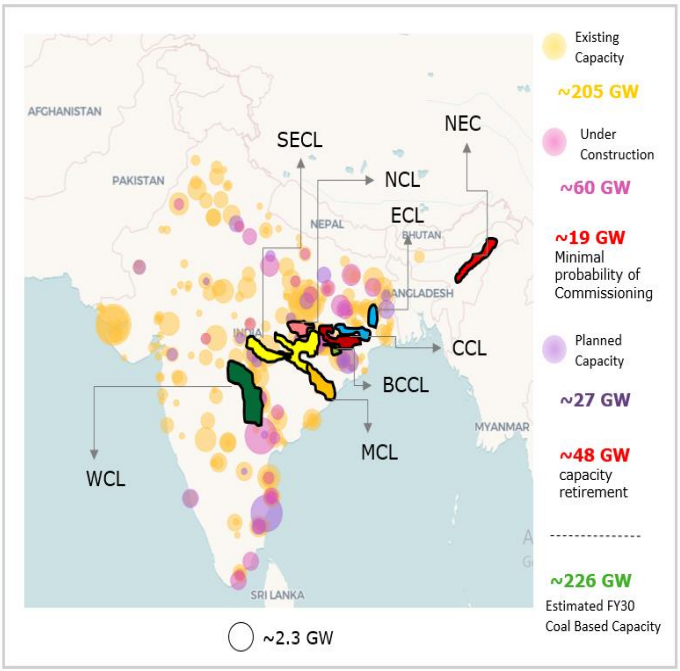
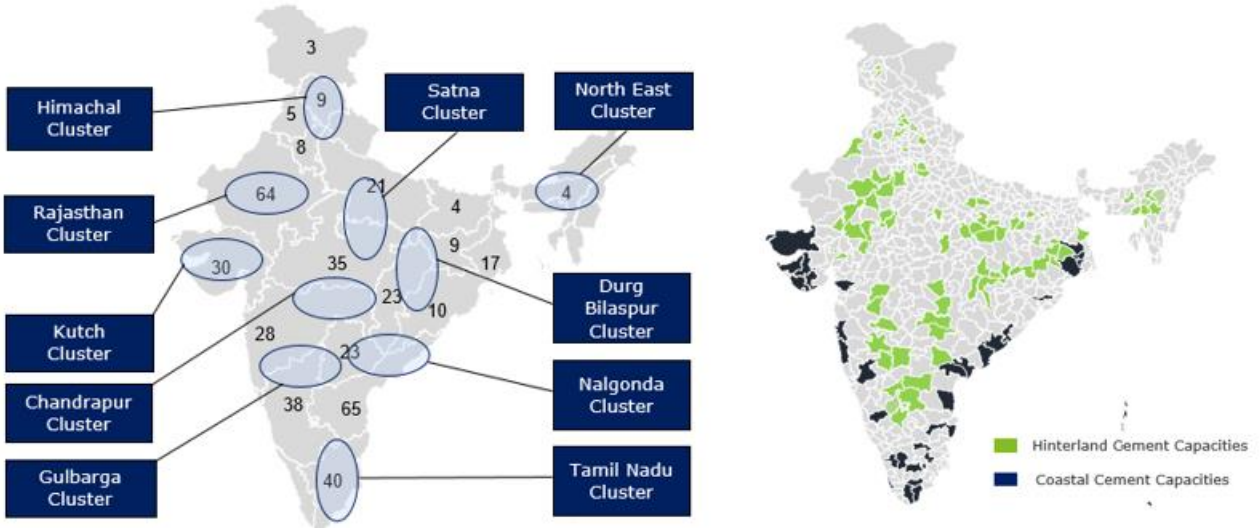


Figure 6: Cement production clusters in India



Around 29% of the cement production capacity is consolidated along the coastline which gives these assets considerable advantage for procuring thermal coal from Indonesia over sourcing from CIL given the landed cost economics and grade slippage issues of domestically sourced coal.

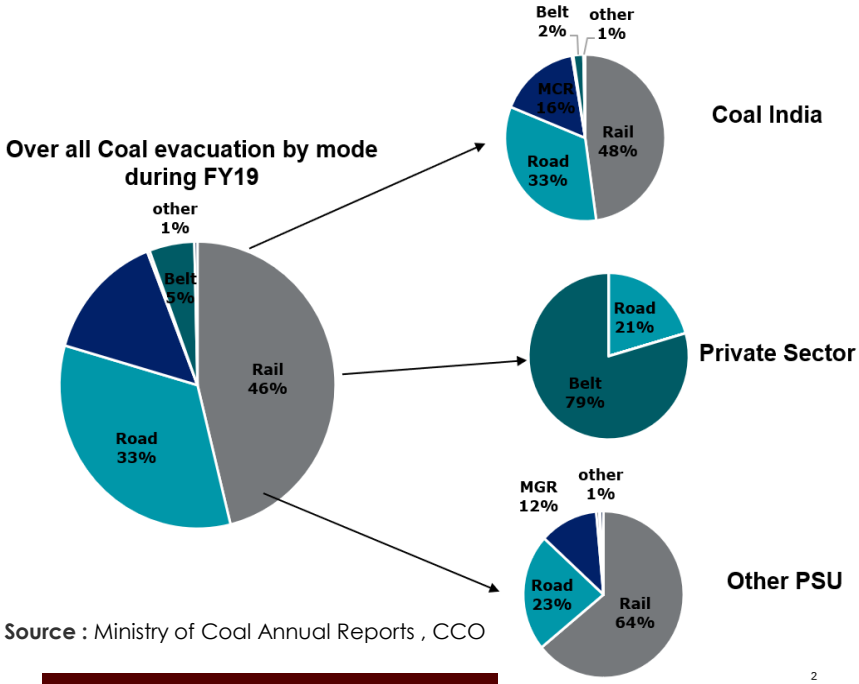
The cement industry in India is highly fragmented with 18 major large and mid-sized players accounting for ~ 87% of the installed capacity and small players accounting for the rest. Even in the portfolio of Large Sized and Mid-Sized cement capacities (accounting for 87% of the total cement capacity), 62% capacity is of large sized plants (> 20 MT) and 25% capacity is of Mid-sized plants (10-20 MT).

The cement industry has continued to consolidate over last three years with large players acquiring capacity from small and weak players. Overall capacity share of large/mid-sized (18) firms increased to 87% in FY20 from 80% in FY17.

Source: Ministry of Coal Annual Reports, CIL Subsidiary Annual Reports, CMIE Database

Modal Mix

Figure 7 :Mode wise despatches of raw coal (in percentage)



Source : Ministry of Coal Annual Reports , CCO

Below figure describe mode-wise coal dispatch using various mode of transportation of coal in the country. This data appears to be reflecting the mode of transportation selected for dispatch from the mine. For this reason, the road is appearing the dominant mode. Coal moving to washery or by road to good shed for loading by rail is reflected here as road dispatch instead of rail. This anomaly can be corrected by capturing mode wise data in NTKM instead of tonnage. In any case the data published by Ministry of Railways for transportation of coal by rail is accurate as it is derived from freight invoices issued by Railways after the coal is loaded in the rake and freight has been collected.

Comparative Analysis

Mode wise comparison on unit cost and emission is reflected in the following tables: Mode wise cost of transportation is Illustrated as under.

Table 1 :Mode-wise transportation cost comparison

Mode	Unit Rate	Unit
Freight by Rail	INR 1.86*	freight/Ton-KM
Transportation cost by Road	INR 2.50**	Cost/Ton-KM
Transportation cost by Conveyor	INR 1.00**	Cost/Ton-KM
Transportation cost by Inland Waterways	INR 1.50**	Cost/Ton-KM

Source : :*ASS 2019-20, MOR ** Market Research

Earlier studies led by National Transport Policy Committee established that road transportation is viable up to a lead of 400 kms. Beyond that rail is more economical. Gradually, the location of power plants is getting closer to the coal mine, with several of them being located at pit head. The average lead of transportation by rail is witnessing a continuous decline after reaching a high of 754 in 1980-81 to 586 in 2019-20. It highlights dispersion of economic activity, which is resulting the production centres coming near to consumption point. Coal volumes being very high, it becomes operational necessity to use rail even for short lead, MGR being the best example.

Emission comparison of modes indicate that Short Sea and multimodal road cum rail are the eco-friendliest modes with Emission gCO_2/Tonne-Km figures of 16 and 26 respectively. Pure rail has emission figure of 22 and pure road 62.

Table 2 :Mode-wise emission level

Mode	Emission gCO_2/tonne-Km
Road	62
Rail	22
Barge Transport	31
Short Sea	16
Intermodal road/rail	26
Intermodal rail/barge	34

Source : OECD

Outlook

India has embraced **Atma Nirbhar Bharat Abhiyan**, the coal & mining sector has started gearing up to make the country Atma Nirbhar (self-reliant) in coal mining through various reforms in the coal sector.

The government is targeting annual domestic coal production of 1BT from CIL by FY24. Presently, Coal India evacuates about 45-50% of raw coal by rail mode with target evacuation by rail at 60%. Coal India would therefore need to evacuate ~600 MT of raw coal by rail mode on an annual basis, which necessitates significant enhancement in coal evacuation capacity through rail. Thus, well-planned execution of infrastructure and logistics for transportation of coal can effectively address the projected demand and production growth.

To achieve this target, Coal rake loading has to increase. As per current policy of Railways, IR is making investment in capacity augmentation of main line or existing feeder line rail network. Construction of rail network to access new coal blocks, which are a little away from existing main lines and loading sidings is the responsibility of the Coal company or by the SPV, created of Railways and the coal company.

Indian Railways has route length of 67950 kms as on 31st March 2020. It loaded and moved 1208 million tonne of revenue earning traffic in FY20. Percentage of total production plus imports of coal carried by the Indian Railways is illustrated in the table below.

Ministry of Coal and Ministry of Railways have identified 14 critical rail infrastructure projects for monitoring at the ministry level. These projects cover high growth areas of coal mining, which are important to achieve the coal production target.

Besides enhancing capacity manifold on the existing network, IR has focussed its attention to development of High Performance, high capacity, heavy haul freight only rail corridors with a view to reduce the unit cost of transportation and increasing the top speed of freight trains to 100 kmph.

Such corridors are expected to easily achieve average speed of 50 kmph thereby doubling the average speed. Doubling of average speed will reduce the rolling stock requirement by nearly half. These corridors are being built to 25 tonne axle load standard, with capability to upgrade it to 32.5 tonne axle load in future.

Need of coal Logistic Policy

Need of coal Logistic policy

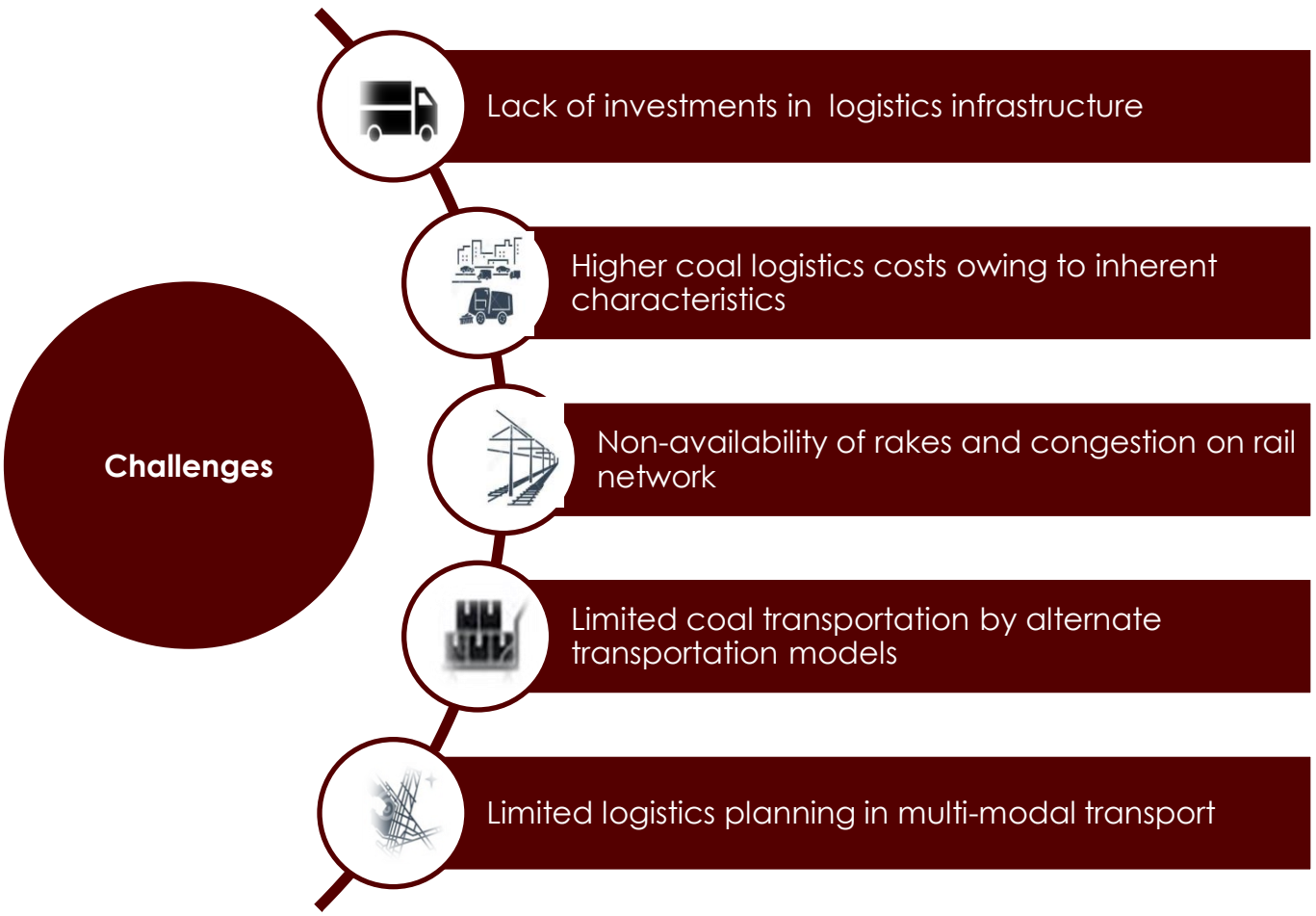
As per 'Coal Vision 2030' commissioned by Coal India in 2017, domestic coal demand was estimated to be 1,300-1,900 MTPA by 2030. Target domestic coal production capacity was estimated at 1,500 MTPA by 2030. Transportation of such high coal volume and creating necessary evacuation capacity are challenging, bulk of the coal has to be transported to power utility and user industries.

In its fourth tranche of stimulus, Government of India announced a slew of reforms to bring in investments in India as part of Atma Nirbhar Bharat Abhiyaan during May 2020. This included substantial investment of INR 50,000 crores for development of coal transportation infrastructure

- Evacuation of coal from CIL (enhanced target of 1 billion tonnes by FY24) and private blocks
- INR 18,000 crores of mechanised transfer of coal (via conveyors) from mines to railway sidings

This presents an opportunity for a study for identifying the potential interventions to enhance coal evacuation infrastructure and reduce the freight cost to improve the overall competitiveness of coal. Further, such planning needs to have an integrated approach with respect to the overall logistics planning for the country considering all transportation modes and commodities.

Figure 8 :Challenges in coal evacuation

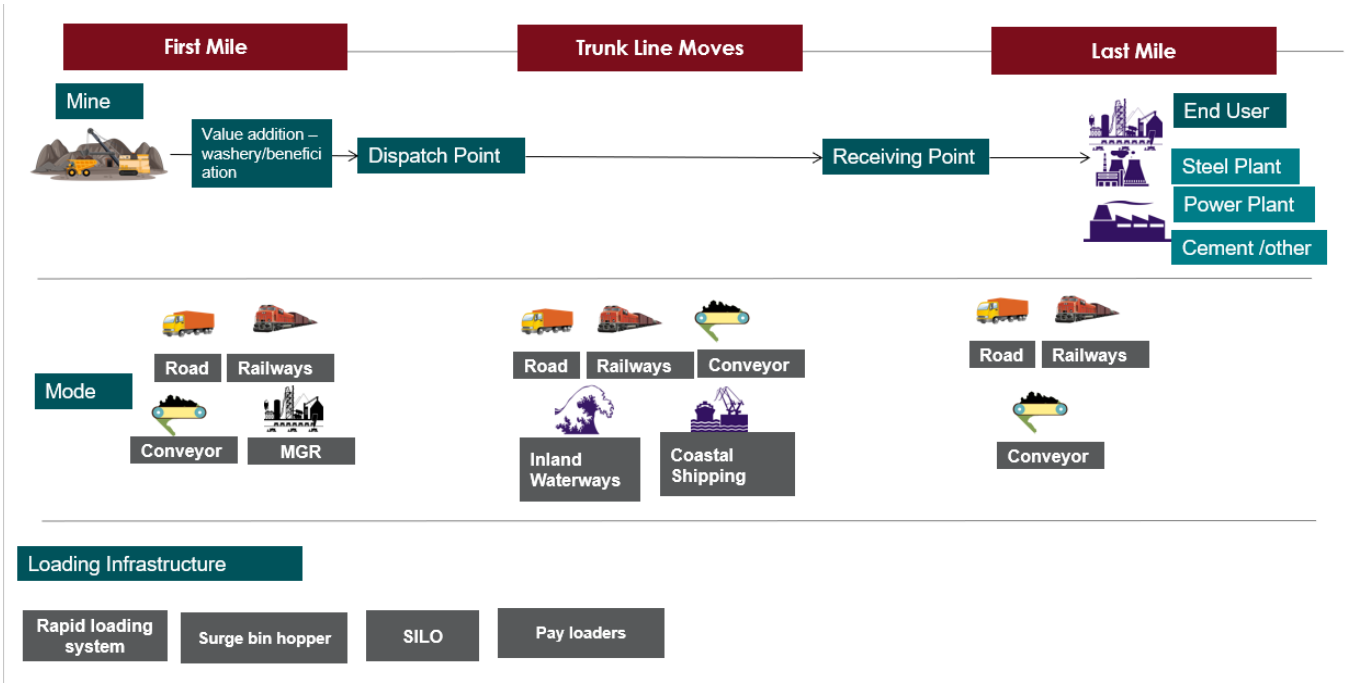


Approach

Approach to Study

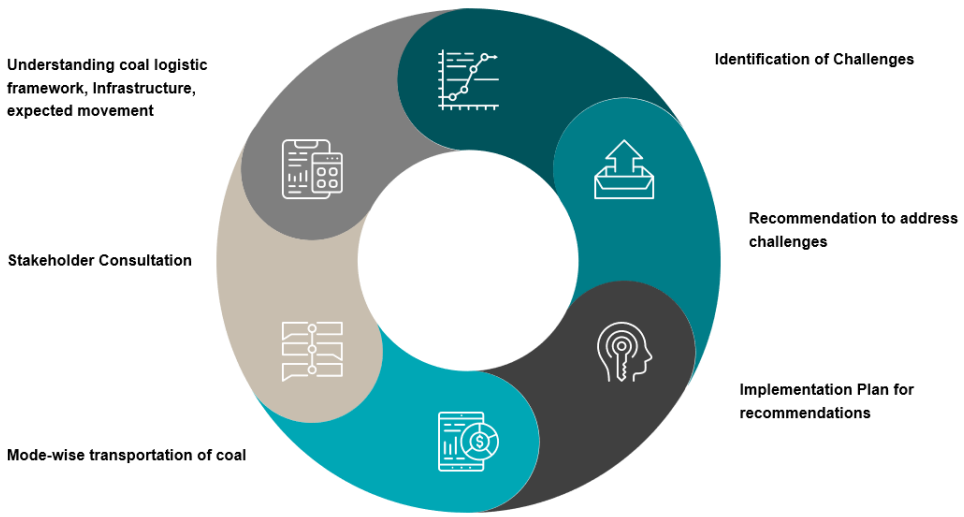
Overall coal logistic chain involves movement of coal from mine to nearby washery or coal handling plant for value addition. Subsequent to that coal is moved to dispatch point which can be a railway siding, port or inland waterways terminal using road, conveyor, merry-go-round (MGR) train and rail. Similarly, trunk line movement and last mile connectivity happens using different mode of transportation for various Origin and Destination (O-D) of coal. The expected coal movement in Net tonne kilometre (NTKM) is analyzed by consulting various stakeholders involved the coal logistic chain.

Figure 9 :Coal Logistic Chain



Existing and upcoming infrastructure of each region is evaluated to identify the challenges and gaps in efficient and environment friendly transportation of coal from mine to end use plant. Accordingly, the policy framework is drafted to address identified challenges and gap as part of this exercise.

Figure 10 :Approach to study



Policy Framework

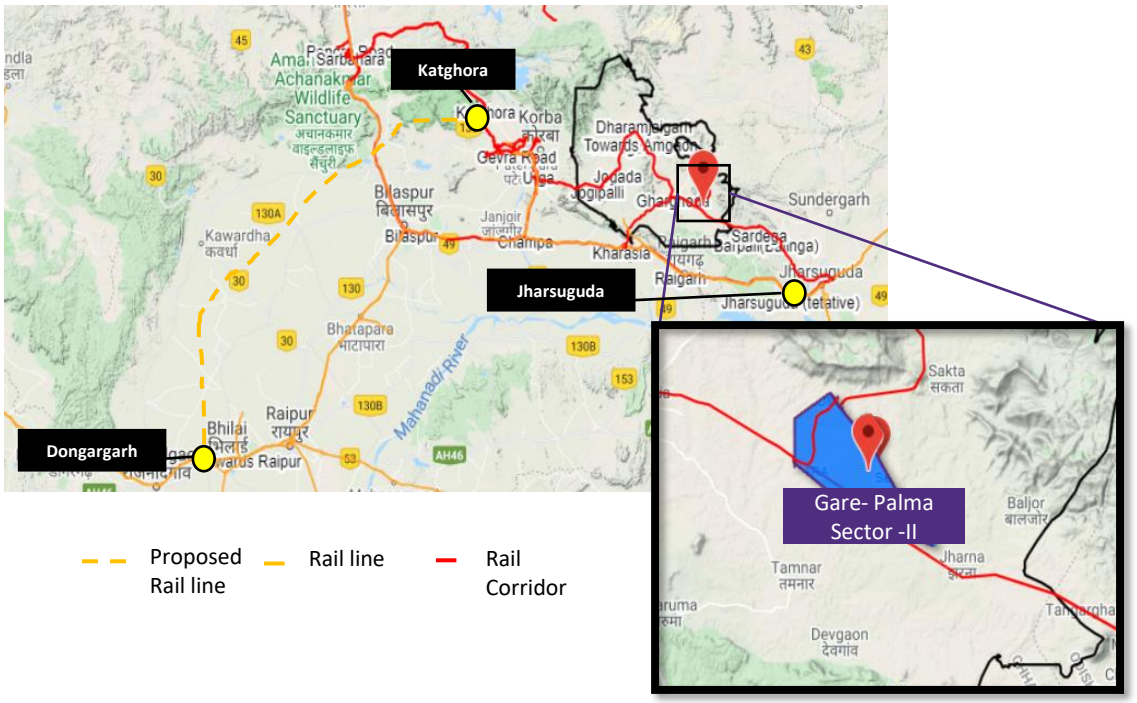
Advance Planning for FMC

The Gare Palma Sector - II Coal Block lies in the eastern part of the Mand-Raigarh coalfield in Chhattisgarh state. It has been allocated to Maharashtra State Power Generation Company (MahaGenco), for their captive utilization. The coal produced in the Gare Palma Sector II coal mine will be transported to the existing power plants and upcoming power plants of MahaGenco in Maharashtra.

In case of Chhattisgarh East Railway Corporation Limited (CERL) project, after acquisition of land for railway it is discovered that it is passing over the coal block of Mahagenco and requires re-alignment.

To avoid such issues, it would be better if the Right of Way (ROW) of rail and roads is marked before allocation of mine.

Figure 11 : Passing of railway line from Gare-Palma sector II mine

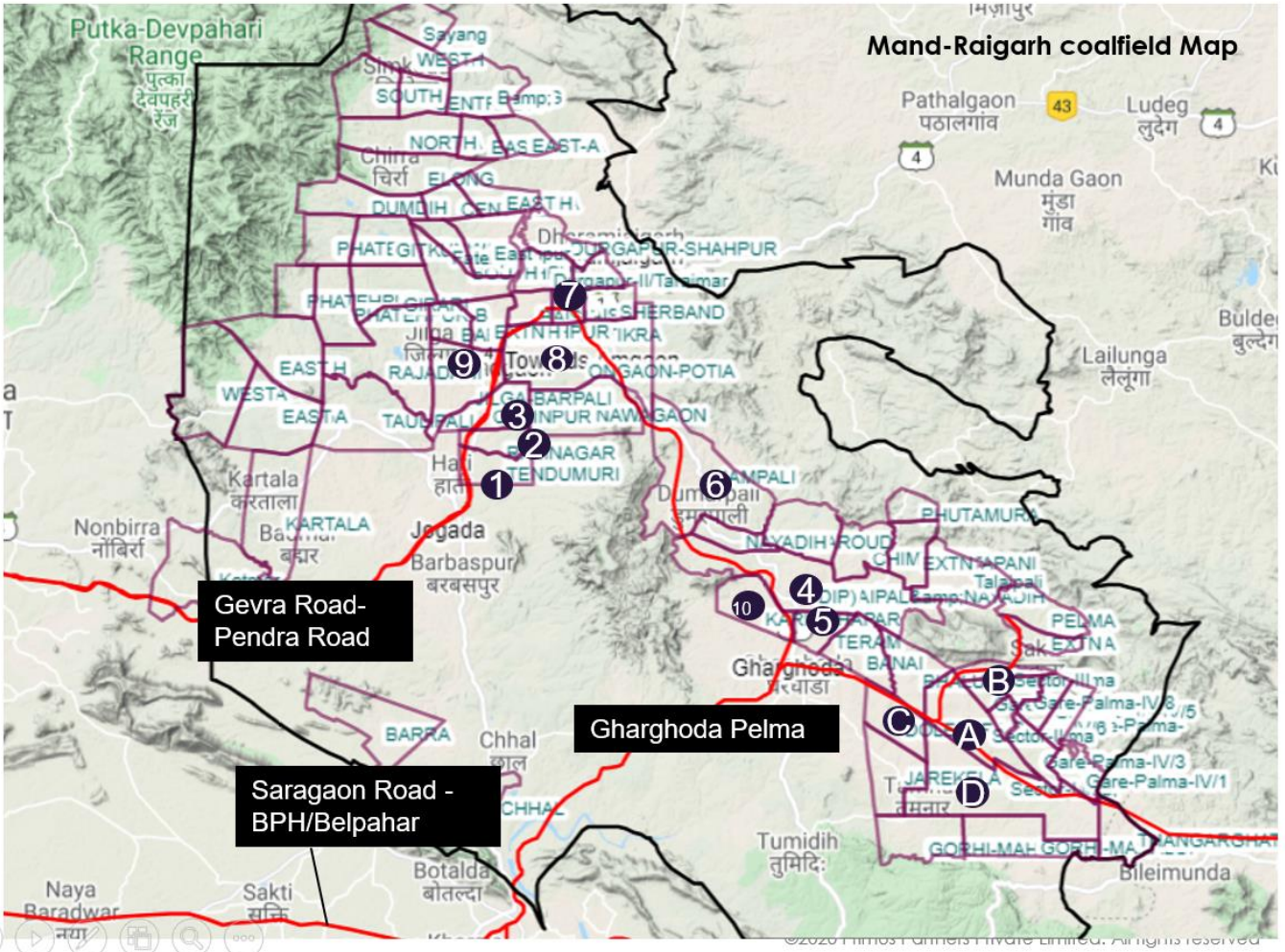


Under the present planning of rail connectivity and rail siding in mining area, the focus is on building the main line. The planning of sidings is done independent of main line construction, which is generally delayed.

CONCLUSION:

ROW of rail and roads and first mile evacuation is planned as part of mine allocation process.

Figure 12 : Details of the mine in Mand-Raigarh coalfield from which rail line is passing



Gerva-Pendra Road:

1. Tendumuri
2. Ramnagar
3. Chainpur
4. Dipside of Barod-Bijari (Sector-I,II,III, Saraipal&Nayadih DIP)
5. Karichhapar
6. Jampali
7. Baisi
8. Ongaon-Potia
9. Jilga-Barpali
10. Karichhapar

Ghargoda Line:

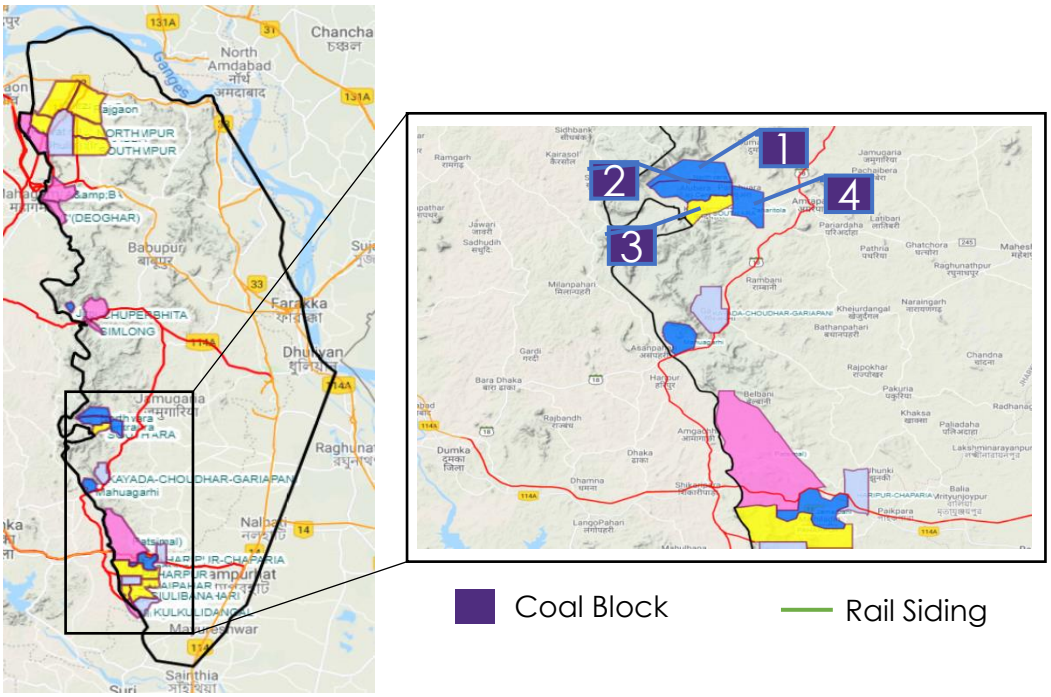
A. Gare Palma sector-II
B. Gare palma sector-III
C. Dolesara
D. Gare Palma sector-I

Case Study 1 - Sharing and Integration of Railway siding

The evacuation of coal from Pachwara North, Pachwara Central and Pachwara South located in Jharkhand is a challenge as the distance of mines from nearest rail station Pakur in Eastern Railway is about 55 kms. Bearing cost of siding by one block owner and have separate siding is wasteful. In order optimize the line connectivity sharing is being planned through SPV JV model of Railways. Land in this case will be acquired by Railways at the cost of SPV. TVNL has taken the lead to form the SPV.

To address this a SPV is formulated by PSPCL, NUPPL, RVNL, WBPDCL to develop Pachwara Railway siding with RVNL holding 26 % stake. Another Block Urma Pahari Tola, which is nearby is also planning to use this siding on sharing basis for evacuation of coal by rail.

Figure 13 : Coal blocks in Rajmahal Coalfield forming a cluster



Rajmahal Coalfield

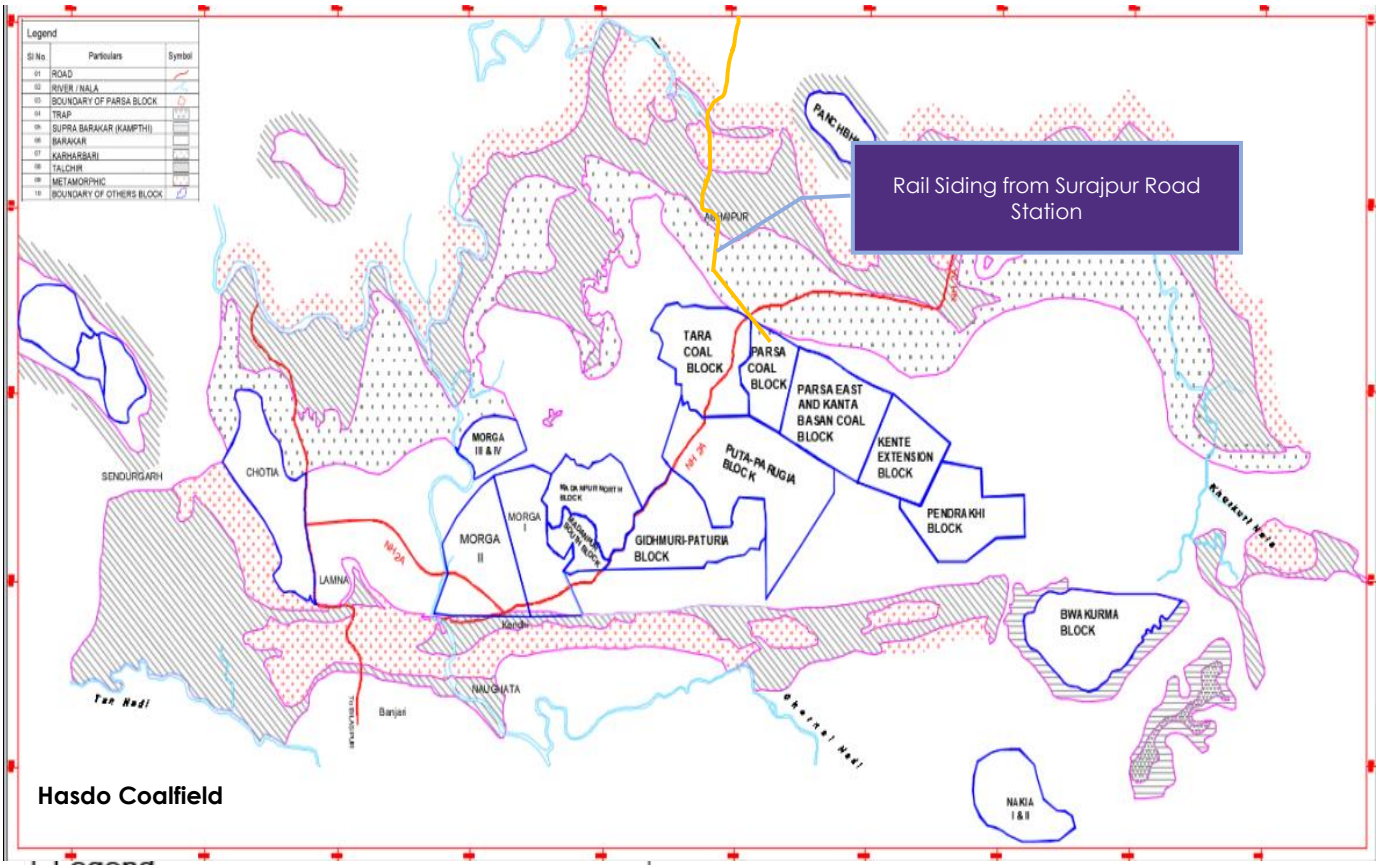
S. No.	Coal Mine	Allocatee
1.	Pachwara North Coal Mine	West Bengal Power Development Corporation Limited (WBPDCL)
2.	Pachwara Central Coal Mine	Punjab State Power Corp Ltd. (PSPCL)
3.	Pachwara South Coal Mine	Neyveli Uttar Pradesh Power Limited (NUPPL)

Other Blocks in the vicinity: Mahuagarhi, Kayada-Choudhar-Gariapani, Haripur-Chaparia, Brahmini, Pokharia-Paharpur etc.

Case Study 2 - Sharing and Integration of Railway siding

Sarguja Rail Corridor Pvt. Ltd (SRCPL) has constructed a Railway siding on Bilaspur division to Parsa Kante coal mining block of Rajasthan Rajya Vidyut Utpadan Nigam Limited
The railway line starts from Surajpur Road station to Ramanuj Nagar railway Station (~33 Km, Phase -I) and from Ramanuj Nagar Railway Station to PE & KB mine with a distance of ~37 Km (Phase II)
Phase I and Phase II of the Project was completed and is operational since October 10, 2014 and April 2018 respectively

Figure 14 : Map showing railway siding of SRCPL and nearby blocks



Legend

Sl No.	Particulars	Symbol
01	ROAD	
02	RIVER / NALA	
03	BOUNDARY OF PARSA BLOCK	
04	TRAP	
05	SUPRA BARAKAR (KAMPTHI)	
06	BARAKAR	
07	KARHARBARI	
08	TALCHIR	
09	METAMORPHIC	
10	BOUNDARY OF OTHERS BLOCK	

Rail Siding

S. No.	Coal Mine	Allocatee
1.	Tara	Unallocated
2.	Parsa	Rajasthan Rajya Vidyut Utpadan Nigam Limited
3	Parsa East & Kanta Basan	
4	Kente Extn	
5.	Gidhmuri	Chhattisgarh State Power Generation Co. Ltd.
6.	Paturia	
7.	Madanpur (North)	Unallocated
8.	Morga-IV	Unallocated
9.	Morga-III	Unallocated
10.	Pendrakhi	Unallocated

Case Study 2 - Sharing and Integration of Railway siding

Existing Provision

RVUNL has entered into Track Access & Usage Agreement ("TAUA") with SRCPL dated July 21, 2015. The agreement is for period of 30 years to use the Sarguja Private Siding as Co-User to transport the mined coal from the mines up to the Surajpur Road station for onward transportation of coal up to thermal power stations of RVUNL in the state of Rajasthan

Business Model

The Rail Corridor is developed by a third party with ~~all~~ role of financing, construction, maintenance & operation. The coal owner has entered into Track Access & Usage Agreement for long term. For land acquisition the Sarguja Rail Corridor Pvt. Ltd approached the state govt and with their assistance land acquistion for railway siding was completed for public purpose.

The Rail Corridor (Sarguja Rail Corridor) developed by Pvt players can be utilized by other nearby mines (Say Tara and Pendrakhi) to optimize logistic cost. For example, going forward allocate of Madanpur (North),Morga III and IV would like to utilize Sarguja corridor

There are cases wherein the new entrant/coal block allocate wants to use the existing siding by taking off from midway of the existing siding or wants to develop a loop on the approach line if traffic level is low. Such sharing has the following benefits.

- The rail capacity created by the siding owner can be optimized. The assets so created have higher utilization.
- Land acquisition requirement is reduced drastically.

CONCLUSION:

As per the discussions undertaken, the following suggestions can be considered for the Coal Logistics Policy:

1. Arrangements of relevant business models need to be encouraged for formation of first mile as well as last mile connectivity. A common user facility like Railway Siding can be developed in the cases where there are 2-3 mines are close to each other. Various models can be assessed for this.
2. One of the models can be, wherein the State Government carries out land acquisitions and the other stakeholders i.e., the block allocates would make investments for the development. It is a common user line.
3. An exercise need to be undertaken, when Railway Administration uses its Rights to allow usage of siding or built another facility by connecting the siding with another siding or handling facility.The original investor need to be suitably compensated.

Source: Maritime India Vision 2030 – Ministry of Ports, Shipping and Waterways

Grouping Trunk line Infrastructure

Construction of rail siding to connect mines, plants, cluster of industries etc. for evacuation by rail face a major challenge in acquisition of land which is of the linear nature. In serving a cluster of mining blocks having different ownership, the same area will require laying of more than one siding, thereby increasing the land requirement. It also results in sub optimal use of assets. It would therefore be advisable to create a shared rail siding, which has a trunk taking off from main rail line and branches off to different blocks at appropriate places.

SPV Model

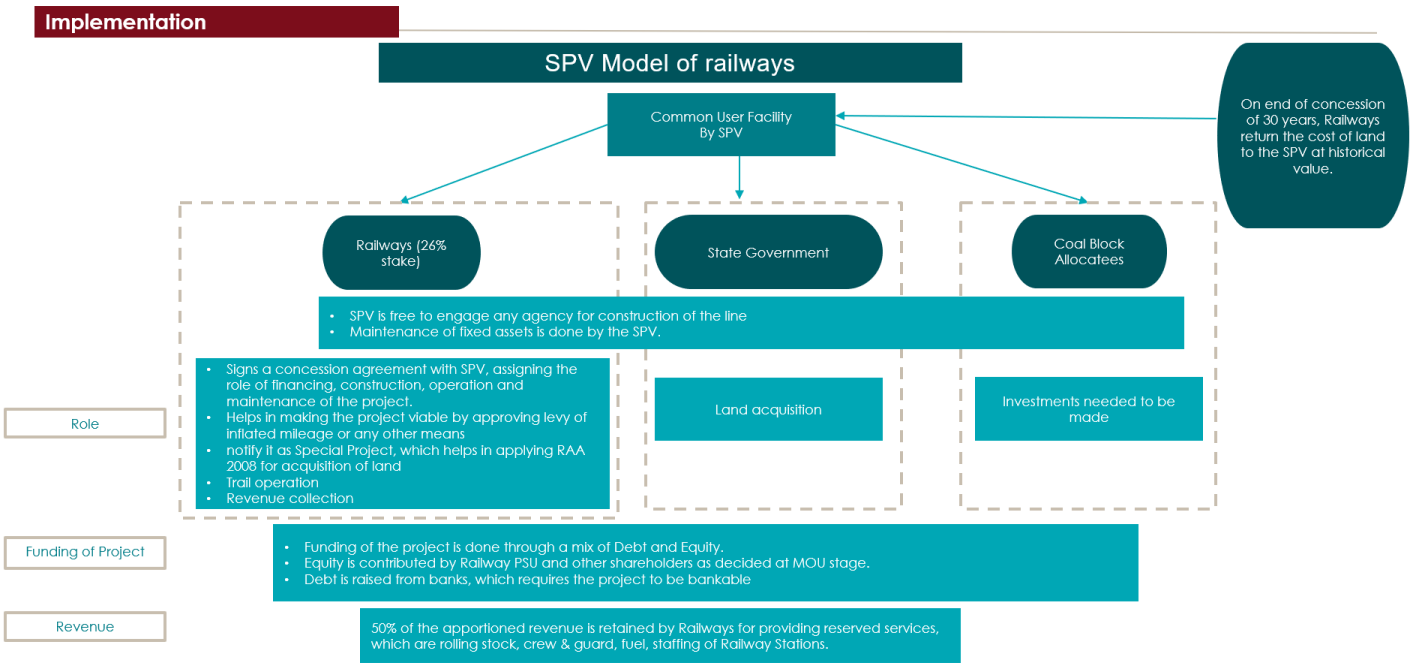
Ministry of Railways has formulated 5 models of private participation in Railway projects in 2012. The JV model is quite appropriate for meeting the above requirement. The salient features of the model are as under:

1. The stakeholders will create a SPV, which will be registered as a company under Company's Act of 1956.
2. The likely stake holders are the owners of private mining blocks, The State Government, a Railway PSU and may be coal PSU. As per the policy the Railway PSU will hold a minimum of 26% stake. It takes few rounds of discussion to arrive at an agreed MOU, which is the starting point.
3. Land for the project is acquired by the Ministry of Railway through the state government at the cost of SPV. The title of land is in the name of the concerned Zonal Railways. Railways generally notify it as Special Project, which helps in applying RAA 2008 for acquisition of land. On end of concession of 30 years, Railways return the cost of land to the SPV at historical value.
4. Funding of the project is done through a mix of Debt and Equity. Equity is contributed by Railway PSU and other shareholders as decided at MOU stage.
5. Debt is raised from banks, which requires the project to be bankable. MOR helps in making the project viable by approving levy of inflated mileage or any other means.
6. MOR signs a concession agreement with SPV, assigning the role of financing, construction, operation and maintenance of the project.
7. Revenue is collected by the Railway. It is apportioned to the SPV as per Inter Railway Financial Adjustment. 50% of the apportioned revenue is retained by Railways for providing reserved services, which are rolling stock, crew & guard, fuel, staffing of Railway Stations.
8. SPV is free to engage any agency for construction of the line.
9. Train operation is done by Railways.
10. Maintenance of fixed assets is done by the SPV.

Source: Maritime India Vision 2030 – Ministry of Ports, Shipping and Waterways

Grouping Trunk line Infrastructure

Figure 15 : Diagram showing SPV model of railways



Common Use Infrastructure

- Construction, maintenance and operation of rail sidings is governed by Freight Marketing circular no. 11 of 2016 issued by Railway Board and subsequent corrigendum thereof issued by the Railway Board.

- The use of siding by other users is a progressive provision.

Para 15 of Private Siding Agreement states as under:

"No traffic, inward or outward other than that of the Applicants works shall any time be sent over the siding by the applicant except with prior permission of the Railway Administration. ….. "not to take or receive or permit any other person to take or receive from any other person whomsoever any consideration of remuneration of any sort or in respect of carrying any commodity------ except with prior permission----".

Para 19 of Private Siding Agreement states as under:

Railway Administration has Rights regarding use of the siding.

a) To use the siding or any extension or part thereof for any purposes of the Railway Administration free of charge or any remuneration to the applicant in respect of such use.

b) To connect or allow to be connected with the siding or any extension or part thereof any other siding---------.

CONCLUSION:

- Planning for construction and use for shared evacuation infrastructure be part of the mine allocation process
- Institutes like CMPDIL/ISM etc. can be identified as nominated agencies for assisting mine owners in developing FMC

Recommendations

Conveyor systems are one of the modes of transportation of goods/items other that road, rail, freight means etc. It is extremely handy for businesses that deal with heavy goods, sharp items, raw materials, and mass-produced products for product short distance transportation

The pipe conveyor systems are being popularly used in countries like USA, China, Russia, Brazil etc. In India, pipe conveyor for coal transportation was implemented by Jindal Steel and Power Ltd. first, and can be now seen in places like Butawada, Krishnapatnam etc. While use of conveyors for carrying coal over long distances from producing to consuming centres is uncommon, it is not uncommon to find conveyors transporting coal from mines to barge-loading stations. In addition, where end user plants is in close proximity to a mine, conveyors are generally used to transport coal to the power plant stockpile.

Conveyors can traverse difficult terrain with greater ease than trucks or rail systems, and they can also be extended easily and have the advantage of continuous transport. Globally conveyors with wide belts and high operating speeds can have enormous capacities, varying from 2,000 to 5,000 tons per hour.

The advantages of a pipe conveyor/conveyor belts over other modes of transportation are:

Cost Effective	• Comparative Low investment • Low maintenance cost
Environmental Friendly	• Keep these toxic residues away from contact with the surrounding environment • Less greanhouse gas emissions
Efficiency	• No material spillage • Two-way transportation • High operational safety. • Suitable for Rougher Terrains

CONCLUSION:

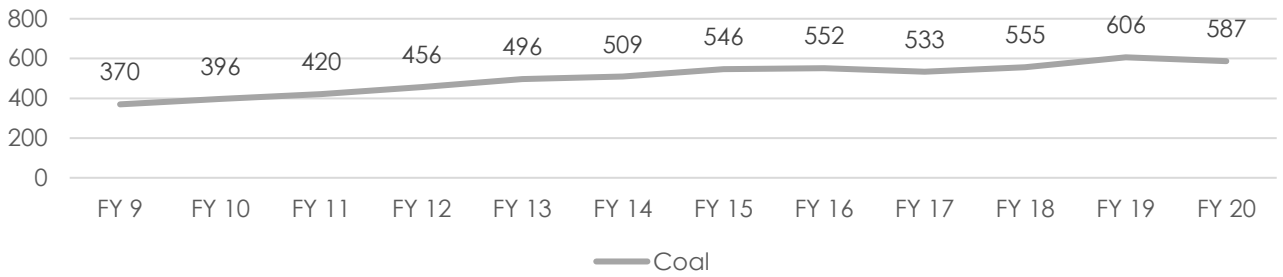
Considering the benefits of conveyor, use of it need to be promoted wherever it is economical to use.

Trunk movement and Transport Costs : Need for Regulation

Coal is the largest market segment for IR, constituting around 45-50% of IR's freight business, both, in terms of revenue as well as throughput. Coal movement through railways has been continuously increasing and it is forecasted to reach up to 1577 MT by 2051 from 587 MT presently as forecasted NRP. Coal is one of the traditional bulk commodity whose transportation accounts for the present the modal share of railways (~30%) in the national transport system. Coal and Coke accounted for 48% of the freight traffic on the Indian Railways.

Logistic cost is one of the major contributor to landed cost of coal at end user plant. In order to make domestic coal more competitive it is essential to optimize logistic cost. More than 60% of coal transportation in the country is through railway mode.

Figure 16 : Railway freight growth trends (in MT)



It is observed that high freight rate of coal transportation by rail is resulting import of coal particularly from Indonesia competitive vis-à-vis domestic coal. This is particularly true for power plants located in South and Western India.

Coal transportation by rail is more expensive when compared with average basket of all commodities moving by rail. The mark up on average cost of transportation is more than 50%.

The Annual Statistical Statement (ASS) of Indian Railways for the year 2019-20 presents the following figures relating to cost of transportation and revenue realisation for coal.

Figure 17 : Revenue realization and cost of hauling

Rs. 1.86 Per Tonne Kms	**Rs. 1.57** Per Tonne Kms	**Rs. 1.20** Per tonne per kilometer
Realization of revenue in 2019-20 from coal (ASS Statement No. 13, Page no. 137)	**Revenue realization for all commodities** **(ASS Statement No. 13, Page no. 171)**	**Cost of hauling a goods unit** **(ASS Statement No. 15, Page no. 187)**

Source: Indian Railways

Coal Freight Rates and Need for Regulation

Figure 18 : Need of Regulator

AWARENESS

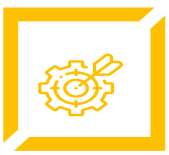
Various committees, Viz: National Transport Development Policy Committee 2013, headed by **Dr. Rakesh Mohan**, 'Committee on modernization of Indian Railways' 2012 recommended the need for creation of an independent Rail Regulator to deal with the issue of cross subsidisation of passenger losses from freight revenue.

DESIRE

Regulator can address the distortion in freight tariff, which leads to higher logistics cost.

KNOWLEDGE

Draft National Rail Plan 2020 recommends reduction in freight tariff (which will be achieved by reduction in O&M cost) as one of the strategy to increase rail share to 46% by 2051.



ABILITY

The regulator will also help in expanding the PPP program of the Railways and could also arbitrate disputes and grievances of freight customers and PPP Concessionaires.

Government of India has issued a gazette notification on May 8, 2017. The notification communicates governments approval of creation of Rail Development Authority. The mandate of the authority related to Tariff fixation are as:

1. Framing guiding principles/ rules/ models for tariff determination for both freight and passenger segments.
2. Make recommendations on tariff setting including suggesting proposed tariff and revision of tariff.
3. Framing principles for determining classification and reclassification of commodities.
4. Framing principles for subsidy/social service obligations in form of budgetary support or other methods.

CONCLUSION:

Railway freight rates for its highest volume commodity, Coal, be subject to regulation as a part of Govt decision

Cost of Domestic and Imported Coal

Analysis on cost of coal was carried out to understand the TLC of coal at end user plants. The cost of coal in INR/Kcal has been calculated for domestic and imported coal at i.e. Mettur Thermal Power Plant in Tamilnadu and Rayalaseema Thermal Power Plant in Andhra Pradesh. For estimating landed cost of domestic coal at the end plants, Notified price of ECL, G11 grade of coal having a GCV Band of 4100 - 4300 Kcal/Kg is considered.

Whereas for imported coal, a coal with 4200 Kcal/Kg is considered. The coal is considered to be sourced from Indonesia mine to Mettur and Rayalaseema plants via Ennore port.The average FOB Price of ICI 4 for 5 years is considered for evaluation.

Royalty is considered on the Notified Price and on this royalty District Mineral Foundation fund and National Mineral Exploration Trust fund was considered. Other basic charges include Sizing charges, Surface transportation charges, Evacuation facility charges and charges like terminal charges are considered.

Figure 19 : Movement of domestic coal from, ECL mines to Mettur TPP and Rayalaseema TPP

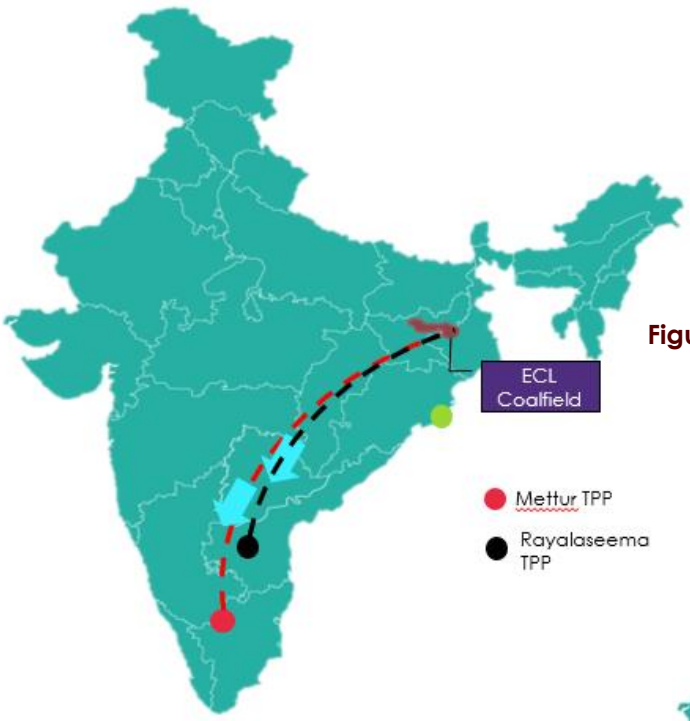
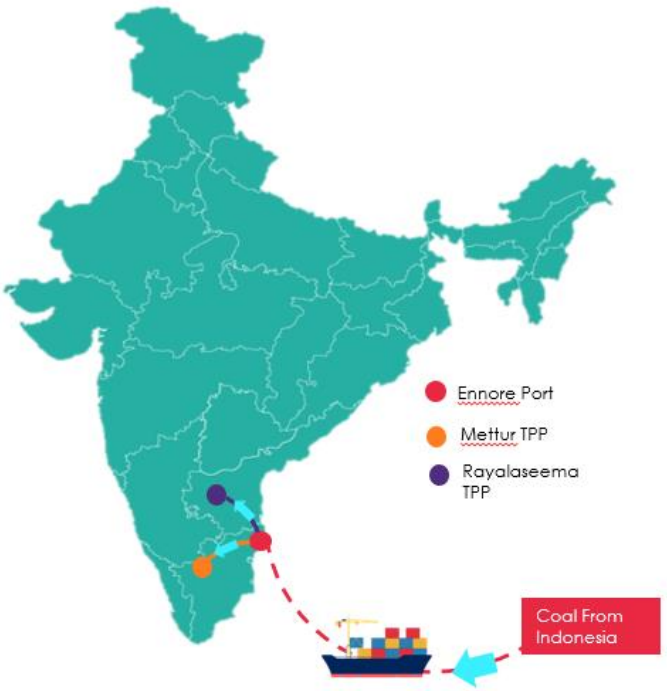
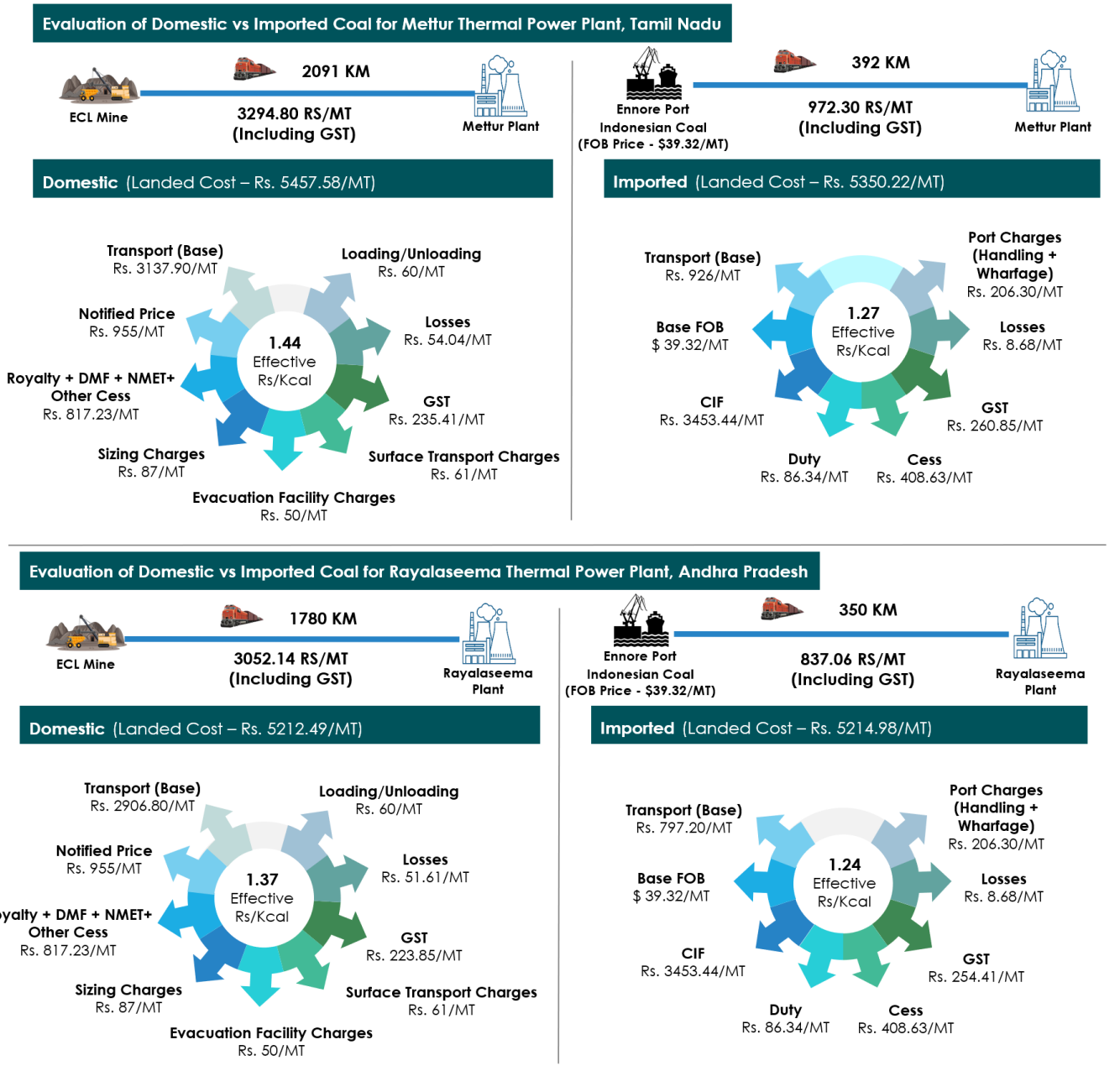


Figure 20 : Movement of imported coal from Indonesia to Mettur TPP and Rayalaseema TPP



Cost of Domestic and Imported Coal

Figure 21 : Comparison of landed cost domestic and imported coal



It has been observed that the domestic coal cost at power plant in terms of Rs./Per Kcal is higher than imported coal cost in the case of Mettur Thermal Power Plant, Rayalaseema Thermal Power Plant, Sikka Thermal Power Plant For this calculation we have considered notified price of the coal, if we consider e-auction coal supplied by CIL than domestic coal will be more expensive in comparison to imported coal as base price of auction coal is generally more than notified rice and a premium is additionally paid.

Cost break up and evaluation details for domestic as well as imported coal for the 3 -power plants is presented in the annexure.

CONCLUSION:

In order to increase share of domestic coal with imported coal, CIL coal pricing review is needed.

Coal Transportation Via Coastal Shipping

Coastal (and inland water) transport contribute only around 6% of India's freight modal mix, despite being more eco-friendly and having comparatively lesser transportation costs. Increasing the share of coastal and inland water movement can result in logistics costs savings as well as savings due to reduced ail pollution and accidents.

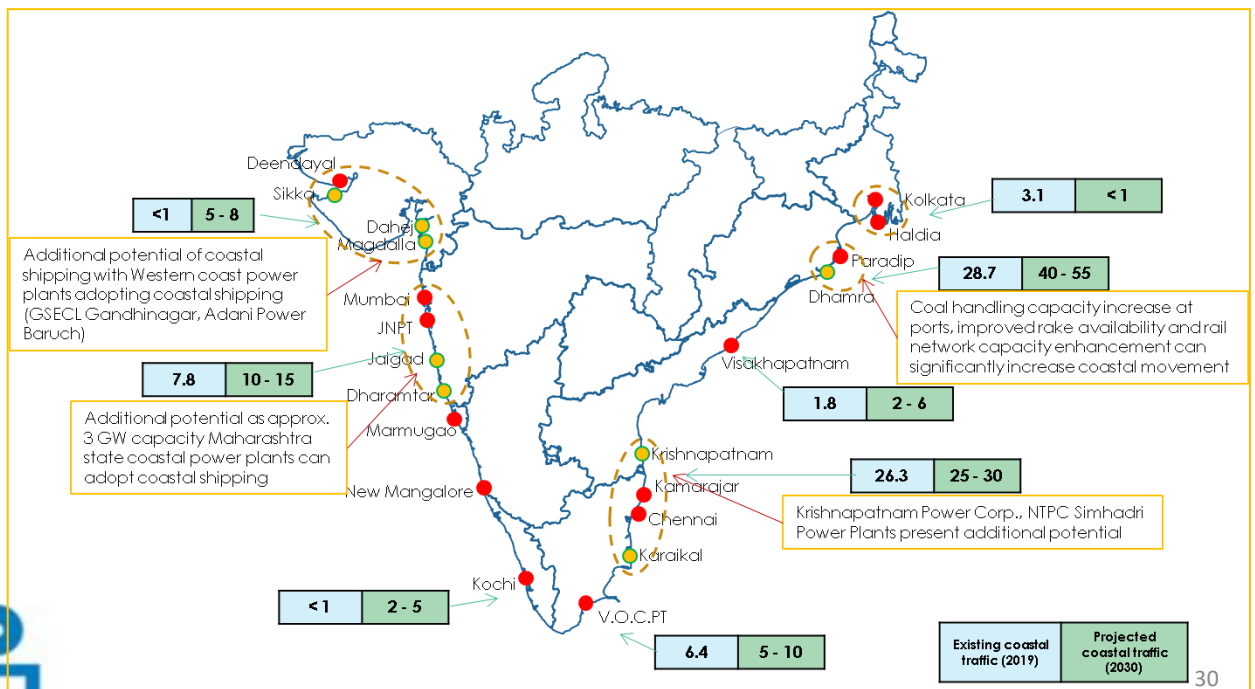
In India, the railways has been the primary transportation mode for coal. In many instances, the current coal linkages have been designed with the objective to optimize railway based transportation costs. The coal traffic moving via the coastal route is handled at Paradip Port as the main load port, and ports at Vizag and Haldia as the other key load ports for originating coastal traffic. This coal movement is destined for Krishnapatnam Port, Kamarajar Port and V.O. Chidambaranar Port Trust in southern India for further transportation to thermal power stations located in the hinterland or along the coast.

Such thermal power stations located in the states of Andhra Pradesh and Tamil Nadu have coal linkages with MCL mines that are situated in close proximity to Paradip port, thus providing opportunities for this coastal movement. In addition to this movement, there is significant potential for additional coastal movement of coal to plants based in the western states of Gujarat, Maharashtra, Goa, and Karnataka. These power plants in Maharashtra and Gujarat primarily have coal linkages from SECL and WCL mines in order to optimize the rail based transportation from mines to these plants. In the following sections, we discuss the opportunities for coastal coal movement, key enablers for promoting coastal movement and then undertake a Total Logistics Cost assessment of various Origin – Destination pairs to understand the feasibility of coastal shipments.

OPPORTUNTIES FOR COASTAL SHIPPING OF THERMAL COAL:

The Ministry of Coal has targeted 1.3 Bn tonnes per annum by 2030, primarily led by around 1 Bn tonne per annum coal output from Coal India Limited (CIL). At the same time, the Government of India is looking to ramp-up commercial block mining to reduce further dependence on imports. As per the Maritime India Vision 2030 of the Ministry of Ports, Shipping and Waterways there exists a potential of around 110 – 130 MMTPA coal coastal movement by 2030 to Gujarat, Maharashtra, Karnataka, Goa, Tamil Nadu, Kerala, and Andhra Pradesh. In the next section we analyse the infrastructure constraints for specifically eastern cluster ports (Paradip & Dhamra) as they are projected to handle maximum coal traffic over the next ten years.

Figure 22 : Potential for coastal shipping for coal (2030)



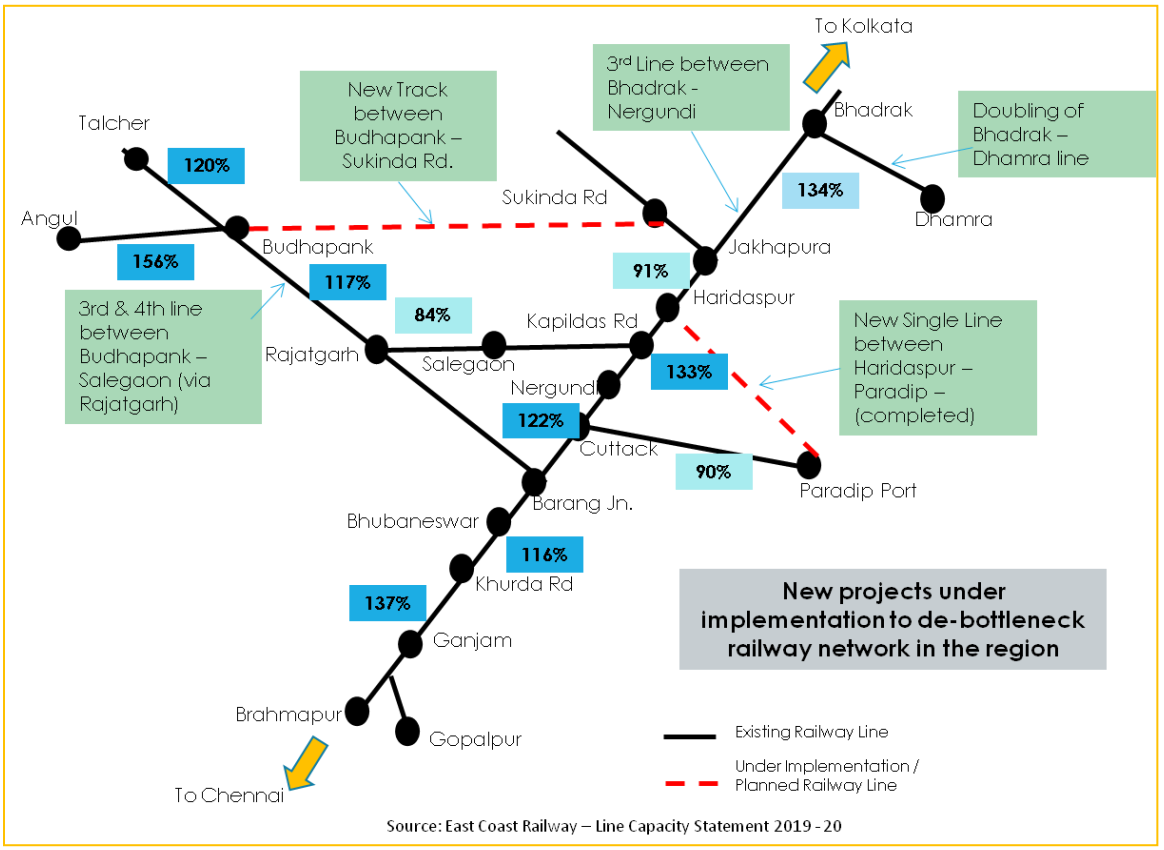
Source: Maritime India Vision 2030 – Ministry of Ports, Shipping and Waterways

Key Enablers for Promoting Coastal Shipping:

A. Enhancing railway network track capacity around eastern cluster ports:

The railway track capacity to the key load ports, especially Paradip Port, faces severe congestion. Most of the rail sections from Talcher to Paradip and Dhamra have an existing capacity utilization of greater than 100%. The Kolkata – Cuttack – Chennai main line passes through the region and witnesses heavy passenger movement, thereby limiting capacity for freight trains (as detailed in the figure below).

Figure 23 : Line Capacity Analysis – East Coast Railway (2019-20)



Source: East Coast Railway – Line Capacity Statement 2019 - 20

Several rail line capacity expansion projects for easing freight movement are under implementation and expected to drive traffic to ports (Paradip, Dhamra & Gopalpur) in the eastern cluster. Some significant port-rail connectivity projects such as the Haridaspur – Paradip Railway Line have been completed and operationlized (in 2021) and this is expected to improve rail connectivity to Paradip Port.

As per the ADB Study on "Action Plan for Promotion of Coastal Shipping in India", an expenditure of INR ~60 billion investment in rail infrastructure (for connectivity to ports in the eastern cluster) can result in logistics cost saving of INR ~370 billion from coastal coal movement of 110 MMT from east coast to south and west coast over the next 10 years.

In order to improve railway track capacity in the region, the following port-rail connectivity projects are at various stages of implementation:

Key Enablers for Promoting Coastal Shipping:

Port-rail connectivity projects planned by East Coast Railway:

The following projects have been identified and planned to improve railway connectivity to the ports in the eastern cluster:

Table 3: Rail connectivity projects to Paradip and Dhamra Ports

SR. NO.	PROJECT	STATUS	CONNECTING PORT
1.	Haridaspur – Paradip New B.G. Line (82 km)	Operational (2021)	Paradip
2.	New B.G. Line between Sambhalpur - Gopalpur (via Phulbani)	Sanctioned in 2019-20	Gopalpur
3.	3rd & 4th line between Budhapank-Salegaon via Rajathgarh section	Sanctioned in 2015-16. (TDC for Rajathagarh-Salegaon section: 2021-22)	Paradip, Dhamra
4.	3rd & 4th line sanctioned ex-Jarpada to Budhapank with fly over at Talcher Road	TDC: 2023-24 (TDC of 4th line for sections Talcher Road - Budhapank: 2020-21 & Angul - Talcher Road: 2023-24)	Paradip, Dhamra
5.	Angul-Sukinda Road new B.G. line (98.7 Kms.)	Work is under progress; TDC: 2021-22.	Paradip, Dhamra
6.	3rd line between Bhadrak – Vizianagaram (Balance section)	Sanctioned in 2015-16; Work is being executed by M/s RVNL; TDC: Not fixed.	Paradip, Dhamra
7.	Doubling of Bansara-Dhamra Terminal Yard section in first phase proposed	DPR is currently under approval.	Dhamra
8.	Bhadrak – Nergundi : sanctioned in 2012-13 & executed	TDC for Jakhapura-Jajpur Keonjhar Road sections: 2022-23; Rest sections Jajpur Keonjhar Road-Baitarani Road-Kenduapada-Bhadrak: 2023-24.	Paradip, Dhamra
9.	One additional loop line each at Tihiri & Bansara stations	Commissioned in 2019-20.	Paradip, Dhamra
10.	Nergundi-Kapilas Road-Byree section	TDC - 2021-22	Paradip, Dhamra
11.	Byree-Haridaspur section	TDC - 2022-23	Paradip, Dhamra

Source: East Coast Railway Line Capacity Statement (2019-20) and stakeholder interactions

Key Enablers for Promoting Coastal Shipping:

B. Coal handling capacity augmentation at ports:

The projected increase (of around 50-60 MMTPA) in coal coastal movement over the next decade shall require– (a) development of additional coal handling capacities at major and non-major ports in India and (b) efficiency enhancement of existing capacities at ports. The Sagarmala Programme and the Maritime India Vision 2030 of the Ministry of Shipping have detailed the future development plans and capacity additions at the major and non-major ports. A significant number of projects are at various stages of planning / implementation and can create additional capacity of around 40-50 MMTPA over the next few years.

Specifically, at Paradip Port, the key load port for coal coastal movement, the project for mechanization for 3 berths—EQ1, EQ2 and EQ3—is already under implementation and shall add an additional 30 MMTPA of coal handling capacity at the port. An additional 25 MMTPA capacity is planned for addition (across various cargo categories) through implementation of efficiency enhancement measures at the port. Paradip Port, at present, has coal handling capacity of 21 MMTPA. Similar capacity additions are planned at other ports along India's coastline – Kamarajar Port, Vizag Port, JSW Ports, Krishnapatnam Port, Dhamra Port, Deendayal – Tuna Tekra Port etc. The following table provides an overview of the various projects at major and non-major ports for coal handling capacity enhancement:

Table 4: Port capacity enhancement projects for dry bulk / coal handling

SR. NO.	PROJECT	TARGET	PORT
1.	Mechanization of EQ-1, 2, 3 Berths on BOT basis (30 MMTPA)	2022	Paradip Port
2.	Deepening and optimization of PPT Inner Harbour facilities including construction of Western Dock Captive berths to handle Cape size vessels. (25 MMTPA)	2025 - 27	Paradip Port
3.	Development of CB-3 and berths for coal capacity addition (18 MMTPA)	2022	Kamarajar Port
4.	New coal bulk berth development for handling imported coal (10 MMTPA)	2022	Paradip Port
5.	Modification of existing iron ore terminal (12 MMTPA) to coal handling terminal	2022	Kamarajar Port
6.	Mechanization of Berth No. 3 (3.5 MMTPA bulk handling capacity)on DBFOT basis at Haldia Dock	2022	Haldia Dock Complex
7.	Development of Mahanadi Riverine Port (Phase – 1) (21 MMTPA)	2027	Paradip Port
8.	NCB III berth mechanization for bulk capacity under PPP mode	2025	V.O. Chidambaranar Port
9.	Mechanized Bulk Terminal at Tuna Tekra	2026	Deendayal – Tuna Teka Port
10.	Coal Berths – 3 & 4 (TNEB)	2024	Kamarajar Port
11.	Increasing cargo handling capacity from 25 MMTPA to 100 MMTPA	2025	Dhamra Port
12.	JSW Jaigad & JSW Dharamtar port capacity expansion (combined more than 100 MMTPA	2025-30	JSW Ports
13.	Phase III capacity addition of 154 MMTPA dry and liquid cargo handling capacity	2025	Krishnapatnam Port

Source: Maritime India Vision 2030 – Ministry of Ports, Shipping and Waterways

Key Enablers for Promoting Coastal Shipping:

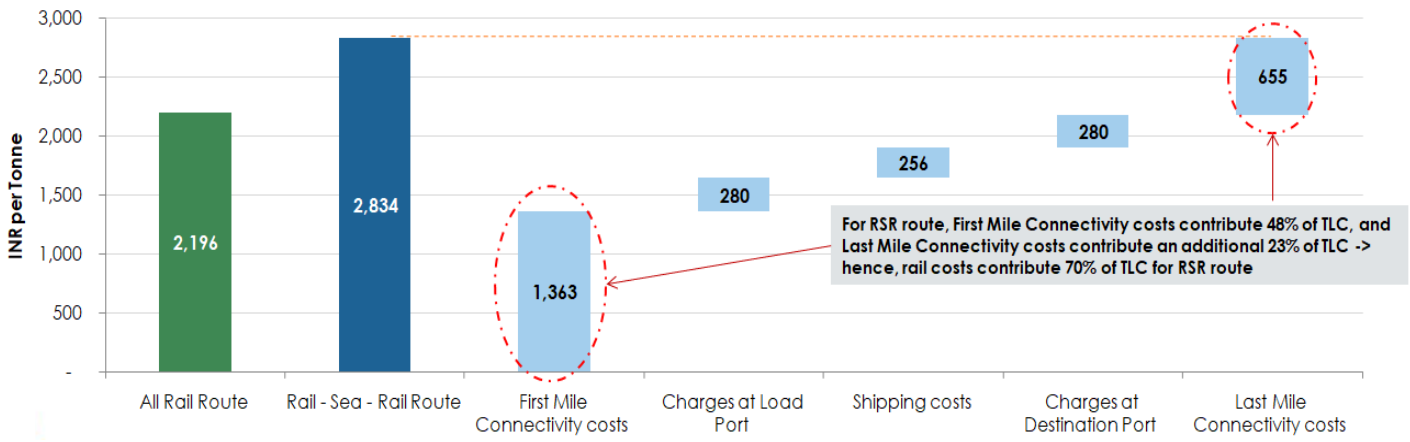
II. Total Logistics Cost (Tlc) Analysis For Coastal Movement:

Several coastal thermal power plants that are currently importing coal can use a certain amount of domestic coal for blending based on their technical configuration. Coastal shipping can be a viable alternative for some of these plants located in the states of Gujarat, Tamil Nadu, Andhra Pradesh, and Maharashtra. In this section, we undertake the Total Logistics Cost (TLC) analysis for select Origin-Destination pairs for shipment of thermal coal.

The analysis shows that, for coastal movement of thermal coal to power plants in Gujarat, Maharashtra and other coastal states of western India, the TLC for coastal shipping (i.e. Rail-Sea-Rail or RSR Route) is significantly higher than the All Rail Route (or ARR) with existing mine linkages. Based on existing coastal movement (to Ennore Thermal Power plants, the TLC cost savings can be used to service power plants located up to 150 - 200 km from the coast). In most of the cases, RSR route costs are higher due to the high first- and last-mile railway connectivity costs. We illustrate these cost differential between RSR and ARR through the following case studies:

Case Study CS-1:
TLC analysis for coastal movement of coal: Movement from SECL (Korba) to Ukai TPS, Gujarat

Figure 24 : Cost Comparison of All Rail Route Vs. Rail –Sea-Route for coal movement from SECL to Ukai TPS (via Dahej & Dhamra Ports) (INR Per Tonne)

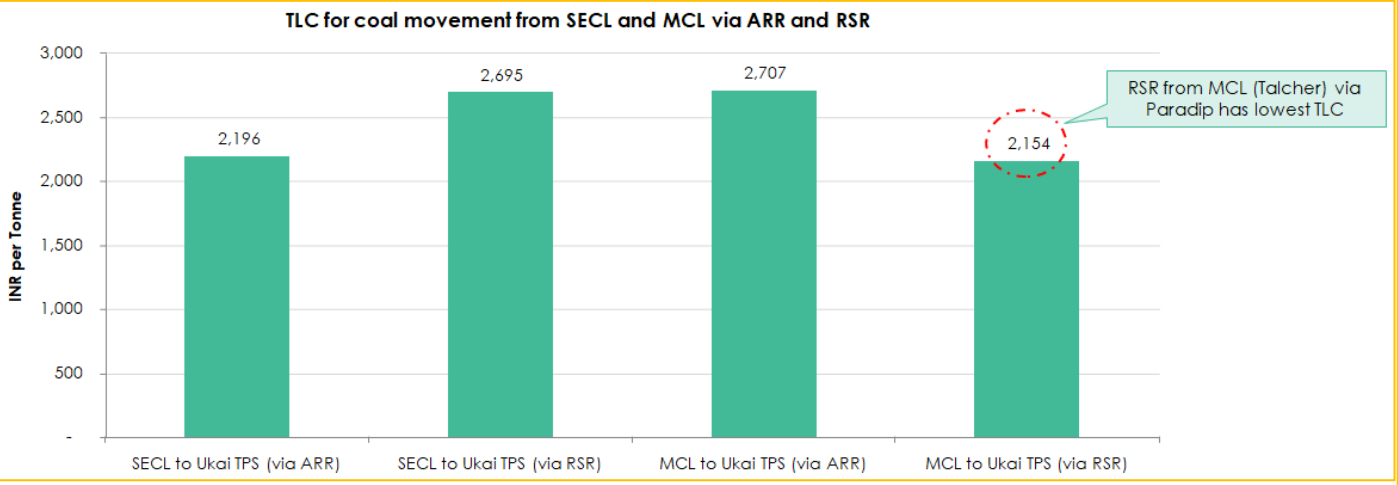


Thermal power stations in coastal areas of western states such as Gujarat and Maharashtra have existing coal linkages with SECL mines that are located at a significant distance from the nearest port. In this case study, we analyse the potential movement of thermal coal from SECL (Korba mines) via the All Rail Route and the Rail-Sea-Rail route (through Dhamra Port - as the Load Port, and Dahej Port – as the Destination Port).

The geographical location for SECL mines increases the first mile cost (which constitutes around 48% of TLC for Ukai TPS) in coastal movement of coal from SECL thereby making the coastal movement unviable vis-a-vis ARR movement. An additional 23% constituted by the last-mile rail connectivity costs results in a total two-leg rail costs amounting to more than 70% of TLC for this O-D coastal coal movement scenario. While such thermal power stations may have potential for coastal shipping of coal, such coastal movement from existing SECL mines is more expensive vis-à-vis ARR route. **Thus, railway tariff rationalization for first- and last-mile connectivity to and from ports can enhance viability of RSR routes.**

Case Study CS-2:
TLC analysis for coastal movement of coal: ARR & RSR for SECL and MCL to Ukai TPS, Gujarat

Figure 25: TLC comparison for coal movement by RSR and ARR between SECL/ MCL and



Thermal power plants located in Gujarat and Maharashtra have existing linkages with SECL, which is about 600 km from Paradip Port. Modification in the existing coal linkages from SECL mines to MCL mines can help reduce the first mile distance to around 200 km, and result in significant reduction in TLC.
TLC analysis for coal movement from Korba mines (SECL) and Talcher (mines MCL) via All Rail Route (ARR) and Rail – Sea – Rail Route (RSR) shows the MCL – Paradip Port - Dahej Port – Ukai TPS RSR option is the most cost effective for coal transportation.

Thus, modification in coal linkages may be evaluated for purpose of minimizing TLC for coal transportation. Also, after target of "1 Billion Tonne coal" is achieved, and imported coal requirement is reduced, additional new linkages may be required. For coastal thermal power stations, such coal linkages may be preferably connected via coastal shipping.

CONCLUSION:

As per the discussions undertaken in this chapter, the following suggestions can be considered for the Coal Logistics Policy:

1. To make the RSR route cost-competitive (vis-a-vis ARR), the rationalization of rail tariffs needs to be evaluated. This would form part of the mandate for the railway regulator, as we have discussed in the earlier chapters of this report. In specific case studies analysed as part of the report, the costs for first-mile and last-mile connectivity via rail on RSR routes constitute as much as 70% of TLC for the RSR route. Thus, railway tariff rationalization for first- and last-mile connectivity to and from ports can enhance viability of RSR routes for coal.

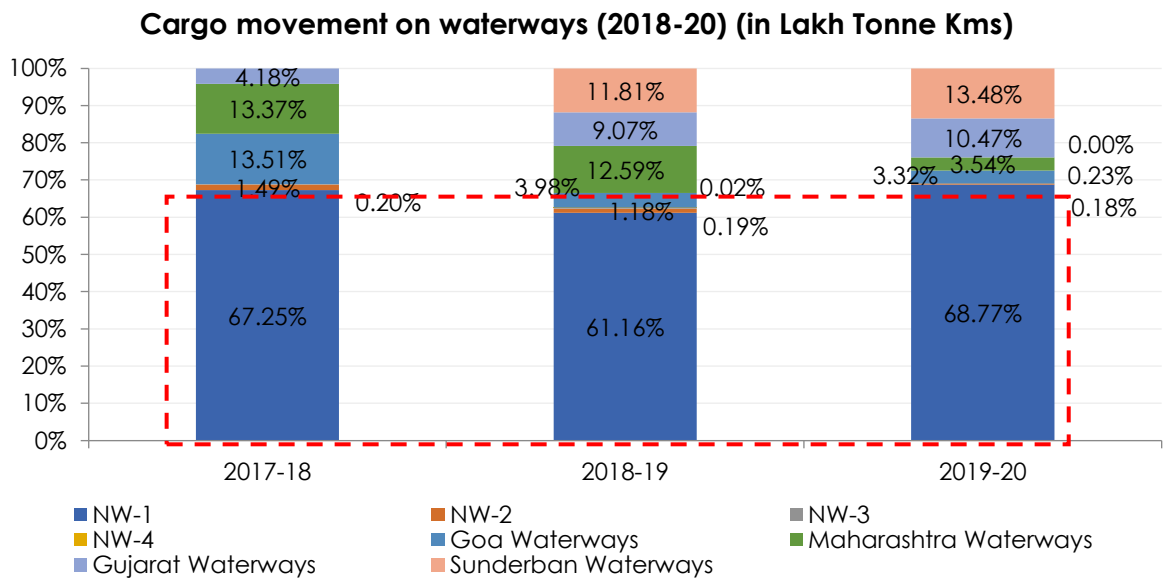
2. A linkage rationalization study is available and there is a need to revisit it in order to be competitive in TLC and per unit energy cost. In specific O-D pairs, the modification in coal linkages between coal mines and power plants may be evaluated for movement via the RSR route with a view to reducing overall TLC and cost per calorie delivered for such coal movement.

3. Further, in future, after dependence on imported coal is reduced and new domestic coal linkages are examined for coastal thermal power stations, such coal linkages can preferably be connected via coastal shipping.

Freight Transportation Over Inland Waterways In India

Following the recommendations of the National Transport Policy Committee (NTPC), the Inland Waterways Authority of India (IWAI) was set up on October 27, 1986 by an Act of Parliament in 1985 for development, maintenance and regulation of National Waterways for shipping and navigation in the country. In the following years (1986 – 2014), 5 waterways were notified as National Waterways in India (named as NW-1 to NW-5). The National Waterways Act, 2016 declared an additional 106 waterways as National Waterways thus totalling 111 National Waterways (NWs) in India. These NWs which cover a total length of 20,162.5 kms spread across 24 States in the country offer a potentially viable solution to transportation by traditional modes such as roads and railways.

Figure 26: Cargo movement on waterways (2018-20) (in Lakh Tonne Kms)



Source: Statistics of Inland Water Transport 2019-20, Ministry of Shipping, Ports and Waterways

NW-1 has the highest share in IWT coal transportation and this is expected to increase significantly over next 25 years...

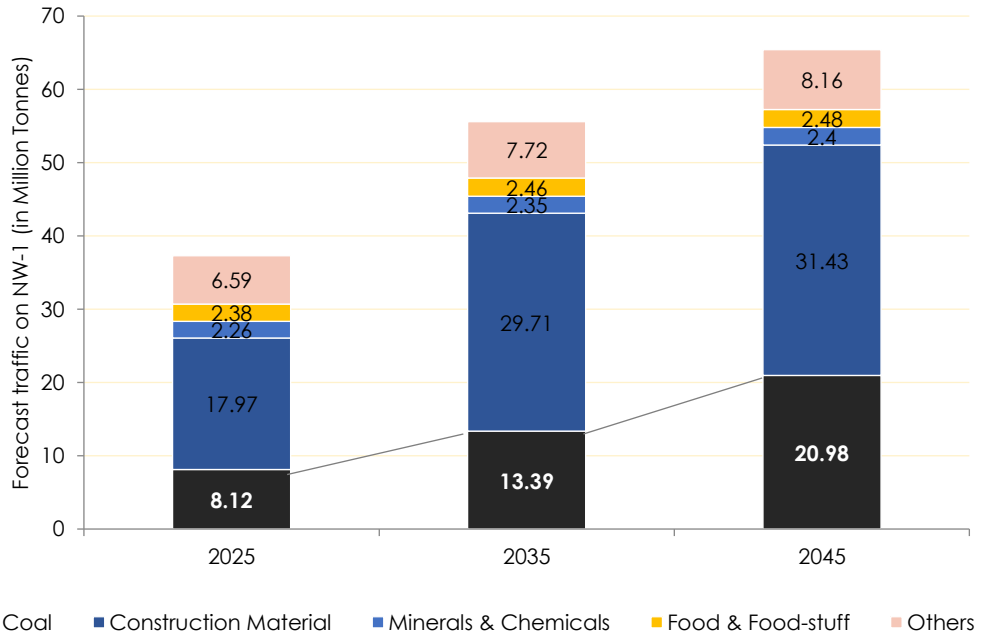
As per IWAI, the following commodities moved along and in vicinity of NW-1 and have great potential to shift to Inland Water Transport (IWT):

- Thermal Coal (imported high-calorie coal, and domestic low-calorie coal),
- Construction Materials (stone chips, cement, sand, steel coils/wires/girders)
- Industrial inputs (steel/iron, manganese ore, spirits, fly-ash, limestone, plastics, etc
- Agricultural Inputs (fertilizer (urea), poultry feed, agro equipment);

Coal traffic on NW-1 is expected to increase up to 13 Million Tonnes by 2035 and cross 20 Million Tonnes by 2045. In addition to Thermal Power Plants (TPPs), cement manufacturing plants are the major industries located in the hinterland of NW-1. As per IWAI, a major component of such coal traffic is expected to comprise of coal imported from Indonesia, and Australia for TPPs operating on imported coal and such coal reaches Sandheads (Haldia) or Paradeep ports and is then transported via rail or road to TPPs located in the region. At present, the NTPC Thermal Power Plant at Farakka also transports coal via barges after transhipment from mother vessels at Sandheads.

A major challenge in barge operations involved in coal transportation via IWT is the downstream return of empty barges. Fly-ash generated from TPPs along the river can be used in construction of roads and production of cement. Transportation of such fly-ash over IWT offers an economical & environment-friendly mode for evacuation. In fact, a large number of barge operators have started transporting such fly-ash from TPPs located along the Ganga downstream to Kolkata and Haldia Ports and onwards to Bangladesh via the Indo-Bangladesh Protocol (IBP) Route. Fly-ash constituted more than 97% of traffic (by volume) on IBP route and is used for cement manufacturing in Bangladesh.

Figure 27: Traffic forecast on NW-1 (2025-45)



*Source: IWT Sector Development Strategy and Business Development Study for Capacity Augmentation of National Waterway 1 from Haldia to Allahabad (June 2016, IWAI)

NW-1 witnessed more than two-thirds (68.77%) of total tonne-kms movement across all inland waterways in the country. On National Waterway I (Ganga- Bhagirathi-Hooghly) (1,620 km), the average distance over which cargo moved was at 335.21 Kms, relatively much longer than any other national waterway in India.

The Jal Marg Vikas Project (JMVP) aims to provide Least Assured Depth (LAD) of 2.2 to 3.0 m, bottom channel width of 45 m for at least 330 days in a year, thus making it navigable for vessels of up to 1,500 – 3,000 DWT along NW-1 on Haldia – Varanasi stretch.

IWT can potentially supplement the congested Railways and Roadways and provide suitable transport alternatives for bulk cargo movement and for carriage of vehicles (in Roll-on-Roll-off mode of cross-ferry).

IWAI projects the following sectors to witness maximum freight traffic up to 2045:

a. Haldia – Patna - Haldia
b. Sahibganj – Patna – Sahibganj
c. Haldia – Varanasi – Haldia
d. Sahibganj – Varanasi – Sahibganj
e. Patna – Varanasi – Patna

In the following sections, we discuss the key challenges that need to be overcome to enable smooth movement of freight over NW-1 followed by a discussion on the Total Logistics Cost analysis for select O-D pairs.

Key Challenges For Inland Water Transport

A. Infrastructure capacity constraints along NW-1:

The following infrastructure bottlenecks have resulted in reduced capacity utilization along NW-1:

i. Suitable target depths (LAD = 2.5 - 3.0 m) has not been achieved by IWAI across the entire stretch of NW-1. As of 2019-20, minimum LAD of 2.1m was available up to Barh allowing vessels with minimum draft of 2.0 m (2,000 Tonne barges) possible.

ii. Most vessels that have fully-laden draft of 3-4 m (max. cargo load of 3,000 tonnes) are inoperable beyond Farakka due to LAD constraints.

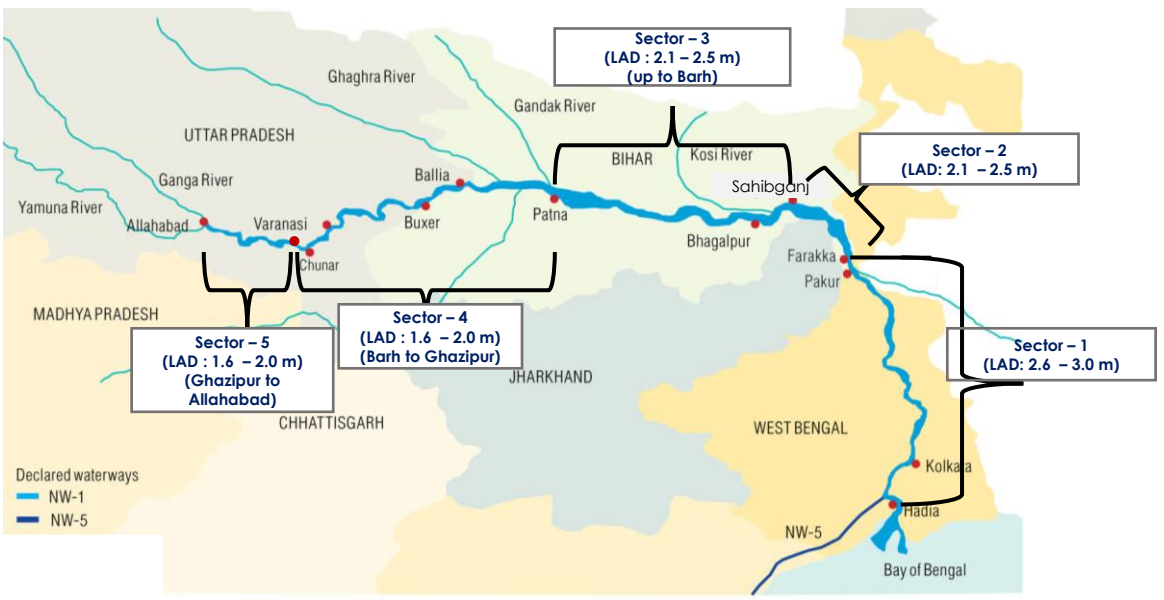
iii. Absence of night navigation facilities across entire NW-1 hinders 24 hours safe navigation.

B. Other challenges:

a. Increased coal off-take via competing transportation modes (railways & roads) from gateway ports

b. Empty return of barges that results in additional costs

Figure 28: LAD across NW-1



Source: IWAI

TRANSPORTATION COST FOR MOVEMENT OVER IWT:

As per the IWAI report on "IWT Sector Development Strategy and Business Development along NW-1" (2016), the total cost for inland-waterway shipping is between Rs 0.33 per ton-km for a 3,000-tonne vessel downstream and Rs 1.22 per tonne-km for a 1,000-ton vessel upstream. The 3,000 Tonne barges are most economical for larger distances, however LAD limitations limit their usage across NW – 1. Operational costs (Fuel costs & Manpower expenses) form the largest component of cargo transportation costs over IWT. In cases where vessels have empty returns, the vessel operators usually compute the cost for entire round trip (upstream + downstream) to arrive at freight for a specific voyage.

In the following sections, we analyse the IWT costs vis-a-vis transportation costs by competing modes for the same O-D pairs for (a) imported coal movement and (b) domestic coal movement.

Total Logistics Cost Analysis For IWT and Competing Modes:

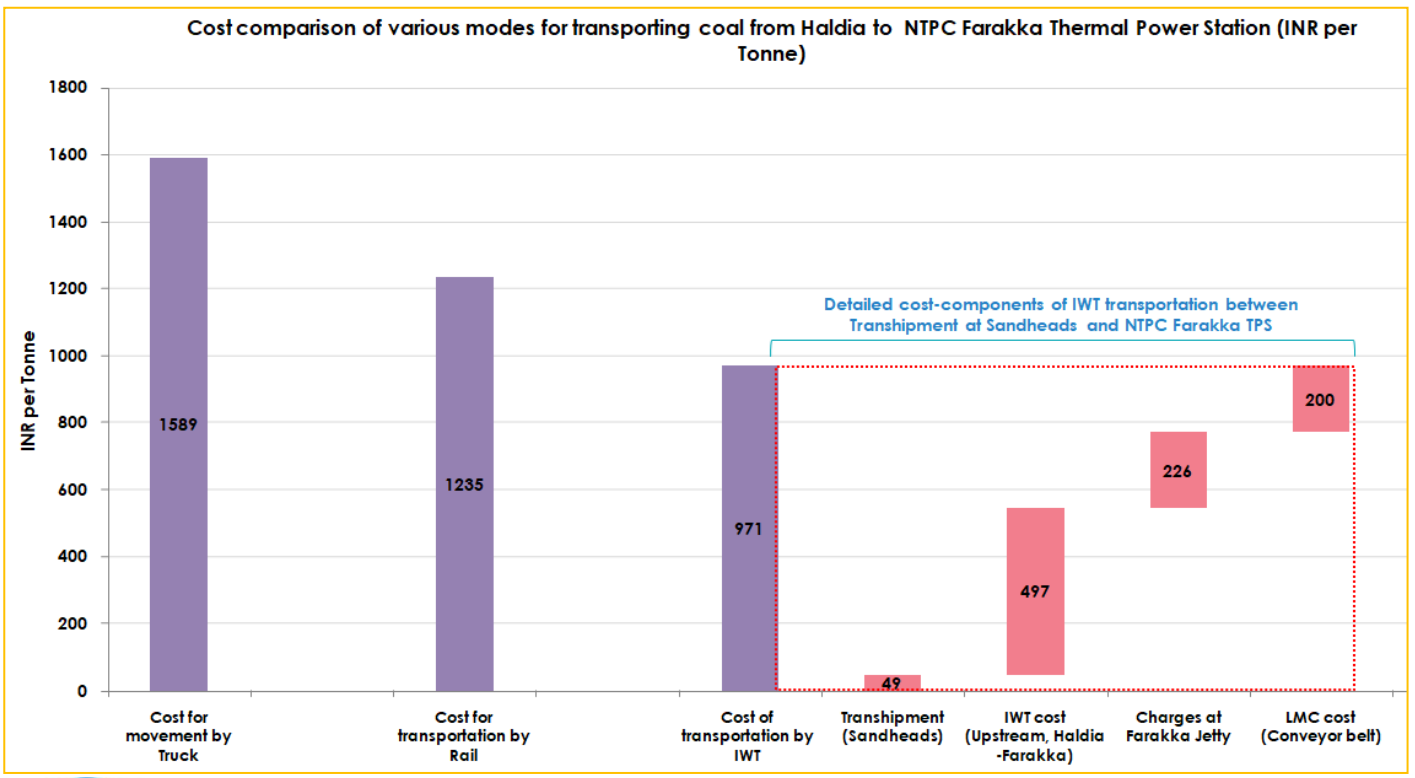
For the purpose of assessing likely transportation costs via different modes – Railways, Roads and Inland Waterways – and a combination of these, we analyse the expected total logistics costs for movement of imported coal from Haldia to NTPC's Thermal Power Plant at Farakka (Case Study – IWT-1) and movement of domestic coal from Rajmahal coal mines to Obra Thermal Power Station (Cast Study – IWT-2)

CASE STUDY – IWT-1: MOVEMENT OF IMPORTED COAL OVER NW-1:

We analyse the scenario where transhipment of imported coal is occurs from the mother vessel on to a barge at Sandheads (near Haldia) and this barge is used for further upstream movement over NW-1 of coal to Farakka. For last mile connectivity, conveyor belt system is used for moving this coal from barge to NTPC Farakka TPP. Modal cost comparison is undertaken with transportation costs via railways and roads for movement from Haldia Dock Complex to NTPC Farakka TPP.

- Road transportation is the most expensive mode followed by rail
- IWT is the most economical transportation mode (INR 971 per tonne) as minimum LAD from HDC to fixed Jetty at Farakka(near Farakka TPP) is expected to be 2.5 – 3.0 m (source: IWAI) as part of the Jal Marg Vikas Project, thereby permitting usage of barges up to 3,000 tonne.
- **IWT can be a more suitable transportation mode for specific O-D pairs for imported coal movement provided suitable LAD and infrastructure are present along NW-1**

Figure 29: Cost comparison of various modes for movement of imported coal over NW-1

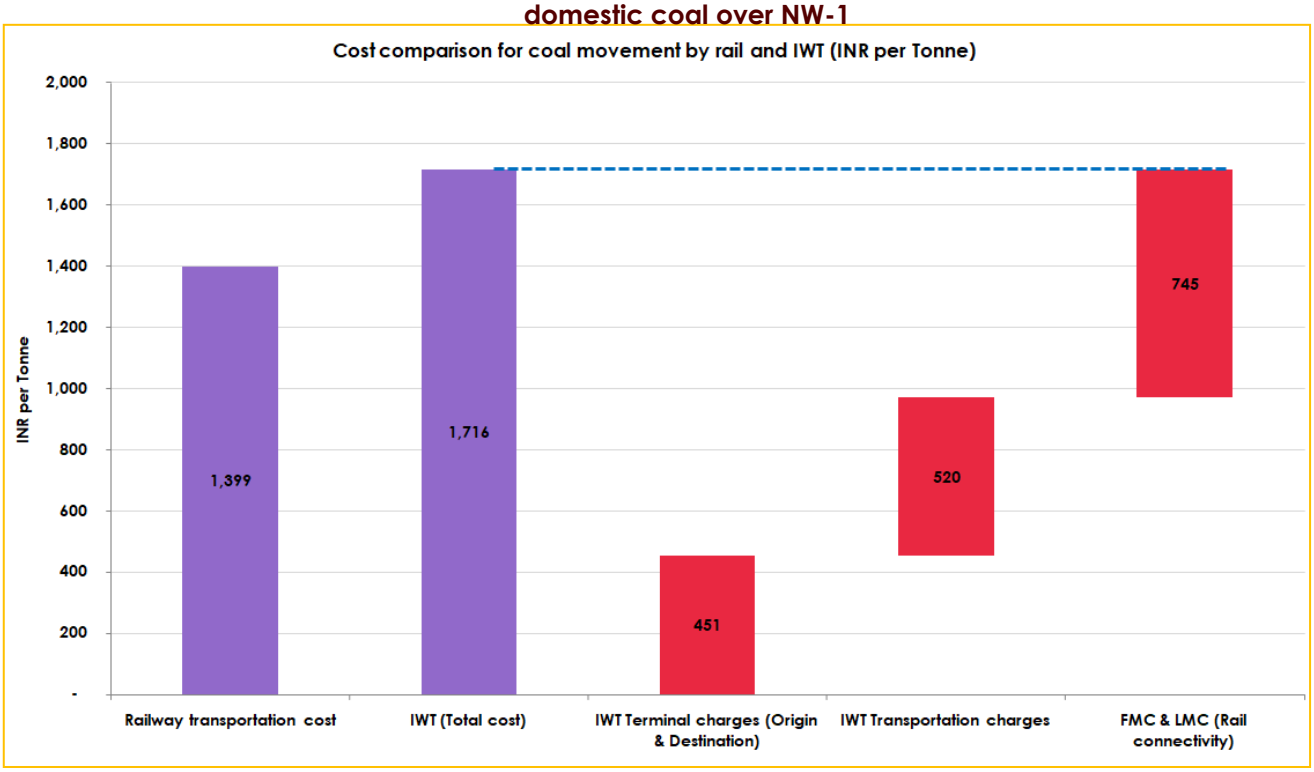


Policy Framework – Inland Water Transport

CASE STUDY – IWT-2: MOVEMENT OF DOMESTIC COAL OVER NW-1:

- For domestic coal transportation between Rajmahal coal mines and Obra Thermal Power Station. For IWT movement, the first mile connectivity is assumed from Rajmahal Coal mines to Sahibganj IWAI Multi-modal Terminal by rail, followed by inland water based upstream movement up to IWAI's Varanasi Multi-modal Terminal. The last mile connectivity is assume from Varanasi Multi-modal terminal to Obra TPS via Rail.
  - Transportation cost by rail is around INR 1,400 per tonne while total transportation cost via Railway + IWT + Railway comes to around 1,700 per tonne
  - This implies that domestic coal movement over IWT may not be cost competitive w.r.t. Railway movement.

Figure 30: Cost comparison of various modes for movement of domestic coal over NW-1



Source: Secondary research, FOIS, IWAI reports

CONCLUSION:

As per the discussions undertaken in this chapter, the following suggestions can be considered for the Coal Logistics Policy:

1. With the objective of reducing TLC for imported coal movement to the hinterland, the IWT route over NW-1 can be a more suitable transportation mode for specific O-D pairs for imported coal transhipped at Sagar Island / Sandheads (near Haldia Port) on to barges for further movement to thermal power stations located in proximity to NW-1, provided suitable LAD and infrastructure are present along NW-1.

2. Infrastructure development (terminals, LAD, 24/7 operations etc.) needs to be prioritized for utilization of IWT for freight transportation.

CONCEPT OF SMART COAL LOGISTICS CORRIDORS:

'Smart Coal Logistics Corridors' can be defined as technology-enabled coal logistics chains that provide real-time information regarding logistics processes from the mine to the destination and can help achieve the beneficial outcomes, as discussed below. Such Smart Coal Logistics Corridors can also help overcome the following key challenges and information gaps in existing logistics chains – presence of multiple actors across the logistics networks, minimal data exchange among stakeholders, usage of manual and traditional data exchange tools for recording and transmitting data across major parts of the logistics chains, delays in transmission of collected information, presence of multiple systems and platforms for information sharing etc.

Integration of technology across the chain can help provide increased situational awareness thereby enhancing the decision-making process, seamless tracking and tracing of cargo, reduction in logistics costs, and result in an overall increase in operational efficiency. We discuss below the expected outcome of such Corridors:

a. **Visibility across logistics chain through 'Track and Trace':** This would permit all relevant stakeholders to know the geographical location of their transport service provider and coal freight on a real-time or near-real time basis. This can help other actors in the logistics chain to plan their service provisions accordingly, and can also contribute to overall reduction in the total logistics costs across the entire chain.

b. **Monitoring Asset Utilization:** Stakeholders can regularly assess capacity utilization of the port/berth/yard/equipment/rake/truck/conveyor systems etc. and plan their respective operations in a efficient manner.

c. **Enhancing safety and sustainability:** Real-time information availability can help infrastructure service providers plan cost-efficient and environment-friendly modes and routes of transportation. Data availability through use of such smart technologies (IoT, sensors etc.) can also help determine congestion on transport corridors and enable service providers to plan for alternate routes / modes.

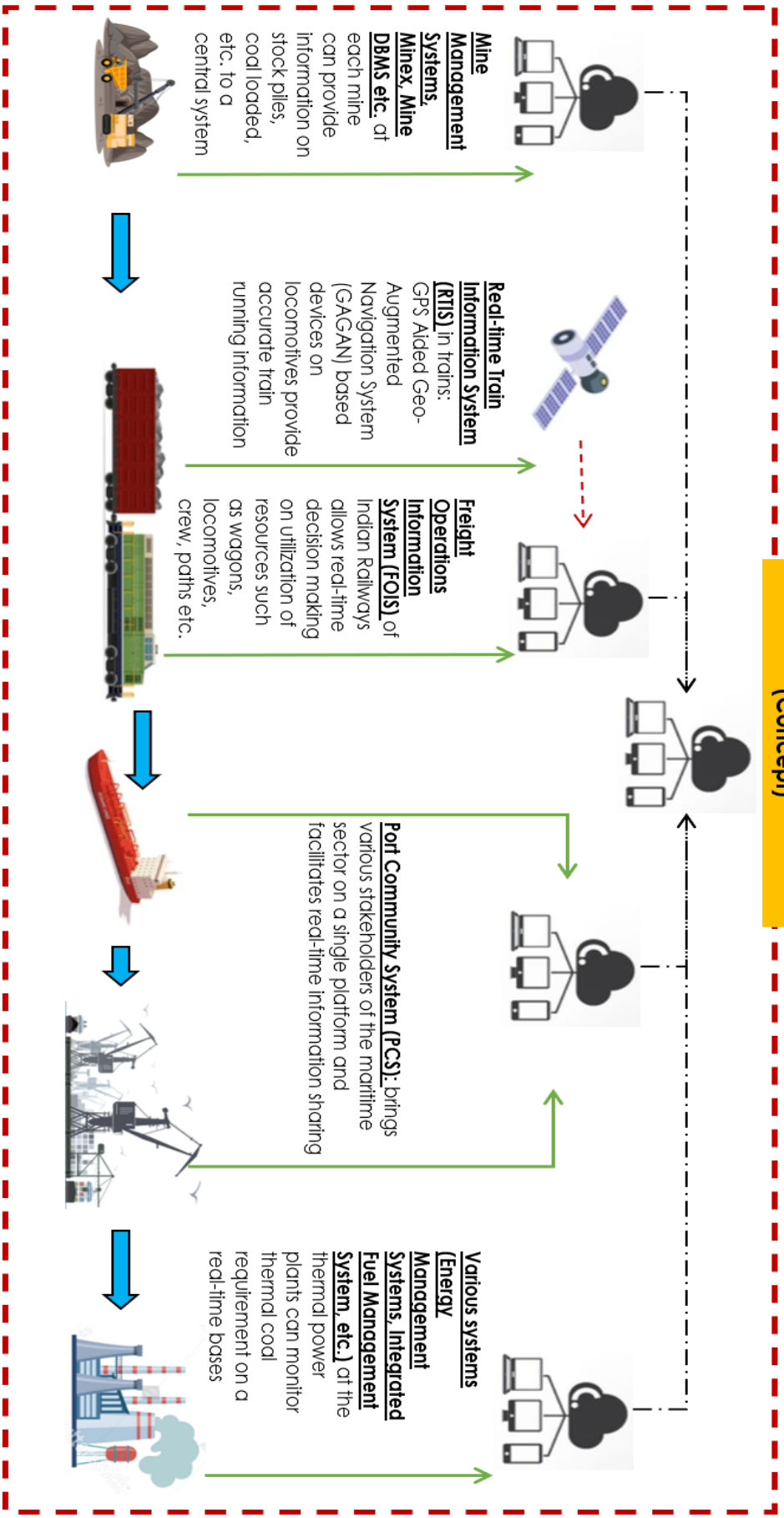
d. **Measuring KPIs:** This outcome can enable the government and other relevant institutions to measure throughput achieved at each stage of the logistics chain (e.g. At mine-head, at railway loading terminal, at destination terminal, at originating and destination ports, truck loading terminals, power plants etc.), as well as measure transit performance and relevant operational KPIs.

e. **Advanced Analytics:** Analysis of the data collected and pooled into a data lake can help decision-makers and policy-makers devise relevant administrative and economic measures to increase overall efficiency of logistic operations and reduce total logistics costs across such chains. This can also help in heat mapping of traffic flows, planning inputs for operational activities, digital logging of arrivals and departures, early warning systems, etc.

In the following pages, we illustrate the basic concept of such a 'Smart Coal Logistics Corridor' utilizing the existing technological interventions available across various transportation modes.

Policy Framework – Smart Coal Logistics Corridors

Figure 31: Concept of Smart Logistic Corridor



The following key IT systems are expected to form the core of the Smart Coal Logistics network:

- FOIS - FOIS is the Management Information System (MIS) used in Indian Railways for its freight business and helps to improve the process of planning, monitoring and decision making through efficient utilization of rolling stock and other assets. The system also records details of loads/trains, wagons, loco movements and consignment details, train departure, train arrival, etc. The system provides continuous cargo visibility and instant access to information regarding status of consignments in transit to freight customers.
- PCS 1x – This is a real-time single-window data exchange system that provides real-time visibility regarding ports, terminals, vessel movement, and other stakeholders in the maritime community. All 12 major ports in India have operational PCS 1x systems and some of the key non-major ports have commenced adoption of this system.
- Other systems – Integration of other systems such as the satellite based tracking of locomotives which provides real-time location of the rake / train, mine management systems and power plant management systems can enable the users to gain a real-time visibility of the entire value chain, the various actors involved and activities being performed at each step of the logistic chain along with providing a real-time track and trace mechanism. Other stakeholders (such as IWAI etc.) can also integrate their systems within the overall system architecture.

The Way Forward

In this section, we have presented an overview of the concept of 'Smart Coal Logistics Corridor'. In the subsequent deliverables and reports, we shall detail this concept and present the implementation framework for the real-time monitoring of processes across the entire value chain.

CONCLUSION:

Smart Coal Logistics Corridors to be established for ensuring complete oversight on every tonne of coal from the mine to the consumption point to ensure online and real-time analysis for market actions. 'Smart Coal Logistics Corridors' can be defined as technology-enabled coal logistics chains that provide real-time information regarding logistics processes from the mine to the destination and can help achieve expected outcomes such as - (a) Visibility across logistics chains, (b) monitoring asset utilization, (c) measurement of KPIs of stakeholders involved in the logistics chain, (d) enhancing safety and sustainability of the processes, and (e) provide the Ministry of Coal with advanced analytics such as heat-map generation, route planning, TLC minimization, etc.

Recommendations

Recommendations

As per the discussions undertaken in this report, the following suggestions can be considered for the Coal Logistics Policy:

1. ROW of rail and roads and first mile evacuation is planned as part of mine allocation process.
2. Arrangements of relevant business models need to be encouraged for formation of first mile as well as last mile connectivity. A common user facility like Railway Siding can be developed in the cases where there are 2-3 mines are close to each other. Various models can be assessed for this.
3. One of the models can be, wherein the State Government carries out land acquisitions and the other stakeholders i.e., the block allocates would make investments for the development. It is a common user line.
4. An exercise need to be undertaken, when Railway Administration uses its Rights to allow usage of siding or built another facility by connecting the siding with another siding or handling facility. The original investor need to be suitably compensated.
5. Planning for construction and use for shared evacuation infrastructure be part of the mine allocation process
6. Institutes like CMPDIL/ISM etc. can be identified as nominated agencies for assisting mine owners in developing FMC
7. Considering the benefits of conveyor, use of it need to be promoted wherever it is economical to use
8. Railway freight rates for its highest volume commodity, Coal, be subject to regulation as a part of Govt decision
9. In order to increase share of domestic coal with imported coal, CIL coal pricing review is needed.
10. To make the RSR route cost-competitive vis-a-vis ARR, the rationalization of rail tariffs needs to be evaluated. The 2-leg rake transportation costs & Terminal Charges (INR 20 per tonne for both inward and outward traffic for all commodities except Containers; introduced in 2016) significantly contribute to increased rail costs in RSR. In specific case studies analysed as part of the report, the costs for first-mile and last-mile connectivity via rail on RSR routes constitute as much as 71% of TLC for the RSR route. Thus, railway tariff rationalization for first- and last-mile connectivity to and from ports can enhance viability of RSR routes for coal.
11. A rationalization study is available and there is a need to revisit it in order to be competitive in TLC and per unit energy cost. In specific O-D pairs, the modification in coal linkages between coal mines and power plants may be evaluated for movement via the RSR route with a view to reducing overall TLC and cost per calorie delivered for such coal movement.
12. With the objective of reducing TLC for imported coal movement to the hinterland, the IWT route over NW-1 can be a more suitable transportation mode for specific O-D pairs for imported coal transhipped at Sagar Island / Sandheads (near Haldia Port) on to barges for further movement to thermal power stations located in proximity to NW-1, provided suitable LAD and infrastructure are present along NW-1.
13. Smart Coal Logistics Corridors to be established for ensuring complete oversight on every tonne of coal from the mine to the consumption point to ensure online and real-time analysis for market actions. 'Smart Coal Logistics Corridors' can be defined as technology-enabled coal logistics chains that provide real-time information regarding logistics processes from the mine to the destination and can help achieve expected outcomes such as - (a) Visibility across logistics chains, (b) monitoring asset utilization, (c) measurement of KPIs of stakeholders involved in the logistics chain, (d) enhancing safety and sustainability of the processes, and (e) provide the Ministry of Coal with advanced analytics such as heat-map generation, route planning, TLC minimization, etc.

Annexure

Annexure

Domestic coal from ECL Area to Mettur Thermal Power Plant, Tamil Nadu

Cost Components		Cost	Remarks
Notified Price	(in Rs./MT)	955.00	ECL notified price of G11 Grade
Royalty	(in Rs./MT)	133.70	14.00% as per MMDR
DMF Fund	(in Rs./MT)	40.11	30.00% of Royalty as per MMDR
NMET Fund	(in Rs./MT)	2.67	2.00% of Royalty as per MMDR
Sizing Charges	(in Rs./MT)	87.00	As notified
Evacuation Facility Charges	(in Rs./MT)	50.00	As per CIL notification
Surface transport Charges	(in Rs./MT)	61.00	As per CIL notification
AMBH Cess	(in Rs./MT)	1.00	Rs. 1/MT, State specific
PWD Cess	(in Rs./MT)	1.00	Rs. 1/MT, State specific
PE Cess	(in Rs./MT)	47.75	5% of ROM Price
RE Cess	(in Rs./MT)	191.00	20% of ROM Price
Sub-Total	(in Rs./MT)	1570.23	
GST	(in Rs./MT)	78.51	5% Government tax rate on coal
GST Compensation Cess	(in Rs./MT)	400.00	Government tax rate on coal
Coal Value (Rs./MT)	(in Rs./MT)	2043.50	
Transportation	(in Rs./MT)	3294.80	As per railways
Loading/Unloading	(in Rs./MT)	60.00	Industry norms
Transit and handling Losses	(in Rs./MT)	54.04	@ 1.0 % Industry norms
Landed Cost	(in Rs./MT)	5457.58	
Per Kcal Cost	**(in Rs./KCal)**	**1.44**	

Annexure

Imported Coal from Indonesia at Ennore Port to Mettur Thermal Power Plant, Tamil Nadu

Cost Components		Cost	Remarks
Base FOB Price	US $ /MT	39.32	Average FOB Price of ICI 4 for 5 years
Freight Rate	US $ /MT	10.00	Prevailing transportation charges
Insurance	US $ /MT	0.01	0.03% of FOB and Freight Rate - Industry norms
CIF Value	US $ /MT	49.33	
Exchange Rate		70.00	Assumption
CIF Value	(in Rs./MT)	3453.44	
Customs Duty (CD)	(in Rs./MT)	86.34	2.50% Industry norms
Education Cess	(in Rs./MT)	8.63	10.00% of Customs Duty
IGST	(in Rs./MT)	177.42	5% Government Tax
GST Cess	(in Rs./MT)	400.00	Government tax rate
Total CD including Cess	(in Rs./MT)	672.39	
Total Price	(in Rs./MT)	4125.83	
Port Charges	(in Rs./MT)	206.30	Port charges of Ennore
GST on Port Charges	(in Rs./MT)	37.134	18%
Transit Loss	(in Rs./MT)	4.34	0.1 % Industry norms
Handling Loss	(in Rs./MT)	4.34	0.1 % Industry norms
Landed Cost at Port	(in Rs./MT)	4377.92	
Total freight	(in Rs./MT)	972.30	As per railways
Landed Cost	(in Rs./MT)	5350.22	
Per Kcal Cost	**(in Rs./KCal)**	**1.27**	

Annexure

Domestic coal from ECL Area to Rayalaseema Thermal Power Plant, Andhra Pradesh

Cost Components		Cost	Remarks
Notified Price	(in Rs./MT)	955.00	SECL notified price of G11 Grade
Royalty	(in Rs./MT)	133.70	14.00% as per MMDR
DMF Fund	(in Rs./MT)	40.11	30.00% of Royalty as per MMDR
NMET Fund	(in Rs./MT)	2.67	2.00% of Royalty as per MMDR
Sizing Charges	(in Rs./MT)	87.00	As notified
Evacuation Facility Charges	(in Rs./MT)	50.00	As per CIL notification
Surface transport Charges	(in Rs./MT)	61.00	As per CIL notification
AMBH Cess	(in Rs./MT)	1.00	Rs. 1/MT
PWD Cess	(in Rs./MT)	1.00	Rs. 1/MT
PE Cess	(in Rs./MT)	47.75	5% of ROM Price
RE Cess	(in Rs./MT)	191.00	20% of ROM Price
Sub-Total	(in Rs./MT)	1570.23	
GST	(in Rs./MT)	78.51	5% Government tax rate on coal
GST Compensation Cess	(in Rs./MT)	400.00	Government tax rate on coal
Coal Value (Rs./MT)	(in Rs./MT)	2048.75	
Transportation	(in Rs./MT)	3052.14	As per railways
Loading/Unloading	(in Rs./MT)	60.00	Industry norms
Transit and handling Losses	(in Rs./MT)	51.61	@ 1.0 % Industry norms
Landed Cost	(in Rs./MT)	5212.49	
Per Kcal Cost	**(in Rs./KCal)**	**1.37**	

Annexure

Imported Coal from Indonesia at Ennore Port to Rayalaseema Thermal Power Plant, Andhra Pradesh

Cost Components		Cost	Remarks
Base FOB Price	US $ /MT	39.32	Average FOB Price of ICI 4 for 5 years
Freight Rate	US $ /MT	10.00	Prevailing transportation charges
Insurance	US $ /MT	0.01	0.03% of FOB and Freight Rate - Industry norms
CIF Value	US $ /MT	49.33	
Exchange Rate		70.00	Assumption
CIF Value	(in Rs./MT)	3453.44	
Customs Duty (CD)	(in Rs./MT)	86.34	2.50% Industry norms
Education Cess	(in Rs./MT)	8.63	10.00% of Customs Duty
IGST	(in Rs./MT)	177.42	5% Government Tax
GST Cess	(in Rs./MT)	400.00	Government tax rate
Total CD including Cess	(in Rs./MT)	672.39	
Total Price	(in Rs./MT)	4125.83	
Port Charges	(in Rs./MT)	206.30	Port charges of Ennore
GST on Port Charges	(in Rs./MT)	37.134	18%
Transit Loss	(in Rs./MT)	4.34	0.1 % Industry norms
Handling Loss	(in Rs./MT)	4.34	0.1 % Industry norms
Landed Cost at Port	(in Rs./MT)	4377.92	
Total freight	(in Rs./MT)	837.06	As per railways
Landed Cost	(in Rs./MT)	5214.98	
Per Kcal Cost	**(in Rs./KCal)**	**1.24**	

ANNEXURES – COASTAL SHIPPING

ASSUMPTIONS FOR CASE STUDY : CS-1: TLC analysis for coastal movement of coal: Movement from SECL (Korba) via Dhamra Port and Dahej Port to Ukai TPS, Gujarat

Origin Mine		Korba (SECL)
Destination Thermal Power Plant		Ukai (Gujarat)
Shipping Vessel Tonnage (Panamax)	Tonnes	75000
Origin Port		Dhamra
Destination Port		Dahej
Distance (Dhamra to Dahej)	Nautical Miles	2187
First Mile Connectivity		Railways
First Mile Connectivity costs		
Origin Rail Terminal		NEW KUSMUNDA COLLIERY SIDING, KORBA- NKCR
Destination Rail Terminal		DHAMRA TERMINAL YARD- DTBR
Type of Wagons		BOXNHL- BOGIE OPEN WAGON AIR BRAKES
Tarrif Lines		GENERAL
Commodity Type		COAL AND COKE
Commodity Sub-type		NON COKING COAL WASHED
Rake		58
Train Load (Class 145 A)		1398.7
RBS Route		IB-SBPY-KPJG-ANGL-BDPK-MRDL-RJGR-KIS-HDS-JKPR
Distance	Km	655
Coal carried in single Rake	Tonnes	4060
Origin / Load Port costs		
Unload from Rake and loading into vessel charges	INR per Tonne	230
Vessel docking charges	INR per Tonne	50
Total charges at load port	INR per Tonne	280
USD INR Exchange Rate	USD per INR	73
Shipping costs		
Panamax charter rates (from Paradip to Kamarajar / Krishnapatnam Ports)	USD per Tonne	3.5
Panamax charter rates (from Paradip/Dhamra to Dahej Port)	USD per Tonne	5.5
Destination Port Charges		Same as Load Port charges
Last Mile Connectivity costs		
Origin Rail Terminal		M/S ADANI PETRONET(DAHEJ) PORT PVT. LTD. SDG.- MAPD
Destination Rail Terminal		GEB THERMAL POWER HOUSE SDG, UKAI SON GADH- TPHS
Type of Wagons		BOXNHL- BOGIE OPEN WAGON AIR BRAKES
Tarrif Lines		GENERAL
Commodity Type		COAL AND COKE
Commodity Sub-type		NON COKING COAL WASHED
Rake		58
Train Load (Class 145 A)		672.5
RBS Route		BH-ST-UDN
Distance	Km	244
Coal carried in single Rake	Tonnes	4060
ARR ROUTE - RAILWAY CONNECTIVITY DETAILS		
Origin Rail Terminal		NEW KUSMUNDA COLLIERY SIDING, KORBA- NKCR
Destination Rail Terminal		GEB THERMAL POWER HOUSE SDG, UKAI SON GADH- TPHS
Type of Wagons		BOXNHL- BOGIE OPEN WAGON AIR BRAKES
Tarrif Lines		GENERAL
Commodity Type		COAL AND COKE
Commodity Sub-type		NON COKING COAL WASHED
Rake		58
Train Load (Class 145 A)		2195.6
RBS Route		CPH-BSP-DURG-G-TMR-KAV-NGP-AJNI-BTBR-SEGM-WR-BD-AK-JM-BSL-JL
Distance	Km	1177
Coal carried in single Rake	Tonnes	4060

ANNEXURES – COASTAL SHIPPING

ASSUMPTIONS FOR CASE STUDY : CS-2: TLC analysis for coastal movement of coal: ARR & RSR for SECL and MCL via Paradip Port and Dahej Port to Ukai TPS, Gujarat

Origin Mine		MCL
Destination Thermal Power Plant		Ukai
Shipping Vessel Tonnage	Tonnes	75000
Origin Port		Paradip
Destination Port		Dahej
Distance (Paradip to Dahej)	Nautical Miles	2187
First Mile Connectivity		Railways
First Mile Connectivity costs		
Origin Rail Terminal		DB COLLIERY SDG , TALCHER- DBCS
Destination Rail Terminal		ADB COAL HANDLING PLANT, PARADEEP PORT TRUST - PPAP
Type of Wagons		BOXNHL- BOGIE OPEN WAGON AIR BRAKES
Tarrif Lines		GENERAL
Commodity Type		COAL AND COKE
Commodity Sub-type		NON COKING COAL WASHED
Rake		58
Train Load (Class 145 A)		672.5
RBS Route		BDPK-MRDL-RJGR-RQP-BRAG-CTC-PRDP
Distance	Km	220
Coal carried in single Rake	Tonnes	4060

Paradip Port charges - Coastal Vessels		
Cargo Related Charges		
Unloading of coal wagon through the coal handling system	57.12	INR per Tonne
Shipment of coal through coal handling plant	85.63	INR per Tonne
Vessel Related Charges		
Berth Hire Charges	0.064	INR per GRT per hour
Port Dues	6.574	INR per GRT per entry
Pilotage & Towage	7,46,700	INR
Last Mile Connectivity costs	9.68	INR per GRT over 60,000 T
Origin Rail Terminal		M/S ADANI PETRONET(DAHEJ) PORT PVT. LTD. SDG.- MAPD
Destination Rail Terminal		GEB THERMAL POWER HOUSE SDG, UKAI SON GADH- TPHS
Type of Wagons		BOXNHL- BOGIE OPEN WAGON AIR BRAKES
Tarrif Lines		GENERAL
Commodity Type		COAL AND COKE
Commodity Sub-type		NON COKING COAL WASHED
Rake		58
Train Load (Class 145 A)		672.5
RBS Route		BH-ST-UDN
Distance	Km	244
Coal carried in single Rake	Tonnes	4060
ARR - RAILWAY CONNECTIVITY CHARGES		
Origin Rail Terminal		DB COLLIERY SDG , TALCHER- DBCS
Destination Rail Terminal		GEB THERMAL POWER HOUSE SDG, UKAI SON GADH- TPHS
Type of Wagons		BOXNHL- BOGIE OPEN WAGON AIR BRAKES
Tarrif Lines		GENERAL
Commodity Type		COAL AND COKE
Commodity Sub-type		NON COKING COAL WASHED
Rake		58
Train Load (Class 145 A)		2706.7
RBS Route		ANGL-KPJG-SBPY-IB-CPH-BSP-DURG-G-TMR-KAV-NGP-AJNI-BTBR-SEGM-WR-BD-AK-JM-BSL-JL
Distance	Km	1509
Coal carried in single Rake	Tonnes	4060

ANNEXURES – INLAND WATER TRANSPORT

ASSUMPTIONS FOR CASE STUDY – IWT-1: MOVEMENT OF IMPORTED COAL OVER NW-1:

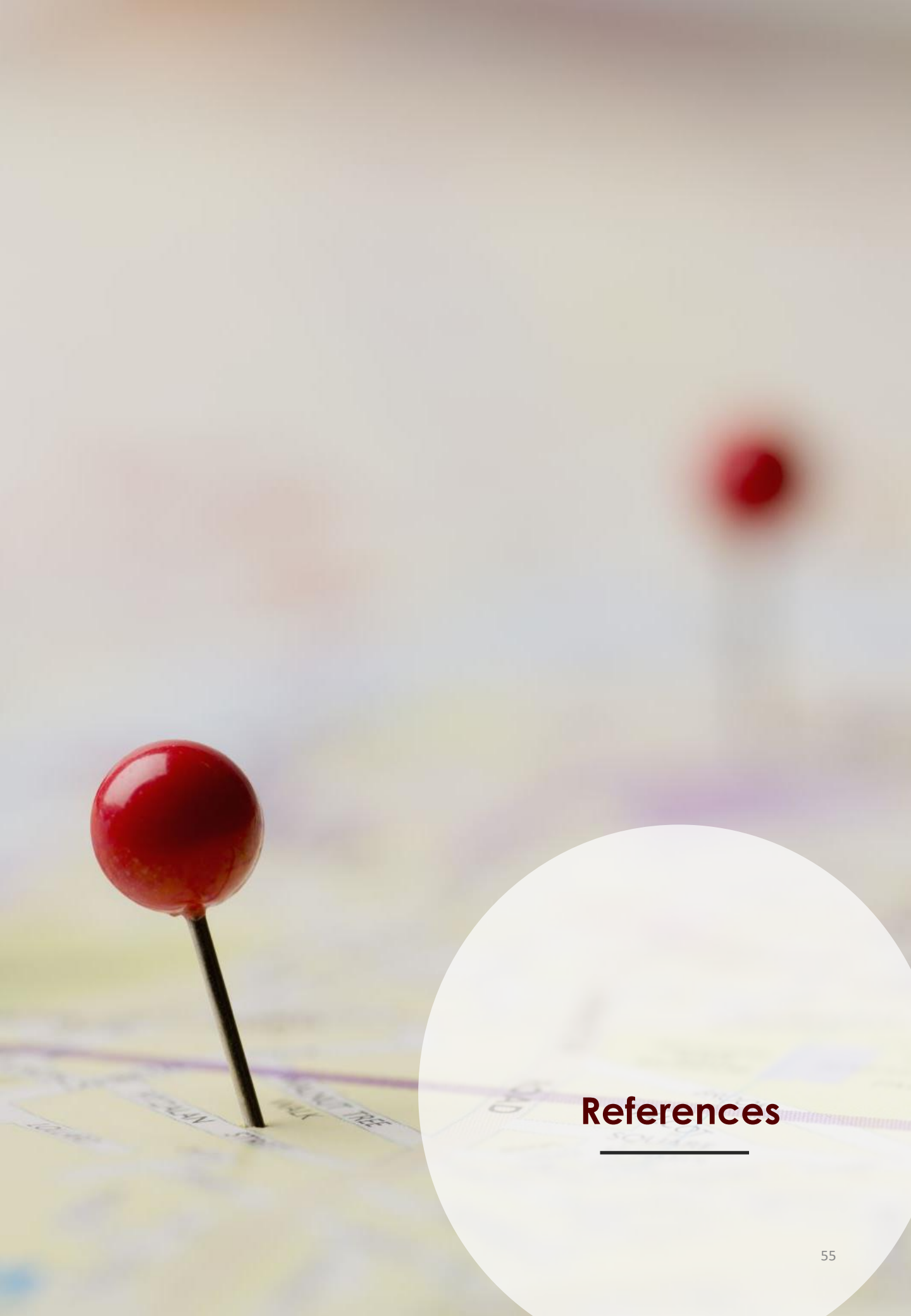
RAILWAYS	
Origin Station	HALDIA DOCK COMPLEX BULK- HDCB
Destination Station	FARAKKA SUPER NATIONAL THERMAL POWER PROJECT- FSTP
Wagon Type	BOXNHL- BOGIE OPEN WAGON AIR BRAKES
Commodity Category	COAL AND COKE
Commodity Type	NON COKING COAL WASHED
Distance	424
Freight Rate (/Tonne) (Class 145A, Train Load)	926
Shortest Route	TMZ-RGX-ADL-BTNG-DKAE-SKG-KAN-JTL-SNT-RPH-NHT
Rake	58

IWT ASSUMPTIONS:		
Fairway distance (Km) (Haldia MMT to Farakka)	600	km
Load carried (Tonnes) per Rake from Haldia to Haldia MMT	3445	Tonnes
IWT Upstream cost (2021) (after inflation) (Rs. Per Ton-Km)	0.75	Rs. Per Tonn-Km (For One 3,000 Tonne Barge) (includes charges for IWAI Waterway User Charge and Farakka Navigation Lock charges)
Coal loaded at Haldia MMT (by 2025) (Tonnes)	17,46,915	Tonnes
Rake trips required daily	1.39	Trips / day
Daily coal loaded at Haldia MMT (2021) (Tonnes)	4786.07	Tonnes / day
Lead	Less than 10 km	Km
Base Rate applicable (2016-17)	0.00	Rs per tonne per rake for BOBRN Wagons for 1 to 1.5 trips per day for distance slab of 1 - 10 km
Escalation	5%	p.a. From 2018 onwards
Applicable rate in 2021	0.00	Rs per tonne per rake for BOBRN Wagons
IWAI Charges (For Augmented NW-1 as per DPR of Haldia to Allahabad)		
At Origin Terminal		
Vessel Related Charges		
Berthing Charges	0.00	Rs. / 24 hours
Pilotage	0.00	Rs. / 24 hours
Stayal charges on Inland vessels	0.00	Rs. / Vessel / Day
Cargo Related Charges (taken as per KoPT's published Scale of Rates of Inland Water Vessels)		
Coal charges (Coal handled through other than mechanical systems)		
Wharfage for Transshipment at Sandheads	35.57	Rs. / Tonne
Dock Toll Charges	13.20	Rs. / Tonne
At Destination Terminal - Charges		
Vessel Related Charges		
Berthing Charges	1000	Rs. / 24 hours
Pilotage	750	Rs. / 24 hours
Operator's profit margin	10%	Percent
Cargo Related Charges		
Wharfage	18.00	Rs. / Tonne
Transfer of Thermal coal from unloading point to stack point	40.50	Rs. / Tonne
Transfer of Thermal coal from stack point to hook point	54.00	Rs./Tonne
Coal - non -mechanized handling charges	112.50	Rs./Tonne

ROADS		
Axle load of Truck (GVW)	28.5	Tonnes
Tonnage carried by 1 truck (Tri-Axle Tipper Truck)	25	Tonnes
Road distance to be travelled	400	Km
Rounded-up number of Trucks to be utilized for transporting 3,000 Tonnes coal from Haldia to TPP	120	Number of Trucks
Tolls along highways	2000	Rs. Per truck
Total cost per Tonne-Km to end customer	3	Rs. Per Tonne-Km

ADDITIONAL ASSUMPTIONS FOR CASE STUDY – IWT-2: MOVEMENT OF DOMESTIC COAL OVER NW-1:

Origin Rail Terminal		LALMATIA LOADING COMPLEX(RAJMAHAL AREA)- LLCR
Destination Rail Terminal		OBRA THERMAL POWER STN, OBRADAM- OTPS
Type of Wagons		BOXNHL- BOGIE OPEN WAGON AIR BRAKES
Tarrif Lines		GENERAL
Commodity Type		COAL AND COKE
Commodity Sub-type		NON COKING COAL WASHED
Rake		58
Train Load (Class 145 A)		1398.7
RBS Route		BGP-KIUL-LKR-TIA-MPO-GAYA-SEB-GHD-OBR
Distance	Km	611
Coal carried in single Rake	Tonnes	3944
Rail - Rajmahal - Sahibganj		
Distance	km	80
Coal carried in single Rake	Tonnes	4060
Rail - Varanasi - Obra		
Distance	km	167
Coal carried in single Rake	Tonnes	4060
IWT		
IWT distance from Sahibganj to Varanasi	Km	691



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