No.KOPT/KDS/CIV/T/2533/78 Date: 13.01.2021

ADDENDUM-I

Ref. Tender Notice No.: SMPK/KDS/CIV /T/2533/65 Dt. 06.01.2021
Tender Id No. 2021_KoPT_609096_1

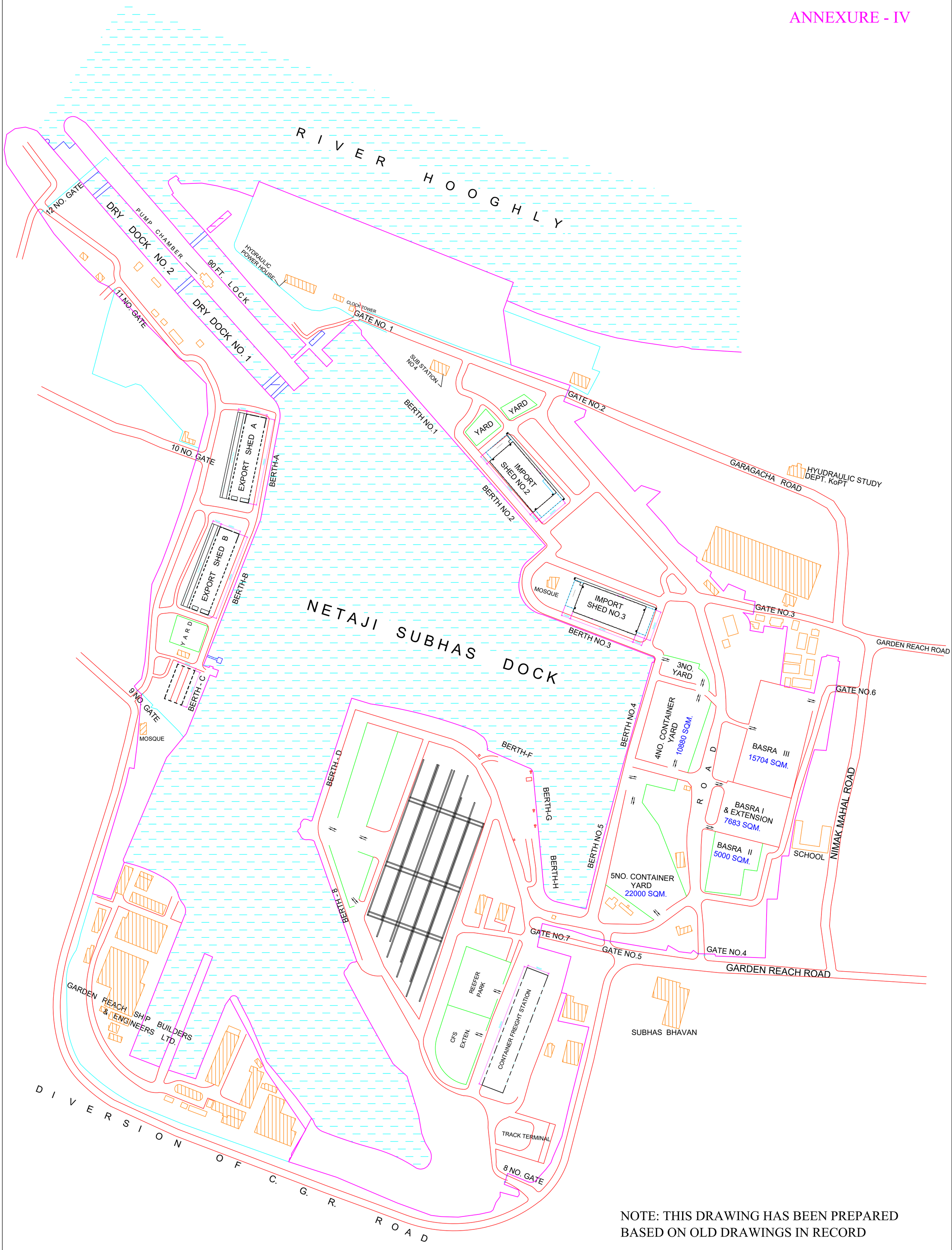
Name of Work :- SELECTION OF Technical Consultant for "PREPARATION OF TECHNO ECONOMIC FEASIBILITY REPORT FOR COMPREHENSIVE EVACUATION STRATEGY IN RESPECT OF CARGO TRAFFIC FOR DIRECT CONNECTIVITY OF KOLKATA DOCK SYSTEM AT KOLKATA TO NATIONAL HIGHWAY ALONG WITH IMPROVEMENT/BETTERMENT OF EVACUATION INFRASTRUCTURE".

Four(4) drawings & a Master Plan Traffic Report KDS(Vol-I) in connection with the above work are attached herewith which form part of the RFP.

All other terms & conditions and Clauses will remain same as per original

Superintending Engineer
For □□□□□ □□□□□□□ / Chief Engineer

ANNEXURE - IV

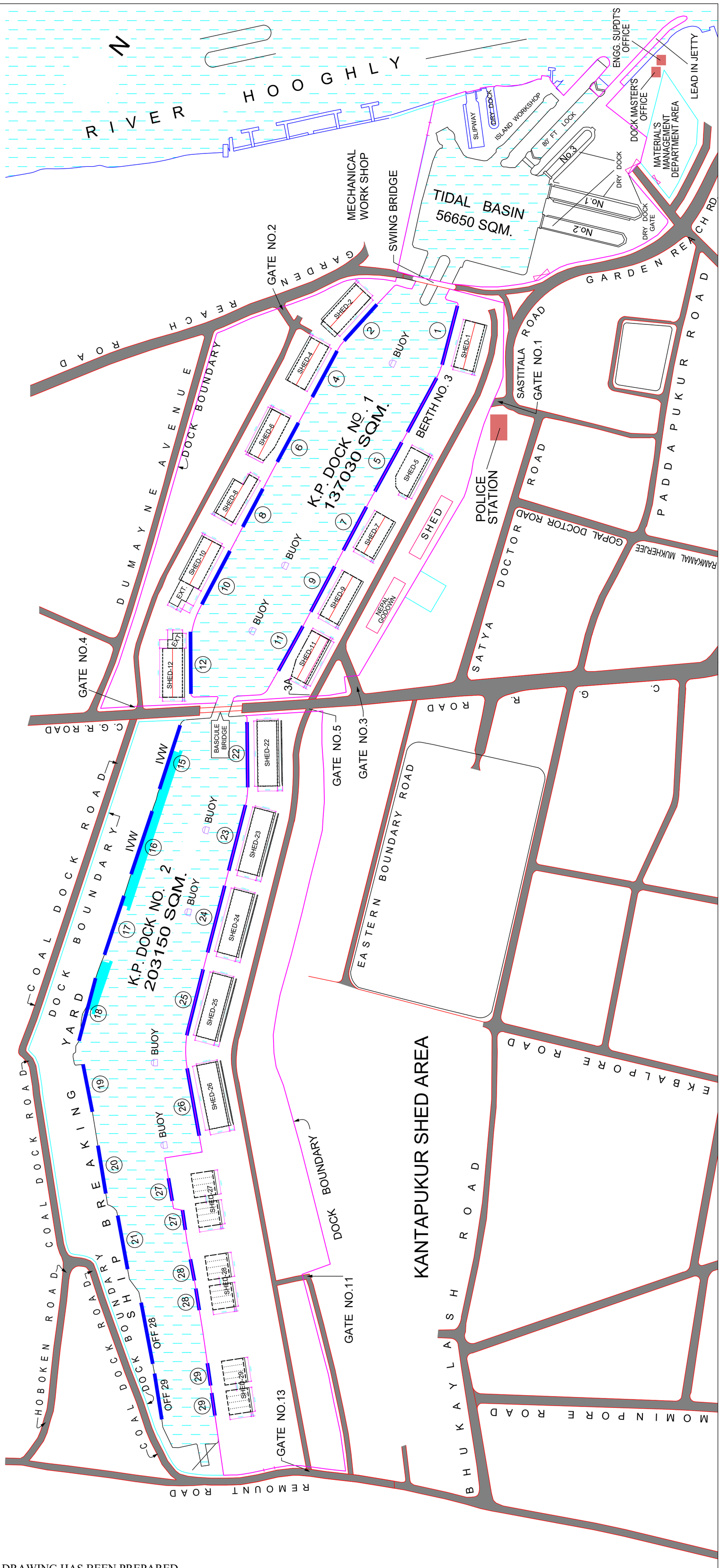


NOTE: THIS DRAWING HAS BEEN PREPARED BASED ON OLD DRAWINGS IN RECORD

N

LAYOUT OF NETAJI SUBHAS DOCK (NSD) SHOWING PLAN OF THE EXISTING SHEDS			
SYAMA PRASAD MOOKERJEE PORT, KOLKATA			
CIVIL ENGINEERING DEPARTMENT			
SCALE	1:100, N.T.S.	DATE	11.01.2021.

ANNEXURE - V



NOTE: THIS DRAWING HAS BEEN PREPARED BASED ON OLD DRAWINGS IN RECORD

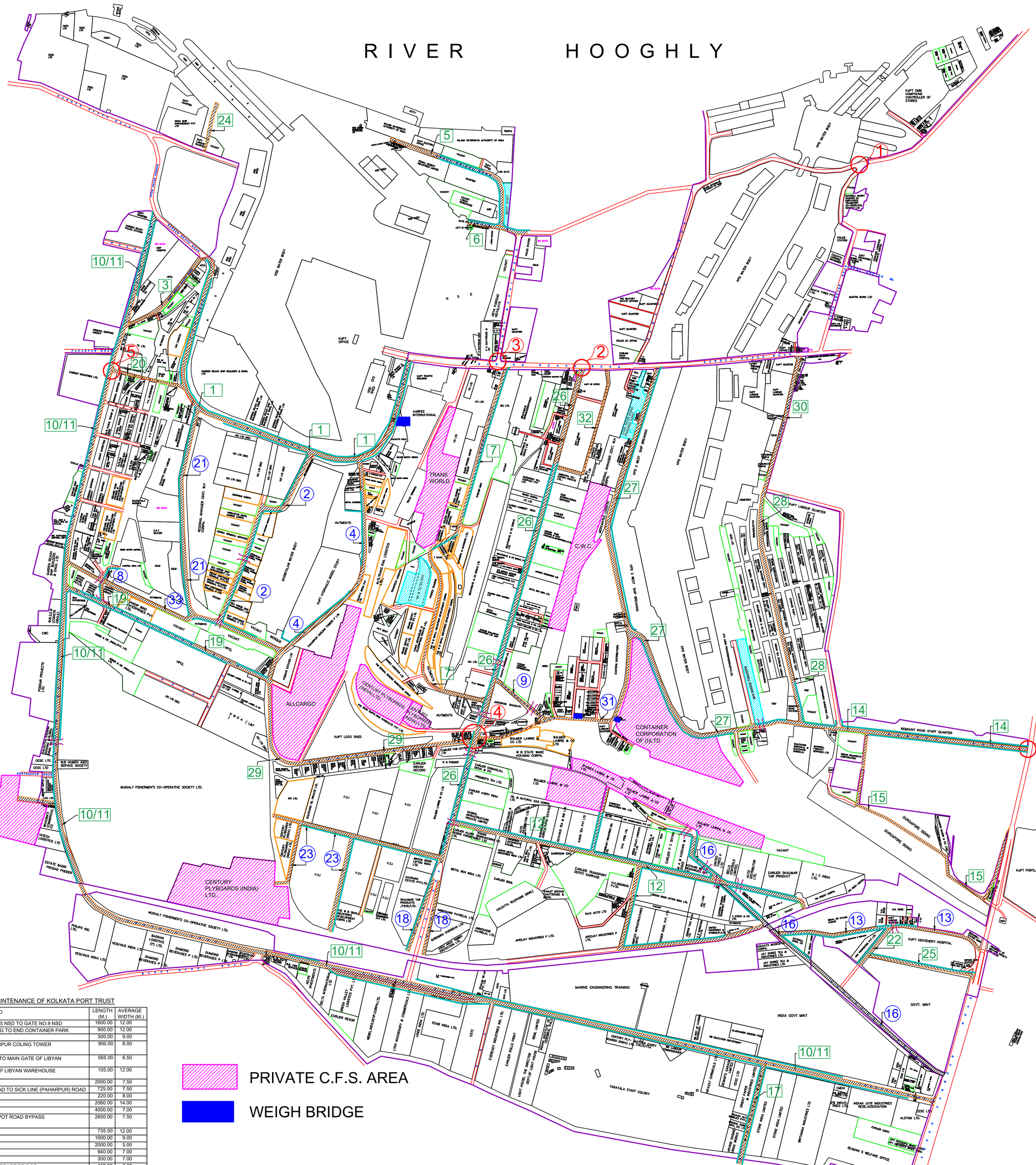
N

LAYOUT OF KHIDIRPUR DOCK (KPD) SHOWING PLAN OF THE EXISTING SHEDS			
SYAMA PRASAD MOOKERJEE PORT, KOLKATA			
CIVIL ENGINEERING DEPARTMENT			
SCALE	1:100, N.T.S.	DATE	11.01.2021.

THE BOARD OF TRUSTEES FOR THE PORT OF KOLKATA

P R O P E R T Y P L A N

ANNEXURE - VI



LIST OF ROADS UNDER THE MAINTENANCE OF KOLKATA PORT TRUST

SL. NO.	NAME OF THE ROAD	LENGTH (M.)	AVERAGE WIDTH (M.)
1.	CGR ROAD DIVERSION ROAD FROM GATE NO.5 NSD TO GATE NO.9 NSD	1600.00	12.00
2.	DHOBITALA ROAD FROM CGR ROAD CROSSING TO END CONTAINER PARK	900.00	12.00
3.	HARIMOHAN GHOSH ROAD	500.00	9.00
4.	ROAD FROM CGR ROAD CROSSING TO PAHARPUR COLING TOWER CONNECTING HYDRAULIC MODEL	900.00	8.00
5.	BRACE BRIDGE ROAD FROM GATE NO.3, GRJ TO MAIN GATE OF LIBYAN WAREHOUSE (PAVER BLOCK)	565.00	6.50
6.	ROAD FROM GATE NO.3 NSD TO MAIN GATE OF LIBYAN WAREHOUSE (PAVER BLOCK)	105.00	12.00
7.	SONAI ROAD	2000.00	7.50
8.	CONNECTING ROAD BETWEEN TARATALA ROAD TO SICK LINE (PAHARPUR) ROAD	725.00	7.50
9.	OLD GARAGACHA ROAD	220.00	8.00
10.	NEW TARATOLA ROAD	2060.00	14.00
11.	OLD TARATOLA ROAD	4000.00	7.00
12.	TRANSPORT DEPOT ROAD & TRANSPORT DEPOT ROAD BYPASS UP TO LEVEL CROSSING	2650.00	7.50
13.	HELEN KILLER SARANI	735.00	12.00
14.	REMOUNT ROAD	1000.00	9.00
15.	DURGAPUR YARD ROAD	2000.00	5.00
16.	GARAGACHA ROAD	940.00	7.00
17.	MINT PLACE ROAD	300.00	7.00
18.	LOW LEVEL BYPASS ROAD ON BOTH SIDE OF BRACE BRIDGE	450.00	7.00
19.	OIL INSTALLATION ROAD & OIL INSTALLATION BYPASS ROAD	800.00	8.00
20.	CROSS ROAD CONNECTING CGR ROAD AND BROOKLYN DEPOT (SINGHERHATI ROAD)	300.00	7.00
21.	SUBHAS NAGAR ROAD FROM CGR ROAD TO DHOBITALA CONNECTOR ROAD	835.00	7.50
22.	INCINERATOR ROAD	300.00	6.50
23.	ROAD FROM HIDE ROAD LEADING TOWARDS JJP AREA	925.00	9.00
24.	STEEL DUMP ROAD LEADING TO CENTRAL STORE/P&T UPTO GATE NO.11 N.S.D.	200.00	8.50
25.	ROAD LEADING TO CENTENARY HOSPITAL	350.00	7.00
26.	HIDE ROAD & HIDE ROAD EXTENSION	2150.00	12.00
27.	COAL DOCK ROAD	1800.00	7.50
28.	KANTAPUKUR ROAD (THROUGH SHED COMPLEX)	1300.00	9.00
29.	SONARPUR ROAD FROM HIDE ROAD CROSSING TO OIL INSTALLATION ROAD	900.00	9.00
30.	DOCK EAST BOUNDARY ROAD	1000.00	8.00
31.	HOBOKEN ROAD	1300.00	8.00
32.	DOCK WEST BOUNDARY ROAD	350.00	4.00
33.	NEW ROAD CONNECTING TARATOLA ROAD TO DHOBITOLA /SONARPUR ROAD	760.00	7.50

ROAD NETWORK
UNDER MAINTENANCE OF Ko.P.T.

① SATYA DOCTOR ROAD & GARDEN REACH ROAD
② HIDE ROAD & C.G.R. ROAD
③ NIMAK MAHAL ROAD & C.G.R. ROAD
④ JAIN KUNJ
⑤ SINGHERHATI ROAD & TARATALA ROAD
⑥ REMOUNT ROAD & DIAMOND HARBOUR ROAD

BHUT GHAT PARKING YARD AREA - 6400 SQM. (APPROX.)

COAL DOCK ROAD PARKING YARD AREA - 7400 SQM. (APPROX.)

"M" & "Q" BLOCK PARKING YARD AREA - 16200 SQM. (APPROX.)

M/S WARSI TRADERS PARKING YARD AREA - 10597 SQM. (APPROX.)

ANNEXURE - III

THE BOARD OF TRUSTEES OF THE PORT OF CALCUTTA

PROPERTY PLAN

(MASTER PLAN)

SCALE 16 INCHES = ONE MILE

LIST OF ROADS UNDER THE MAINTENANCE OF KOLKATA PORT TRUST

SL. NO.	NAME OF THE ROAD	LENGTH (M.)	AVERAGE WIDTH (M.)
1.	CGR ROAD DIVERSION ROAD FROM GATE NO.5 NSD TO GATE NO.9 NSD	1600.00	12.00
2.	DHOBITALA ROAD FROM CGR ROAD CROSSING TO END CONTAINER PARK	900.00	12.00
3.	HARIMOHAN GHOSH ROAD	500.00	9.00
4.	ROAD FROM CGR ROAD CROSSING TO PAHARPUR COLING TOWER	900.00	8.00
5.	BRACE BRIDGE ROAD FROM GATE NO.3, GRJ TO MAIN GATE OF LIBYAN WAREHOUSE (PAVER BLOCK)	565.00	6.50
6.	ROAD FROM GATE NO.3 NSD TO MAIN GATE OF LIBYAN WAREHOUSE (PAVER BLOCK)	105.00	12.00
7.	SONAI ROAD	2000.00	7.50
8.	CONNECTING ROAD BETWEEN TARATALA ROAD TO SICK LINE (PAHARPUR) ROAD	725.00	7.50
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10.	NEW TARATOLA ROAD	2060.00	14.00
11.	OLD TARATOLA ROAD	4000.00	7.00
12.	TRANSPORT DEPOT ROAD	1500.00	7.50
13.	TRANSPORT DEPOT ROAD BYPASS	900.00	8.00
14.	REMOUNT ROAD	1000.00	9.00
15.	DURGAPUR YARD ROAD	2000.00	5.00
16.	GARAGACHA ROAD	700.00	7.00
17.	MINT PLACE ROAD	300.00	7.00
18.	LOW LEVEL BYPASS ROAD	450.00	7.00
19.	OIL INSTALLATION ROAD & OIL INSTALLATION BYPASS ROAD	800.00	8.00
20.	CROSS ROAD CONNECTING CGR ROAD AND BROOKLYN DEPOT	300.00	7.00
21.	ROAD FROM CGR ROAD TO DHOBITALA CONNECTOR ROAD	835.00	7.50
22.	INCINERATOR ROAD	300.00	6.50
23.	ROAD LEADING TOWARDS M/S. TATA STEEL GODOWN, ETC. AT JJP AREA	350.00	9.00
24.	STEEL DUMP ROAD LEADING TO CENTRAL STORE/P&T	200.00	8.50
25.	ROAD LEADING TO CENTENARY HOSPITAL	350.00	7.00
26.	HIDE ROAD (UPTO SONARPUR ROAD CROSSING)	1600.00	12.00
27.	COAL DOCK ROAD	1800.00	7.50
28.	KANTAPUKUR ROAD	1300.00	9.00
29.	HIDE ROAD EXTENSION	550.00	10.00
30.	SONARPUR ROAD FROM HIDE ROAD CROSSING TO OIL INSTALLATION ROAD	900.00	9.00
31.	DOCK EAST BOUNDARY ROAD	1000.00	8.00
32.	HOBOKEN ROAD	1300.00	8.00
33.	DOCK WEST BOUNDARY ROAD	350.00	4.00

Kolkata Port Trust

Haldia Dock Complex



MASTER PLAN FOR KOLKATA PORT TRUST

Draft Master Plan Report
Kolkata Dock System
Volume I: Draft Traffic Report

December 2019

L&T Infra Engineering

L&T Infrastructure Engineering Limited

L&T Infra Engineering

L&T Infrastructure Engineering Ltd.

Client:	**Kolkata Port Trust** West Bengal, India		
Project:	Master Plan for Kolkata Port Trust	**Project No.:** C1181108	
Title:	Volume I- Draft Traffic Report for KoPT	**Document No.:** RP003	**Rev.:** 0

File path:
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Notes:

1.

Revision Details:

0	24/12/2019	First Submission			Shekhar		Sameer	
Rev.	**Date**	**Details**	**Init.**	**Sign.**	**Init.**	**Sign.**	**Init.**	**Sign.**
			Prepared		**Checked**		**Approved**	

Table of contents

Contents

Chapter 1: Introduction

1 Introduction

1.1 Scope of the Study

The broad scope of consultancy work for preparing complete master plan for the Kolkata port includes

- Study the potential hinterland for the purpose of movement of EXIM and Coastal Cargo to and from HDC and KDS separately
- Study the demand and Supply of different EXIM and Coastal commodities by the industries, Mining Sector, other businesses in the hinterland.
- O-D study to analyse the mode in which these commodities are moving in and out of the hinterland.
- Analyse increase in demand - prospects of future industrialization / commercial developments in the hinterland as well as changes in Govt. policies
- Prepare plans for attracting North-Indian traffic moved by western ports which have potential for being handled in the East-Coasts ports.
- Analyse possibilities of shifting existing inland cargo moving in and out of hinterland by Rail/Road to coastal/IWT mode.
- Study the potential of HDC and KDS to meet the present and future demand of EXIM and Coastal commodities and how.
- Analyse opportunities and challenges due to rise in inland waterways traffic.
- Study the connectivity of HDC and KDS by rail / road / IWT with the hinterland for the purpose of movement of present and future demand of EXIM and coastal cargo.
- To study the competitiveness of HDC and KDS in attracting the hinterland cargo vis-à-vis the other major and non-major ports (existing and future)
- To make long term cargo projection separately for HDC and KDS for next 20 years
- To identify the measures to be taken by HDC and KDS for handling the projected cargo by way of :-
    - Construction of new cargo handling facilities to add capacity for the required commodities.
    - Modernizing and upgrading of existing cargo handling
    - Construction and upgrade of supporting infrastructure such as lock / road / rail /gates/ storage areas etc.
    - Removal of procedural bottlenecks.
    - The need for rationalization of port tariff
    - Developing competences in HDC and KDS to complement each other
    - Other development works required to be undertaken at HDC and KDS as may be found necessary by the Consultant.
- To prepare a complete Master Plan for implementing the identified measures in phases during the period up to 2035.

1.2 Acknowledgement

We express our gratitude towards Chairman and officials of Kolkata Port Trust for their everlasting support and cooperation while conducting this study.

Chapter 2:
Project Background

2 Project Background

2.1 Purpose of the Document

The aim of the traffic assessment report is to inform the decision makers and stakeholders on the methodologies used for projection, various policy implications, hinterland analysis, emerging trends and regional perspective and how the interaction between various commodities are managed. The focus of the study is to estimate cargo traffic to be handled by Kolkata Port Trust-Kolkata Dock System (KDS) and Haldia Dock Complex (HDC) in the next 20 years (2019-39).

2.2 About Kolkata Port

Kolkata Port is one of the 13 major ports in India and the gateway port of Eastern India. The Port handled total traffic of 64 MMT during 2018-19. Kolkata Port has two approaches from the sea side one from the eastern channel and other from western channel. Kolkata port is divided into two dock complexes i.e. Kolkata Dock System (KDS) and Haldia Dock Complex (HDC). Kolkata Dock System is situated in the left bank of Hooghly river while Haldia Dock Complex is situated in right bank of Hooghly river.

The port is very well connected by different modes of transport

Roads: Kolkata Dock System is located at 10 km from Junction of NH2 & NH6 and at 25 km from Junction of NH34 and the Airport. These distances are covered by various city roads.

Haldia Dock Complex is connected to NH41 which links it to NH6 and rest of the country. Four laning of 52.2 km stretch of NH-41 from Kolaghat-Haldia is being implemented by NHAI.

Railway: Sealdah-Budge Budge Branch Line of Eastern Railway connects KDS with the Truck Railways at Majherhat Junction. While Railway connections are available for serving 3 (three) berths, however, railway tracks leading to all the berths except 1NSD require strengthening.

While, Panskura-Haldia Branch Line of South Eastern Railway connects HDC to the Trunk Railways. This is a single line. Doubling of the 15.05 Km stretch of this line from Panskura to Rajgoda has already been completed

Following figure 1 depicts location of Kolkata Dock System and Haldia Dock Complex.

Figure 1: Project Site Location

Being one of the major ports of the country, it is very essential to make provision for future development inside and in the vicinity of the port. For that purpose, Kolkata Port Trust entrusted L&TIEL to undertake master planning for the port for a 20-year horizon. L&TIEL has in turn appointed KPMG Advisory Services Private Limited (KASPL) to carry out detailed traffic assessment and traffic forecast for the period to enable it towards preparation of a suitable master plan.

2.3 Historical Growth of Cargo Traffic at Kolkata Port Trust

Analysis of historical traffic growth trend is one of the key tasks in traffic projection exercise. Year on year growth for Kolkata Port Trust was 10.14% for year 2017-18 to 2018-19. It was second highest amongst major ports of India and much higher than national average of 2.9%. Cargo traffic at Kolkata Port Trust increase at growth rate of 9% from year 2014 to 2019. Following Figure depicts the growth of cargo traffic across the years.

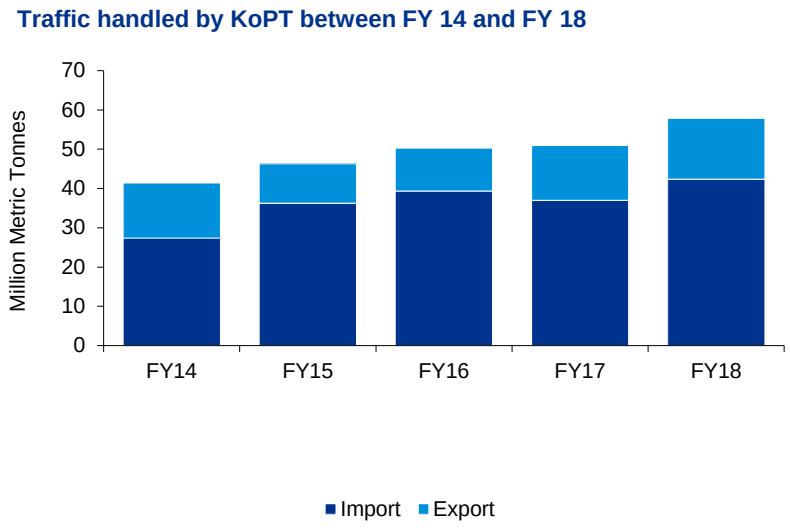


Figure 2:Historical Growth of traffic handled by KoPT

There are 12 major commodities in KoPT which constitutes of 84% of cargo traffic following figure represents traffic generated by each commodity in Million Metric Tonnes

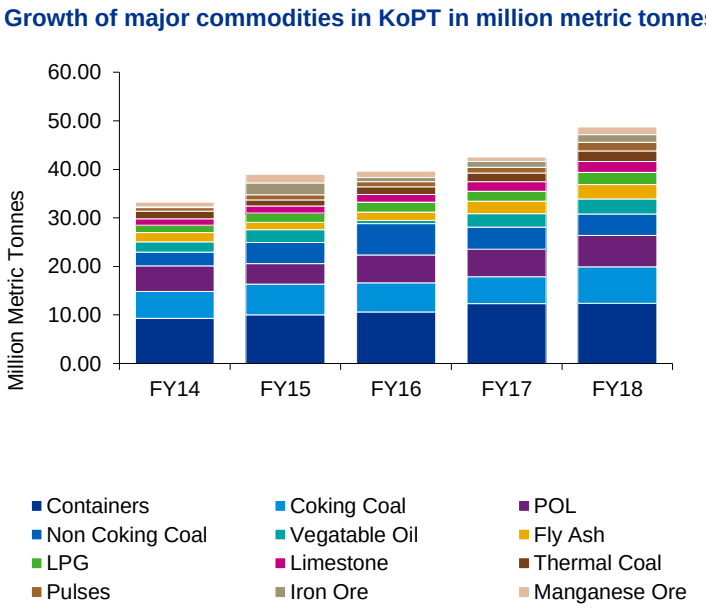


Figure 3:Growth of major commodities in KoPT in million metric tonnes

The split of traffic growth by Haldia Dick Complex and Kolkata Dock system is represented in below figure. During period of 2014-19 traffic of HDC increased by 9.7% while KDS increased by 7.6%.

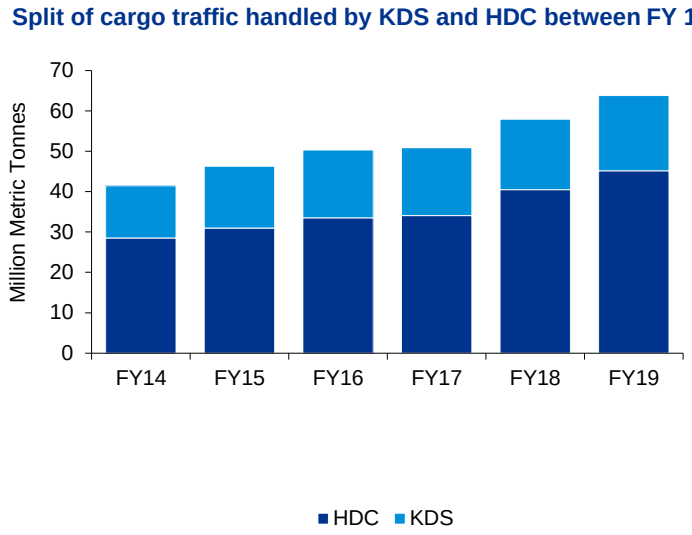


Figure 4: Split of traffic handled by HDC and KDS in million metric tonnes

2.4 SWOT Analysis

In line with the objective of study, KPMG carried out SWOT analysis for existing facilities of Kolkata Port

2.4.1 Strength

- Kolkata Port is very well connected with National Waterways 1 and 2
- Coking coal, Petroleum products, Oil and Lubricants are major commodities handled at the port
- Kolkata port is very much strategically located for domestic and international trade. It has easy access to almost all-important modes of the transport.
- It is nominated gateway port for BIMSTEC hence very important in terms of trade relation with neighbouring countries like Bangladesh, Myanmar, Thailand, Sri Lanka, Nepal and Bhutan.
- Kolkata port has always demonstrated growth rates of over period in terms of cargo traffic.
- It is one of the few ports where focus has given to technology advancements which includes features like Radio Frequency Identification (RFID) based Port Access Control System (PACS) at Kolkata Dock System (KDS).

2.4.2 Weakness

- Kolkata port has facing challenges due to improper draft, huge dredging requirement and lock restrictions.
- Kolkata city is one of the densely populated cities in country due to which evacuation and congestion are real pain many times.
- Without proper charging system and too many middle men, trading transformed into complicated eco-system which eventually leads into unpredictable cost.

2.4.3 Threats

- Rapidly Improving infrastructure facilities at competing ports is one of the possible threats for Kolkata Port in near future.
- Likely addition of Ports like Tajpur & Subarnarekha will surely impact the growth of Kolkata port.
- Introduction Inland Waterways Transport may result in traffic diversion
- In regional perspective, Ports of Mongla and Pyra of Bangladesh possess possible alternatives for trading in Kolkata Port

2.4.4 Opportunity

- Kolkata Port's location allows it to access large, land-locked hinterland
- Ongoing connectivity projects like EDFC, ECEC, AKIC will further boost trading in Kolkata Port
- Regional Trade Agreements with BBIN, BIMSTEC, IBP will further drive growth
- IWT enhancement will help to increase the reach of Port
- Potential upside from the terminals like Balaghar, Sagar expansion is expected.

2.5 Structure of the report

Traffic assessment report has been structured as follows

- Project Background
- Regional Perspective and Emerging Trends
- Approach and Methodology
- Cargo Traffic Projection
- Conclusion and Way Ahead

Chapter 3:
Regional Perspective and Emerging Trends

3 Regional Perspective and Emerging Trends

Cooperation between neighboring states can be achieved through economic, political and environment integration with the help of common institutions and regulations. India's regional stand could be very well explained through its trade relation with neighboring countries. Therefore, in order to attract more cargo to the port, it is imperative that it captures a significant portion of the cargo flow that could emerge from various infrastructure and trade related developments happening in the region.

3.1 Background

3.1.1 Bangladesh Bhutan, India and Nepal(BBIN) Trade

India has a positive balance of trade with Bangladesh, Bhutan and Nepal over the years.

Table 3-1 Trade between India and neighboring countries[1]

Country	Exports by India (USD mn)		Growth Rate (%)	Imports by India (USD mn)		Growth Rate (%)
	FY 13	FY 17		FY 13	FY17	
Bangladesh	5144.99	6728.29	30.77	639.33	703.77	10.08
Bhutan	233.92	509.30	118.38	164.00	299.42	82.57
Nepal	3088.84	5399.98	74.82	543.10	445.38	-17.99

It is evident from the table above that the volume of trade is highest with respect to Bangladesh and least with Bhutan. It is also observed that exports to Nepal have increased by 74% during FY13-FY17, while the imports have reduced by 18% in the corresponding period.

The table below presents the expected imports and exports of India with Bangladesh, Bhutan and Nepal in FY 21.[2]

Table 3-2 Expected balance of trade-India and neighboring countries

Country	Export (USD Mn)	Import (USD Mn)
	FY 21	FY 21
Bangladesh	9409	721
Bhutan	1347	348
Nepal	10855	3734[3]

Agreements between India and neighboring countries

[1] https://commerce.gov.in/writereaddata/uploadedfile/MOC_636477306238949138_Trade_with_South_Asia_2016-17.pdf
[2] KPMG Analysis
[3] http://www.indembkathmandu.gov.in/page/about-trade-and-commerce/ and KPMG analysis

There is an agreement between India, Bangladesh, Bhutan and Nepal which is known as BBIN Motor Vehicle Agreement.

Bangladesh, Bhutan, India and Nepal (BBIN) had signed a framework Motor Vehicle Agreement (MVA) in June 2015 to enable movement of passenger and cargo vehicles across borders among the member countries. Bhutan has not yet ratified the pact for its entry to come into force. However, Bhutan had given its consent to the other 3 countries i.e. Bangladesh, India and Nepal for the BBIN MVA, who have already ratified it.[4] Bhutan is not part of it.

As per the agreement, member countries would allow vehicles registered in the other countries to enter their territory under certain terms and conditions. Customs and tariffs will be decided by the respective countries and these would be finalized at bilateral and trilateral forums.

It would permit unhindered movement of passenger and cargo vehicles among the four countries. Cargo vehicles do not have to be changed at the borders. The BBIN agreement will promote safe, economical road transport in the region.

India, Bangladesh, Bhutan and Nepal are members of South Asia Free Trade Area (SAFTA) Agreement, Asia Pacific Trade Agreement (APTA) and SAARC Preferential Trading Arrangement (SAPTA). Under these Agreements, preferential access is provided to the products of the member countries.

Trade between India and Bangladesh

Major commodities of trade between India and Bangladesh

The total bilateral trade between India and Bangladesh in FY 17 was USD 7.4 billion. Exports accounted for USD 6.73 billion while the imports accounted for USD 0.70 billion.[5] Fly ash, cars, TMT bars, butadiene is being exported from India to Bangladesh via KoPT.[6]

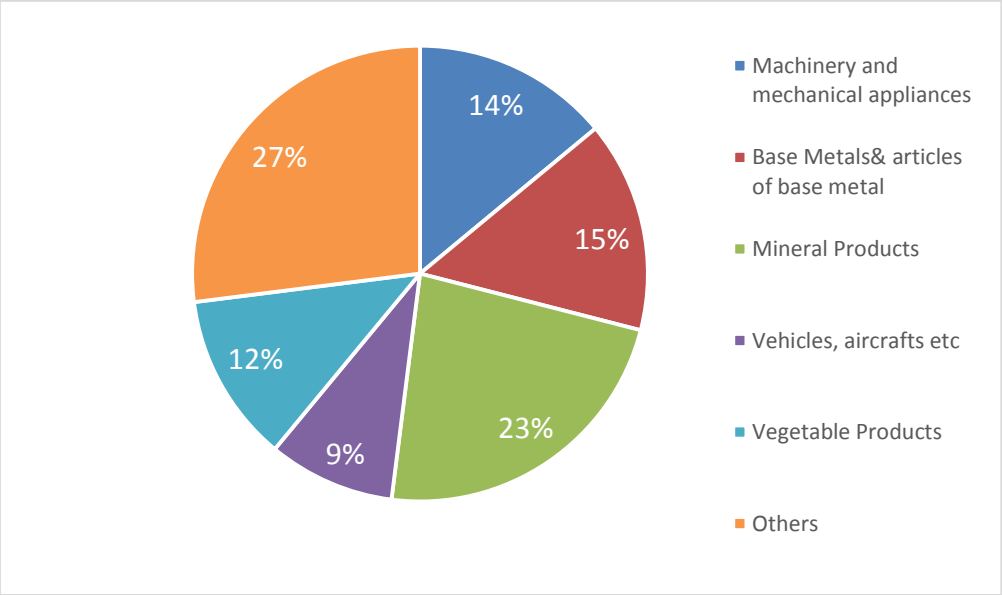


Figure 5 Composition of India's exports to Bangladesh-FY 17

[4] https://www.insightsonindia.com/2019/04/16/bangladesh-bhutan-india-nepal-bbin-initiative/

[5] https://commerce.gov.in/writereaddata/uploadedfile/MOC_636477306238949138_Trade_with_South_Asia_2016-17.pdf

[6] Administrative Report 2017-18, KoPT

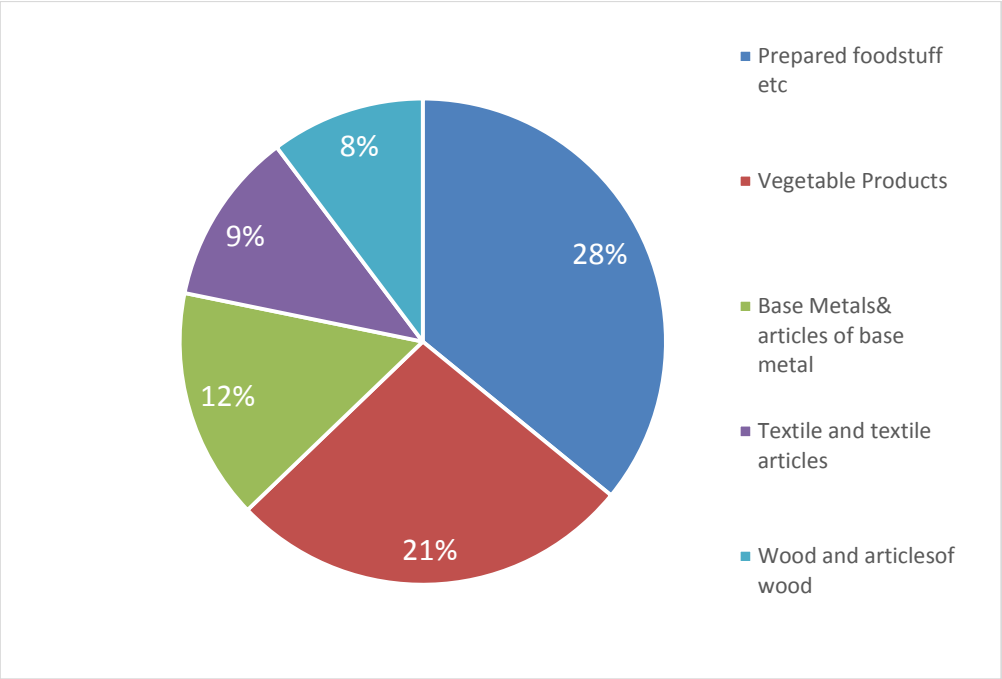


Figure 6 Composition of imports from Bangladesh-FY 17

46.5% of India's exports to Bangladesh were routed by land, 0.5% through railways, balance exports took sea or air routes in FY 17. 76.2 % of imports were by land, 2.6% were by rail, 20.5% imports availed the sea route.

Agreements between India and Bangladesh

India and Bangladesh have a bilateral trade agreement, which was last renewed with effect from April 2015 for a period of five years, with automatic renewal clause. The agreement does not prescribe any preferential tariffs for the imports of products into the other country and is only a facilitative mechanism for enhancement of bilateral trade. However, the bilateral trade between India and Bangladesh is governed under various regional trading agreements. India has provided preferential access for specified goods when imported from countries under agreement of Global System of Trade Preferences (GSTP) and duty free/preferential access is provided to around 98.2% of India's tariff lines under Duty Free Tariff Preference Scheme (DFTP) for Least Developed Countries. Further, India has provided zero duty access to LDC members of SAFTA for all tariff lines, except for 25 lines related to liquor and tobacco. Bangladesh being a LDC enjoys preferential access to Indian market under these trading arrangements.

Agreements for Enhancing Inland and Coastal Waterways Connectivity [7]

India Bangladesh Protocol Route: An Inland water transit and trade protocol exists between India and Bangladesh under which inland vessels of one country can transit through the specified routes of the other country. The routes are indicated in the figure below. For inter-country trade, four ports of call have been designated in each country namely; Haldia, Kolkata, Pandu and Karimganj in India and Narayanganj, Khulna, Mongla and Sirajganj in Bangladesh. Under the Protocol, 50:50 cargo sharing by Indian and Bangladeshi vessels is permitted both for transit and inter country trade.

[7] http://pib.nic.in/newsite/PrintRelease.aspx?relid=184384

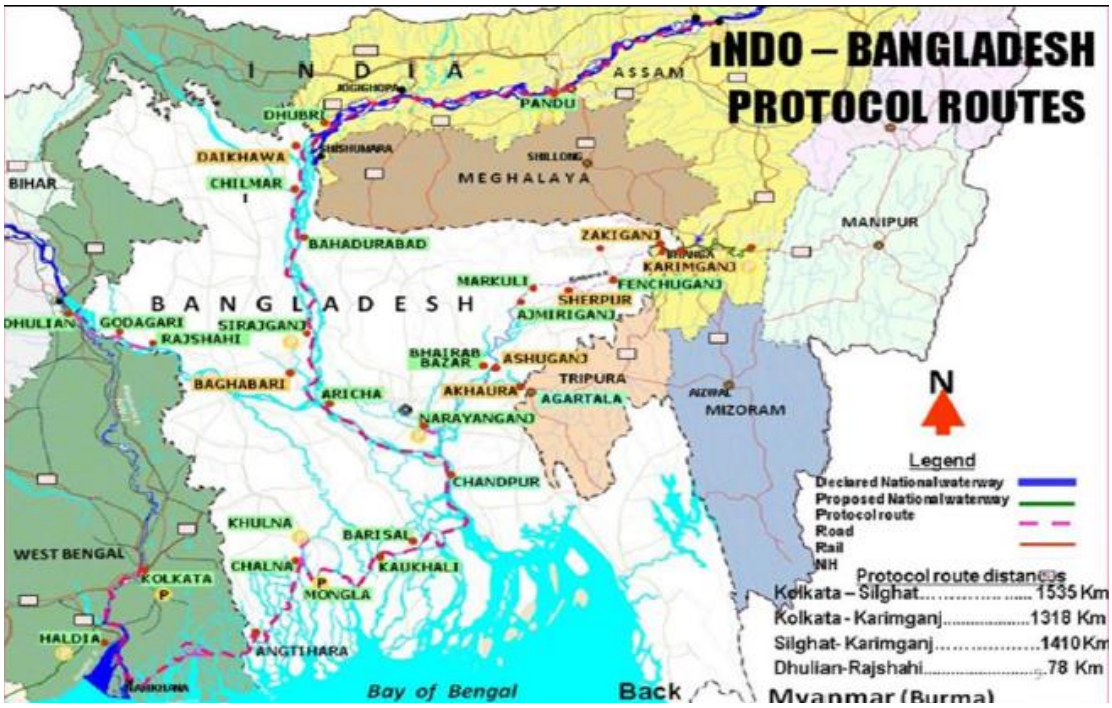


Figure 7 Indo Bangladesh Protocol Route

India and Bangladesh signed an agreement in 2018 to use Chattogram and Mongla Ports in Bangladesh for movement of goods to and from India. In addition to this, an addendum to 'Protocol on Inland Water Transit and Trade' (PIWTT) between India and Bangladesh has been signed for inclusion of Dhubri in India and Pangaonin Bangladesh as new Ports of Call. Currently 3.5 MMT cargo is transported on protocol routes through inland waterways which is expected to increase substantially after the declaration of additional Ports of Call and extension of protocol routes.[8]

Moreover, it was agreed to consider inclusion of Rupnarayan river (National Waterway-86) from Geonkhali to Kolaghat in the protocol route and to declare Kolaghatin West Bengal as new Port of Call. Chilmari was agreed to as a port of call in Bangladesh. Further, both sides agreed to declare Badarpur on river Barak (NW 16) as an Extended Port of Call of Karimganj in Assam and Ghorasal of Ashuganj in Bangladesh on reciprocal basis.

India and Bangladesh also agreed for development of Jogighopa as a hub/trans-shipment terminal for movement of cargo to Assam, Arunachal Pradesh, Nagaland and Bhutan and notifying Munsiganj River terminal by Bangladesh Customs for routing third party Exim cargo through Kolkata Port.

Trade between India and Bhutan

Major commodities of trade between India and Bhutan

The total trade between India and Bhutan was USD 0.8 billion in FY17. Exports accounted for USD 0.5 billion in FY 17 while imports accounted for USD 0.3 billion.

[8] http://pib.nic.in/newsite/PrintRelease.aspx?relid=184384

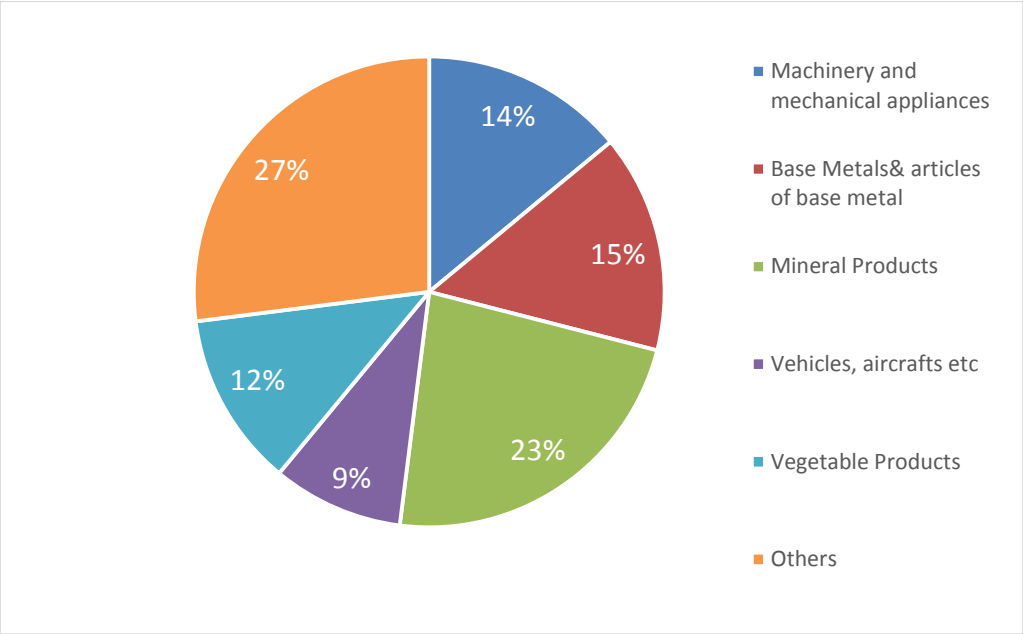


Figure 8 Composition of India's export to Bhutan-FY17

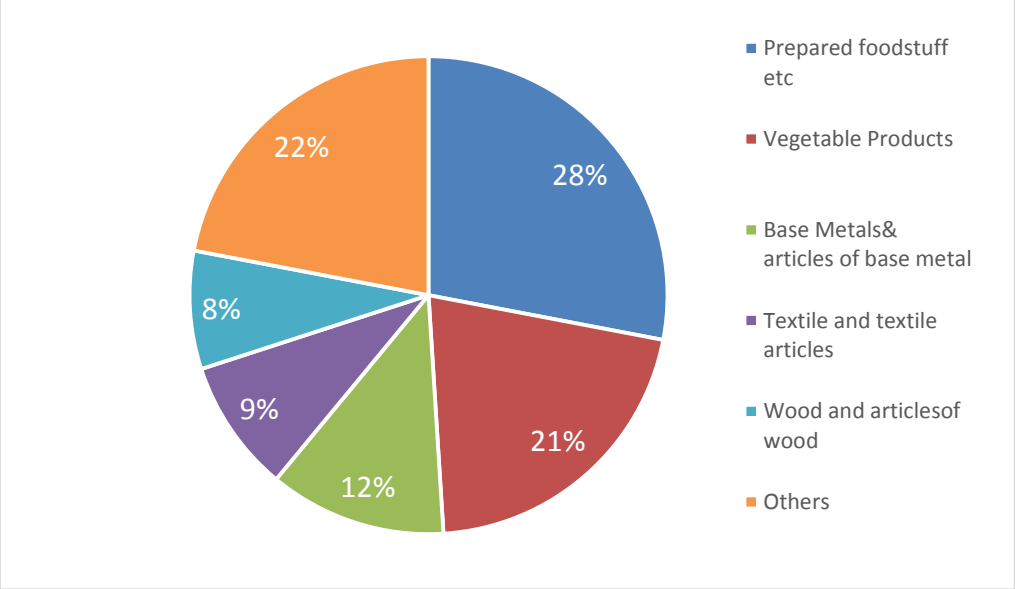


Figure 9 Composition of India's imports from Bhutan-FY17

It is evident from the figures above that machinery and mineral products contributed 34% and 26% of Indian exports to Bhutan respectively. Mineral products contributed to 56% of total imports from Bhutan in FY 17.

97% of India's exports to Bhutan and 99.9% of imports from Bhutan, in FY 17, were made by land i.e. via Land Customs Stations (LCS) on the India---Bhutan border. 78% of exports and 93.4% of imports were routed through Jaigon LCS.

Agreements between India and Bhutan

Post expiry of the existing agreement in July 2016, a new bilateral Agreement on Trade, Commerce and Transit was signed between India and Bhutan on 12 November 2016 and has come into force with effect from 29 July 2017. The bilateral trade and transit arrangement for Bhutan's trade with third countries is also covered by this Agreement.

In terms of India---Bhutan Agreement on Trade, Commerce and Transit, there is free trade between the two countries and no Basic Customs Duty is levied on import of any product

from Bhutan or export to Bhutan. Accordingly, the entire imports from Bhutan are duty free. Further, the trade is carried out in Indian Rupees and Bhutanese currency (Ngultrums).

India has provided duty free access to all products from LDCs of SAFTA (except 25 lines pertaining to alcohol and tobacco) and accordingly such duty-free access is also available to all the products from Bhutan.[9]

Trade between India and Nepal

Major commodities of trade between India and Nepal

The total trade between India and Nepal was USD 5.8 billion during 2016.Exports accounted for USD 5.4 billion while imports accounted for USD 0.44 billion in FY 17.

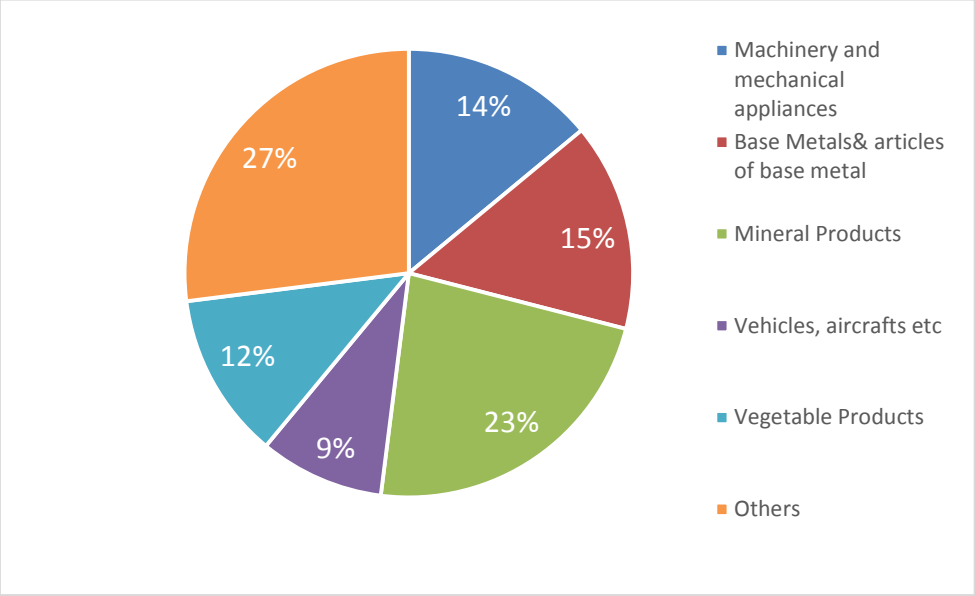


Figure 10 Composition of India's exports to Nepal- FY 17

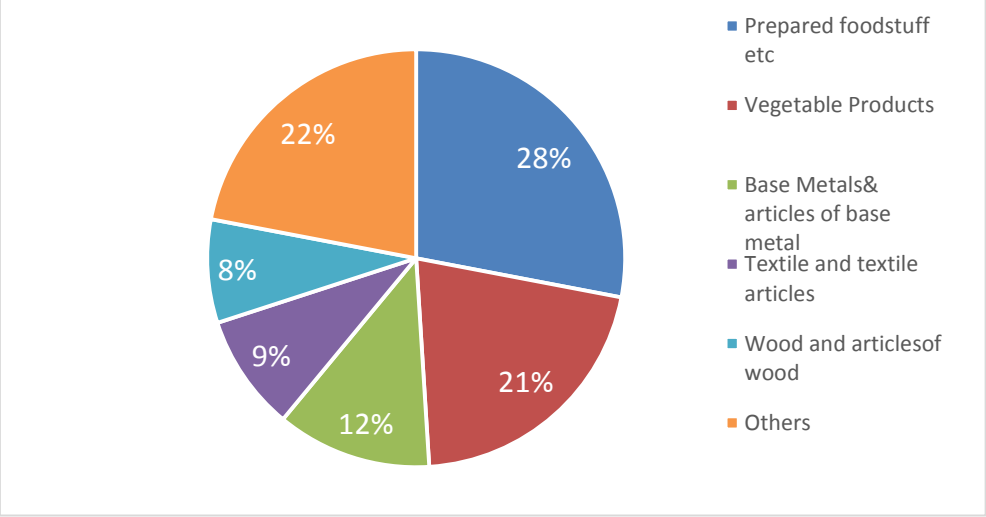


Figure 11 Composition of India's imports from Nepal- FY 17

It is evident from the figures above that machinery, base metals and mineral contributed 34% and 52% of Indian exports to Nepal. Prepared food stuff, vegetable products and base

[9] https://commerce.gov.in/writereaddata/uploadedfile/MOC_636477306238949138_Trade_with_South_Asia_2016-17.pdf

metals contributed to 61% of total imports from Nepal in FY 17. KoPT mainly handles container traffic to and from Nepal.

97.3% of India's exports to Nepal and 99.8% of imports from Nepal, in FY17, were carried out by land. Raxaul, Nautanwa, Jogbani, Nepalgunj and Panitanki are the top 5 LCS for both exports and imports. Raxaul in Bihar is the most important LCS and serves as gateway to Nepal contributing 45% of total exports and 44% of imports.

Agreements between India and Nepal

Bilateral trade between India and Nepal is governed by the India --Nepal Treaty of Trade, which was last renewed on 27 October 2016 for a further period of seven years. Under the Treaty, India has provided duty free access to almost all the products imported from Nepal, except few products relating to tobacco, perfumes and cosmetics and alcohol. However, India has applied tariff rate quotas on the import of four products - Vegetable fats, Acrylic yarn, Copper products and Zinc Oxide from Nepal.

Main features of the current treaty are as under:[10]

Duty free access to each other's primary products as per agreed list, which has been expanded in 2009 Treaty.

- Nepalese manufactured products are allowed non-reciprocal access to the Indian market, free of basic customs duty, on the basis of Certificate of Origin issued by a Government of Nepal designated authority – FNCCI, if the goods are manufactured in Nepal with Nepalese and/or Indian inputs; or, with at least 30% local value addition, if third country inputs are used; and, involves substantial manufacturing process leading to change in HS classification at four-digit level
- Annual quotas for duty free access in respect of four items – vegetable fats (100,000 tonnes) acrylic yarn (10,000 tonnes), copper products (10,000 tonnes) and zinc oxide (2,500 tonnes)
- MFN list of three items – cigarettes, alcohol (excluding beer) and cosmetics with non-Nepalese and non-Indian brands
- Nepalese goods attract Countervailing Duty (CVD) equal to excise duty on similar products in India
- Goods manufactured by small scale units in Nepal enjoy the same benefits as SSIs in
- The exports and imports of goods not subject to prohibitions or duties are also allowed to move through the traditional routes on common border (Nepal has established customs stations called Chhoti Bhansars on some of these traditional routes).

India has provided duty free access to all products from LDCs of SAFTA (except 25 lines pertaining to alcohol and tobacco) and accordingly such duty-free access is also available to all the products from Nepal.

Since Nepal is a land---locked country, India has provided transit rights for Nepal's bilateral trade with third countries, under the India---Nepal Treaty of Transit. The Treaty was last renewed in 2013 for a period of seven years. Under the Treaty, India has provided sea access to Nepal through the ports at Kolkata/Haldia and Vishakhapatnam. The access through Vishakhapatnam was provided in 2016.[11]

[10] http://www.indembkathmandu.gov.in/page/about-trade-and-commerce/

[11] https://commerce.gov.in/writereaddata/uploadedfile/MOC_636477306238949138_Trade_with_South_Asia_2016-17.pdf

India and Nepal have also signed a Railway Services Agreement to facilitate the movement of goods through rail.

3.1.2 SAARC Regional Multimodal Transport Study (SRTMS)

In order to have smooth efficient movement of both goods and passengers across the South Asia region and with a view to achieving the specific objective of SRMTS to enhance transport connectivity amongst SAARC member countries to promote intra-regional trade, an attempt was made to identify the main existing and potential maritime gateways. Under Phase I of SRMTS, the country reports already examined existing and potential gateways that could serve as SAARC corridors for inter-country movement but studied these gateways from the individual country perspective. All the identified gateways were reviewed and those that were considered to have the highest potential to serve as the SAARC corridors catering to the needs of two or more countries were selected for further assessment. SRTMS has identified 10 maritime gateways in South Asia Region. Kolkata/Haldia (SAARC Maritime gateway 6) Port was one of the identified gateways.

Based on inputs from SRTMS study and BIMSTEC, Asian Development Bank has been given the mandate to drive South Asia Sub-regional Economic Cooperation (SASEC) Program. Under this program, measures related to upgradation of Haldia Port worth of 295 million USD were suggested which has been listed below

- Augmentation of capacity of Haldia Dock Complex by way of new lock gate in existing dock/basin and modification of existing lock gate
- provision of two liquid cargoes and one dry bulk facility to augment capacity

3.1.3 Eastern Freight Corridor

The Eastern Dedicated Freight Corridor with a route length of 1856 km consists of two distinct segments: an electrified double-track segment of 1409 km between Dankuni in West Bengal & Khurja in Uttar Pradesh & an electrified single-track segment of 447 km between Ludhiana (Dhandarikalan) - Khurja - Dadri in the state of Punjab, Haryana and Uttar Pradesh. Since the origin and destinations of traffic do not necessarily fall on the DFC, a number of junction arrangements have been planned to transfer traffic from the existing Indian Railway Corridor to the DFC and vice versa. These include Dankuni, Andal, Gomoh, Sonnagar, Ganjkhwaja, Mughalsarai, Jeonathpur, Naini/Cheoki, Prempur, Bhaupur, Tundla, Daudkhan, Khurja, Kalanaur, Rajpura, Sirhind and Dhandarikalan.

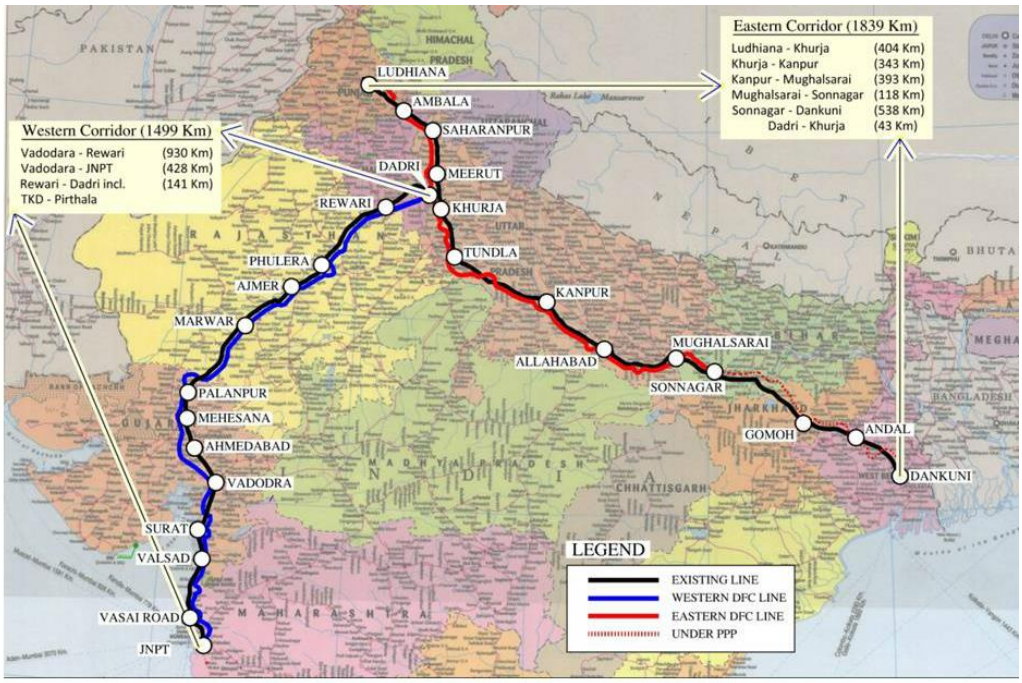


Figure 12 Map of Dedicated Freight Corridors

Eastern Corridor is projected to cater to a number of traffic streams-coal for the power plants in the northern region of U.P., Delhi, Haryana, Punjab and parts of Rajasthan from the Eastern coal fields, finished steel, food grains, cement, fertilizers, lime stone from Rajasthan to steel plants in the east and general goods.

The total traffic in UP direction is projected to go up to 116 million tonnes in 2021-22. Similarly, in the Down direction, the traffic level has been projected to increase to **28 million tons** in 2021-22[12].

Dankuni is a fast-growing industrial township north of Howrah. The town is well connected by road and rail from both Howrah Station and Sealdah Station. Dankuni Junction rail station is 15 km from Howrah Station. Major companies in Dankuni comprise of Mother Dairy, Coca Cola, Dankuni Coal Complex Ltd, Food Corporation of India, etc. It is progressing very fast due to the growing industries and manufacturing units. [13]

Road Connectivity:

Both NH2 and NH6 terminate at Dankuni. Other major arteries meeting the town are Belghoria Expressway connecting to NH 4 and the Dankuni- Memari Delhi Road.

Rail Connectivity:

Dankuni railway station is located on the Howrah-Bardhaman chord which is part of the Kolkata Suburban Railway system. Already, there is a growing presence of freight and wagon movements around Dankuni Railway Station which is important as it connects Eastern Railway with South Eastern Railway with a link line. In the future, Dankuni will play a significant role because it will be the endpoint of the Ludhiana-Dankuni leg of the EDFC that is being built by Indian Railways.

Growth of North East States of India

Recent focus towards development of North East states by government increased scope for significant investments and strategic growth plans for both infrastructure and industrial

[12] http://www.dfccil.gov.in/dfccil_app/Eastern_Corridor

[13] http://iwai.npglobal.in/sites/default/files/2248143324Market_Dev_Analysis_Report_HPC.pdf

growth in the region. Following initiatives taken by government may lead in increase of cargo traffic in future.

- Strategic Road Development Projects
- Several railway projects are under implementation to enhance connectivity between Bangladesh, North East and Kolkata.

Few of rail connectivity projects are listed below

- Agartala – Akhaura railway project
- New Mayanguri to Jogighopa railway project

3.1.4 Eastern Coast Economic Corridor & Others

India & Asian Development Bank (ADB) signed USD 375 million loan agreement to develop 800 km long Visakhapatnam-Chennai Industrial Corridor on 24th February 2017. 800 km long Visakhapatnam-Chennai Industrial Corridor is 1st phase of planned 2500 km East Coast Economic Corridor. Earlier in September 2016, ADB approved USD 631 million loan for industrial corridor.

ECEC, India's 1st coastal economic corridor along eastern coast, stretches about 2500 km from Kolkata (West Bengal) in North to Kanyakumari (Tamil Nadu) in South.

It will connect long eastern coastline & strategically located ports w/multiple international gateways to connect India w/global value chains (GVCs) in East & Southeast Asia.

ECEC supports port-led industrialisation under Sagarmala initiative & Act East Policy by linking domestic companies w/vibrant global production networks of East & Southeast Asia.

A 300 million USD funded by World Bank for master plan of development of logistics infrastructure around Kolkata Metropolitan Area focusing on industrial infrastructure and making West Bengal a trading hub of the South Asian region

Growing logistics zones of Dankuni & Durgapur to provide immediate and direct benefit to Kolkata Port

3.1.5 Coastal Shipping:

It is estimated that coastal shipping of about 180-200 MMTPA[14] can be achieved from current and planned capacities across coal, cement, iron and steel, food grains, fertilizers, POL by 2025 across India. This offers a potential area for KoPT to focus and capture a significant share given its superior hinterland connectivity.

KoPT already handles cars via coastal shipping, wherein cars are transported from South India to Nepal via KoPT.[15] There are plans to coastally ship passenger cars and trucks from major automobile and truck manufacturers based in Tamil Nadu to KoPT from where the automobiles shall be shipped to the ultimate destinations. To facilitate the same, the wharfage rates on small passenger cars have been reduced by approximately 75% by KoPT. Similar plans are also on the anvil for a major automobile manufacturer having its manufacturing plant in Gujarat from where the cars shall be shipped through waterways to Varanasi, from where it shall be transported to Kolkata/ Haldia Port via NW-1. The Government is exploring new avenues for promotion of shipping, commerce and trade through coastal shipping. A Coastal Shipping Agreement was signed between India and Bangladesh in June 2015. As per the Agreement, sea transport from India to Bangladesh is

[14] https://maritimeinvest.in/coastal-shipping

[15] https://www.business-standard.com/article/economy-policy/kolkata-port-set-to-start-coastal-shipping-of-cars-116071600839_1.html

treated as coastal movement, making it eligible for 40 percent concession on vessel-related and cargo related charges. Apart from above, Haldia Dock Complex under Kolkata Port Trust has been declared as a Transshipment Port for containerized cargo originating from/destined to Bangladesh to attract more cargo movement through sea-route. [16]

3.1.6 Inland Water Ways:

With the growth of NW 1 (Projected to handle 21.89 MT by 2021)[17] and NW 2, considerable traffic will directly move through Inland Waterways. KDS and HDC are suitably located to take advantage of these developments. The Jal Marg Vikas Project (JMVP) on NW-1 is being implemented with the financial and technical support of the World Bank. The project will enable commercial navigation of vessels with the capacity of 1500-2000 tons. The project includes development of fairway, Multi-Modal Terminals at Varanasi, Haldia and Sahibganj, strengthening the river navigation system, conservancy works, modern River Information System (RIS), Digital Global Positioning System (DGPS), night navigation facilities, modern methods of channel marking, construction of a new state-of-the-art navigational lock at Farakka etc. The first container movement on NW-1 took place in October 2018, with Pepsico moving 16 containers from Kolkata to Varanasi.

As stated above, NW-1 shall generate significant cargo demand in future. The NW-1 project also involves development of multimodal terminals (MMT) at Haldia and Garden Reach Jetty (GR Jetty-Kolkata). The estimated cargo to be handled by the respective multimodal terminals is presented below.

Table 3-3 Estimated cargo to be handled by Haldia MMT (in million tons)

Year	Bagged	Container	Dry Bulk	Neo Bulk	General Cargo	Total
2020	0.43	0.16	5.15	1.27	0.93	**7.95**
2025	0.44	0.17	12.61	1.40	0.96	**15.59**
2035	0.74	0.19	12.89	1.56	0.98	**16.36**
2045	0.75	0.21	20.51	1.58	0.99	**24.04**

It is estimated that Haldia MMT shall handle 16.36 MT and 24.04 MT of cargo in 2035 and 2045 respectively. More than 75% of this cargo shall comprise of dry bulk cargo (mainly coal).[18]

Table 3-4 Estimated cargo to be handled by Kolkata GR Jetty (in million tons)

Year	Bagged	Container	Dry Bulk	General Cargo	Neo Bulk	Others	Total
2020	0.39	4.03	0.30	0.30	2.13	0.06	**7.21**
2025	0.43	4.35	0.31	0.32	2.21	0.06	**7.69**
2035	0.70	4.79	9.48	0.33	2.27	0.36	**17.92**

[16] http://pib.nic.in/PressReleaseIframePage.aspx?PRID=1563330

[17] https://economictimes.indiatimes.com/industry/transportation/shipping-/-transport/cargo-traffic-on-ganga-waterway-may-rise-to-21-89-mt-by-2021-nitin-gadkari/articleshow/66043060.cms

[18] http://iwai.npglobal.in/sites/default/files/2248143324Market_Dev_Analysis_Report_HPC.pdf

2045	0.71	5.17	9.61	0.33	2.31	0.37	**18.51**

It is estimated that Kolkata GR Jetty shall handle 17.92 MT and 18.51 MT of cargo in 2035 and 2045 respectively. More than 80% of this cargo shall comprise of dry bulk cargo and container.[19]

3.1.7 Upcoming Balagarh Terminal:

The traffic at the Kolkata Dock System has been seeing a steady growth in the past few years leading to capacity constraints at the port. Evacuation of cargo is expected to become a key challenge for handling the increasing traffic. The Port's present cargo volume itself had put enormous strain on the city's road network.

In order to cater to the anticipated increase in traffic and to resolve the problem of restricted movement of its outgoing cargo, KoPT is exploring a shift part of its operation to another site.

Container and pulses are two major commodities handled at KDS. Initially, the port plans to shift part of these commodities to Balagarh.

Balagarh is located about 85 kilometres from its main Docks. Balagarh is a riverfront with a depth of around 3.0 metres. KoPT owns about 300 acres of land at this site. The Port proposes to develop at this place a barge terminal and associated facilities initially for handling container and pulses.

KoPT's plan is to discharge containers and pulses from mother vessels into barges in stream and bring the barges to Balagarh for unloading and further handling. Similarly, it will load export containers on barges at Balagarh and take them to stream for loading on mother vessels.

The estimated cargo to be handled at Balagarh terminal is presented below.[20]

Table 3-5 Estimated cargo to be handled at Balagarh Terminal

Commodity	2020	2025	2035
Container (Mn TEUs)	0.22	0.25	0.30
Peas and Pulses (Mn Tons)	0.30	0.30	0.30

3.1.8 Trade with Neighboring Countries:

Currently India's trade with South Asia accounts only 3% of its total global trade[21].

Of the total imports of USD 510 billion in FY 15 into South Asia, India accounts for 77% while out of the total exports of USD 264 billion from South Asia in FY 15, India accounted for 80% of the total exports. India is the biggest trading partner for Nepal, Bhutan and Sri Lanka.[22]

[19] http://iwai.npglobal.in/sites/default/files/2248143324Market_Dev_Analysis_Report_HPC.pdf

[20] http://kolkataporttrust.gov.in/showtndfile.php?tender_id=4321

[21] https://www.business-standard.com/article/economy-policy/india-s-trade-with-neighbours-only-31-of-total-potential-world-bank-118092400820_1.html

[22] https://commerce.gov.in/writereaddata/uploadedfile/MOC_636477306238949138_Trade_with_South_Asia_2016-17.pdf

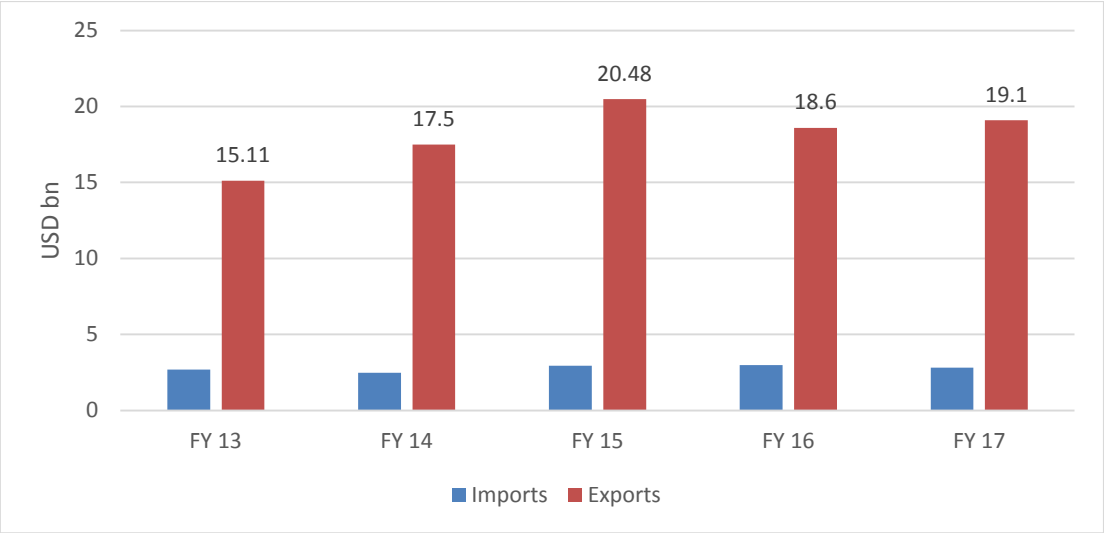


Figure 13 Trends in India-South Asia Trade

As per FY 17 data, Bangladesh is the largest trading partner in South Asia, followed by Nepal, Sri Lanka, Pakistan, Bhutan, Afghanistan and Maldives. The level of Indian exports also follows the same order. 83% of the total exports in South Asia were made to Bangladesh, Nepal and Sri Lanka, with Bangladesh alone accounting for 35%. The total contribution of Afghanistan, Bhutan and Maldives to exports has remained around 4% to 6%.

India enjoys a substantial trade surplus with all the countries in South Asia. Bangladesh and Sri Lanka are the major countries of import, followed by Pakistan/Nepal.

There is a lot of potential for this to increase. KDS and HDC are strategically located to benefit from this.

Chapter 4:
Cargo Traffic Projections

4 Cargo Traffic Projections

Based on the assessment of existing cargo handled by KoPT, key target commodities for the port have been identified. It includes13 major commodities, which are listed below

- Coking coal
- Iron Ore
- Containers
- Vegetable oil
- Pulses
- Limestone
- Manganese Ore
- Fly ash
- Thermal coal
- Non-Coking coal
- Petroleum Oil and Lubricants (POL)
- Liquified Petroleum Gas (LPG)
- Liquified Natural Gas (LNG)

Stepwise procedure of approach and methodology adopted for cargo traffic projections based on principal commodities is explained below.

4.1 Approach and Methodology

4.1.1 Study of past trends of cargo

Cargo traffic handled by Haldia Dock Complex & Kolkata Dock System in the past 5 years was analysed and growth rate is calculated

4.1.2 Identification of Hinterland

Based on identification of major drivers of demand for the commodity, secondary research is conducted to identify the hinterland

4.1.3 Key users and Growth Plans

The present and future capacities of the driver of demand of the commodity in the hinterland is studied to estimate the total addressable demand for the commodity. For example, Steel is prime demand driver for coking goal. In view of this, major steel plants are identified in hinterland of the port. Existing demand of coking coal for steel plant is calculated.

4.1.4 Government Policies and Regulations

The major product/ factor driving the demand for the relevant commodity is identified. This could be End product or macro-economic indicator viz GDP etc.

The Policy of the Government of India pertaining to the relevant commodity is identified and the implications of the same is studied for example according to the The Steel Policy 2017, Government of India envisages increasing crude steel production capacity to 300 MTPA by Financial Year 31. Domestically Manufactured Iron and Steel Products Policy makes it mandatory to give preference to locally produced steel in government procurement. This kind of policies have direct impact on future demand of commodities. Similar exercise was carried out for other commodities as well.

4.1.5 Primary Interaction with Port Users

Meetings with various commodity manufacturers, freight forwarders etc. was conducted to appreciate the cargo demand.

4.1.6 Validation of Traffic through primary interactions with Subject Matter Experts and users

The projected cargo demand figures were discussed with Subject Matter Experts to validate the same based on which the figures were refined suitably

4.2 Scenario Analysis

Scenario analysis was carried out based on growth plans of competing ports in the hinterland. Four scenarios were developed which are listed below.

- Completion of Eastern DFC and increase in traffic from NE India
- Increase in capacity of Paradip port and connectivity improvement at the port
- Connectivity Improvement at Dhamra Port
- Emergence of Tajpur and Subarnarekha Ports

4.3 Minor Commodities

To compute percentage of minor commodities, historic traffic data for aggregated major commodities and minor commodities of HDC and KDC starting from FY 14 to FY 18 is collected through secondary sources. Average percentage of major and minor commodities is worked out for both KDS and HDC.

On an average, other commodities accounted for close to **16.5 per cent of total traffic handled in KDS** and **18 per cent of total traffic handled in HDC.** The same were assumed for projecting the traffic forecasts. Following table represents historic traffic data for major and minor commodities.

Table 4-1: Historic Traffic data of commodities

Commodity	All figures in Million Metric Tons											
	FY-14		FY-15		FY-16		FY-17		FY-18		Average	
	KDS	HDC	KDS	HDC	KDS	HDC	KDS	HDC	KDS	HDC	KDS	HDC
Aggregate of major commodities	11	22.3	12.2	26.8	13.2	26.4	14.3	28.3	15.2	33.5	13.2	27.5
Other Commodities	**1.8**	**6.2**	**3**	**4.2**	**3.6**	**7.1**	**2.5**	**5.8**	**2.1**	**6.9**	**2.6**	**6**
Total traffic handled	12.8	28.5	15.2	31	16.8	33.5	16.8	34.1	17.3	40.4	15.8	33.5
Major Commodities handled (%)	85.94%	78.25%	80.26%	86.45%	78.57%	78.81%	85.12%	82.99%	87.86%	82.92%	83.55%	81.88%
Other commodities handled (%)	**14.06%**	**21.75%**	**19.74%**	**13.55%**	**21.43%**	**21.19%**	**14.88%**	**17.01%**	**12.14%**	**17.08%**	**16.45%**	**18.12%**

Chapter 5:
Commodity wise Cargo Traffic Forecasting

5 Commodity Wise Cargo Traffic Forecasting

5.1 Coal

World coal production increased by 3.1% in 2017. It is recorded as 225 Mt after falling for three years. The growth was influenced by a 3.3% increase in coal production in the People's Republic of China. The People's Republic of China remained the largest coal consumer in the world with a 0.4% increase on 2016 levels. In 2015, India became the second largest consumer, India continued increasing its consumption in 2017 by 23.6 Mtce, a 4.4% increase compared to 2016 numbers. This growth was mainly driven by a higher coal demand for power generation. Conversely, for the fourth consecutive year, consumption in the United States decreased in 2017, reaching a new low of 473.1 Mtce. India and the United States experienced the largest increase and decrease of coal consumption respectively in 2017.

An increase in the international demand for US coal, driven by Asian and European countries, offset the US decline in coal consumption, contributing to a higher coal production in 2017.

Indonesia and Australia remained the world's largest coal exporters in 2017, with 28.5% and 27.6% on a tonnage basis, despite Australia witnessing the major decline in coking coal exports in 2017, which led Indonesia to surpass Australian total coal exports by 11.6 Mt. Over a quarter (28.9%) of Indonesian coal was exported to the People's Republic of China.[23]

5.1.1 Global Perspective

Coking Coal

2015 witnessed the first annual decrease in world coking coal production since 2002. This trend continued in 2016 falling to 1040.1 Mt and remained practically flat in 2017, with world coking coal production reaching 1040.0 Mt. Australia, the world's second largest producer of coking coal after the People's Republic of China, saw a slight increase of 0.4% in 2017, after peaking in 2015 at 191.1 Mt and a small fall in 2016. India showed a major decline of coking coal production in 2017 (-16.2 Mt) whilst increases occurred in the United States (+15.3 Mt), Mongolia (+5.8 Mt) and Mozambique (+3.1 Mt), which were mostly the result of a growth in production intended for export. However, by far the most prominent story is production and consumption by the People's Republic of China. Chinese production increased by 334.7% since 2000 to peak at 619.8 Mt in 2014 but subsequently dropped to 539.6 Mt in 2017, 1.4% lower than in 2016. The People's Republic of China increased its share of world production from 37.1% to 50.0% over the same period (2000-2017).

Total world coking coal exports increased by 4.5% to 327.2 Mt in 2017. Australia remained by far the largest exporter of coking coal at 177.2 Mt, accounting for 54.2% of coking coal exports, down from 60.0% in 2016. The United States remained, the second largest coking coal exporter with a volume of 50.1 Mt, up by 35.0% from 37.1 Mt in 2016, while third-ranked Canada remained relatively flat exporting 29.0 Mt of coking coal. Exports from Mongolia continued increasing in 2017 by 26.0%, to 25.7 Mt from 20.4 Mt in the previous year, widen the gap with the Russian Federation whose exports increased by 4.7% reaching a volume of 22.8 Mt. The combined total of the five largest exporters accounted for 93.1% of the global coking coal exports in 2017, one percentage point lower than in 2016.

Global coking coal consumption fell by 6.7 Mt or 0.7% in 2017 to 997.9 Mt, a decrease of 536.5 Mt or 116.3% since 2001. Consumption within the People's Republic of China accounts for 60.9% of global coking coal consumption.

[23] COAL INFORMATION (2018 edition), IEA

Non-Coking Coal (Thermal Coal)

In 1978, the OECD accounted for 42.8% of the world non-coking coal production and this figure remained above 37% until 2000. However, since then its share has declined, as non-OECD countries increased their non-coking coal production, predominantly led by the expansion of the China's coal industry since 2001 and OECD production fall. In 2017, the OECD's share (16.4%) was less than half its 1978 share, and its production decreased to 931.4 Mt, the lowest level since the start of the IEA's data series.

In 2017, non-coking coal imports in the Asia-Oceania market increased by 52.3 Mt to 798.1 Mt, 261.7 Mt of which was to OECD countries. Asia-Oceania imports represented 73.4% of total world non-coking coal trade in 2017, up from 72.1% in the previous year. The People's Republic of China's non-coking coal imports increased by 6.1% to 201.2 Mt in 2017, making it the largest non-coking coal importer followed by India, which increased by 10.0% to 161.3 Mt. Other major importers in the region were Japan (140.1 Mt– up 1.8%), Korea (112.6 Mt – up 13.5 %) and Chinese Taipei (61.0 Mt – up 3.3 %). In 2017, the major non-coking coal suppliers to the Asia Oceania market were Indonesia (383.0 Mt), Australia (205.6 Mt), the Russian Federation (84.2 Mt), and South Africa (64.9 Mt). non-coking coal imports in the Europe/Eurasian market remained flat at 221.7 Mt in 2017. This market now represents 20.4% of total world non-coking coal trade, compared to 39.7% in 2000 and 65.4% in 1991, which included new international trade between members of the Former Soviet Union. Within the region, the major Europe/Eurasian importers were the Netherlands with national imports and transit stocks (36.0 Mt) 20.0% lower than in 2016, Germany (35.1 Mt, down 10.4 Mt) the largest drop in 2017, Turkey (30.4 Mt) continuing with an increasing trend since 2013, the Russian Federation (17.4 Mt) predominantly from Kazakhstan and Italy (13.5 Mt). The 2017 main non-coking coal suppliers to this market were the Russian Federation (78.8 Mt), Colombia (50.0 Mt), the United States (18.9 Mt) and South Africa (11.2 Mt).

World non-coking coal consumption was up 1.4% in 2017, increasing by 79.0 Mt. non-coking coal consumption in the OECD decreased by 6.2 Mt to 1 158.0 Mt, including the decrease of 15.6 Mt in the United States and 9.2 Mt in Germany.

Following graph shows historic production of coking and non-coking coal at global level.

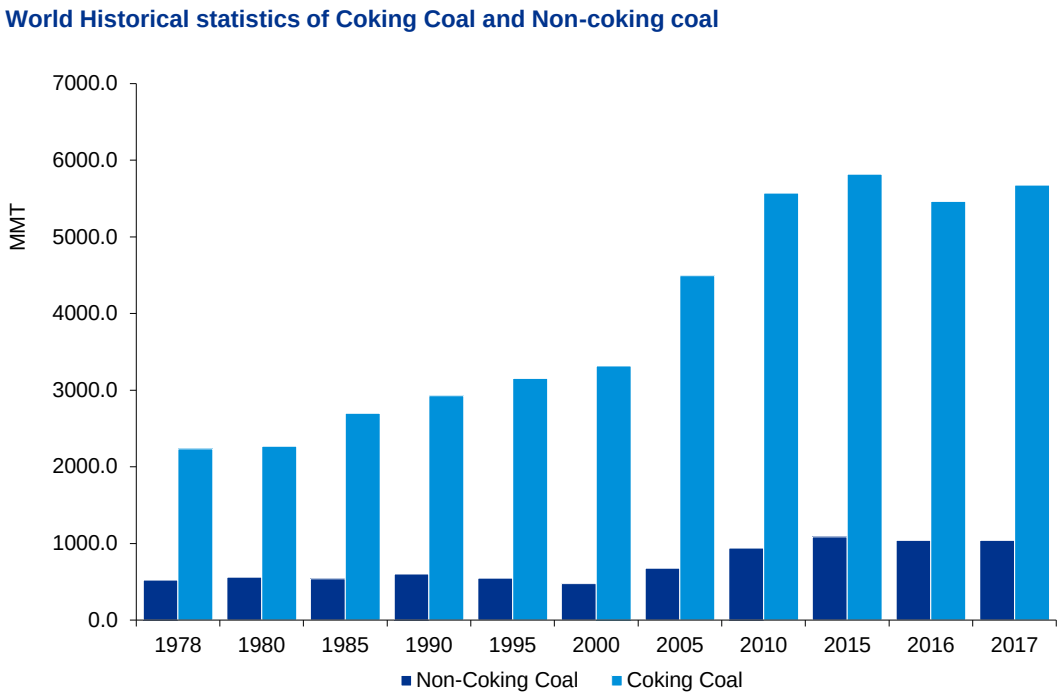


Figure 14:World Historical statistics of Coking Coal and Non-coking coal[24]

5.1.2 Indian Scenario

Production

The provisional total production of coal in 2017 was 729.79 million tonnes which was higher by 2.54% in comparison to that of the previous year. India constitutes 9.67% of World's total coal production. Chhattisgarh is the largest coal producing State followed by Odisha and Jharkhand. In 2017, out of the total production of coal, 5.6% was coking coal and 87.9% was of non-coking coal. In 2017, production of coking coal and non-coking coal was 40.9 MMT and 641.4 MMT respectively. For coking coal, production was lower by 28.4% in comparison to that of previous year while for non-coking coal, production was higher by 5.3% in comparison with previous year.

In 2017, India constitutes of 8.9% percent of coking coal and 14% of non-coking coal consumption world's coking and non-coking coal consumption. India's year 2017 consumption for coking coal and non- coking coal was decreased by 13 percent and increased 6.7 percent in comparison with the previous year respectively.

Following graph shows India's historic growth for production and consumption of coking coal, non-coking coal and coal.

[24] IEA/OECD World Energy Statistics

India Coking and Non-Coking Coal (Thermal Coal) production and consumption

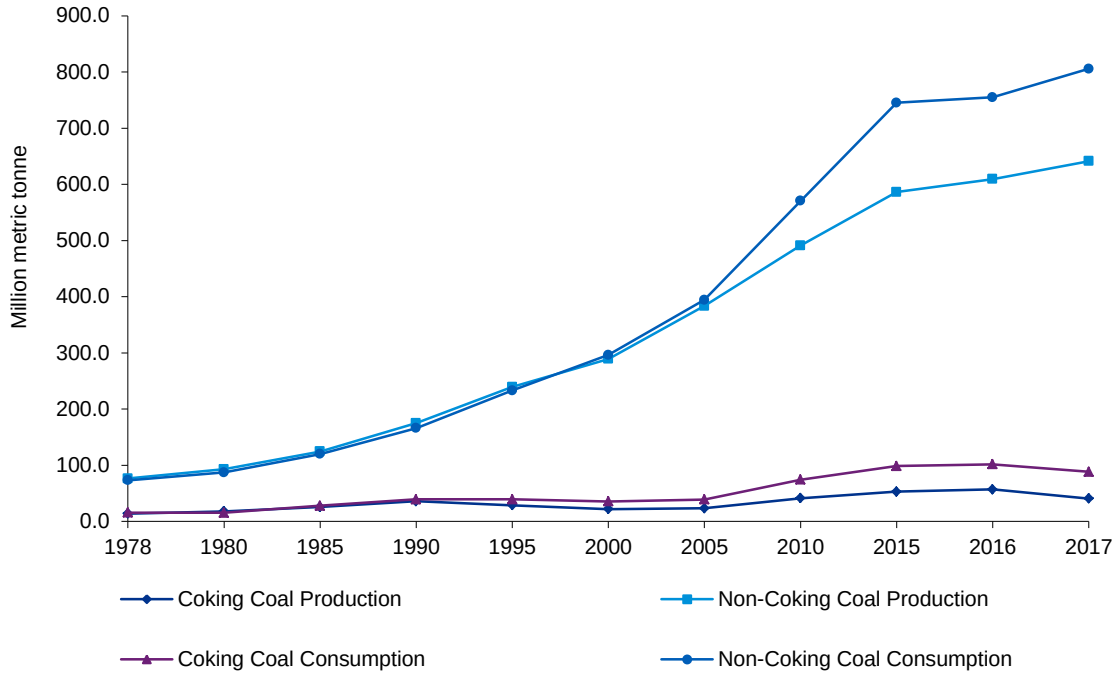


Figure 15:India Coking and Non-Coking Coal (Thermal Coal) production and consumption

Foreign Trade

Imports:

Coking Coal

Imports of coking coal decreased by negligible margin of about 0.08% to 47.00 million tonnes in 2017 from 47.04 million tonnes in the previous year. Coking Coal was mainly imported from Australia (81.9%), USA (7.2%) and Canada (6%).

Non-Coking Coal (Thermal Coal)

Imports of Non-coking coal increased by good margin of about 10.01% to 161.27 million tonnes in 2017 from 146.60 million tonnes in the previous year. Non-Coking Coal was mainly imported from Indonesia (66.3%), South Africa (24.5%), USA (4.2%), Russia (2.2%) and Australia (2%).

Exports:

There is no significant export activity recorded for coal commodity.

5.1.3 Port Traffic Scenario

Coal (Coking and Thermal) Traffic at Major Ports

To have general idea about the coal traffic handled by major ports, traffic data of 13 years have been plotted. However, there is no identical trend is observed for growth of coal traffic handled by major ports. Most of the coal traffic is handled by major ports. CAGR of 5.2% is observed from 2005-06 to 2017-18. Highest traffic i.e. 134.06 Million tonnes was handled in the year 2015-16. Following graph depicts growth of traffic handled at major ports of India.

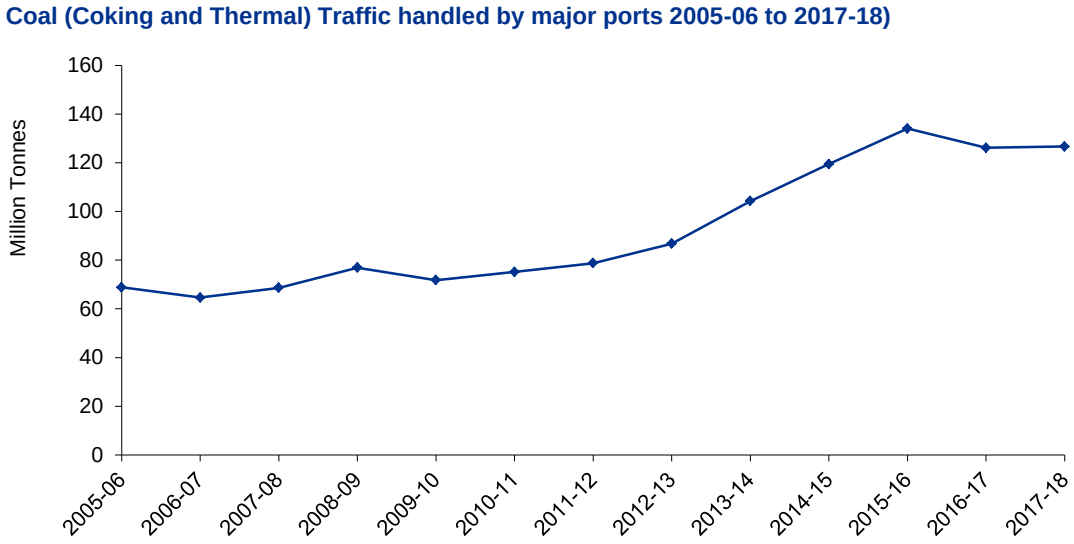


Figure 16: Coal Traffic handled by major ports[25]

Out of 12 major ports in India, 9 major ports handle the traffic related to coal. In 2017-18, JNPT has highest share of traffic handled pertaining to coal amongst all major ports. It has handled coal traffic of 41.9 million tonnes. Following table detailed out coal traffic handled by various major ports in the year 2017-18.

Table 5-1: coal traffic handled by major ports

Traffic handled at major ports in 2017-18	
Major Ports	**coal (million tonnes)**
Kolkata D.S	13.8
Haldia D.C	2.4
Paradip	
Vishakhapatnam	10.5
Kamarajar	6.7
Chennai	
V.O.Chidambarnar	9.8
Cochin	
New Mangalore	23.2
Mormugoa	8.7
J.L.Nehru	41.9
Mumbai	9.5
Deendayal	0.2
All Ports	**126.7**

Coal (Coking and Thermal) Traffic at Non-Major Ports

Non major ports from Gujrat are the main contributor to coal traffic. Followed by ports from Andhra Pradesh contributed to the traffic at non major part. Highest coal traffic of 156.74 million tonnes was observed in the FY 2014-15. Following graph depicts the coal traffic handled by non-major ports.

[25] Basic Port Statistics of India 2017-18

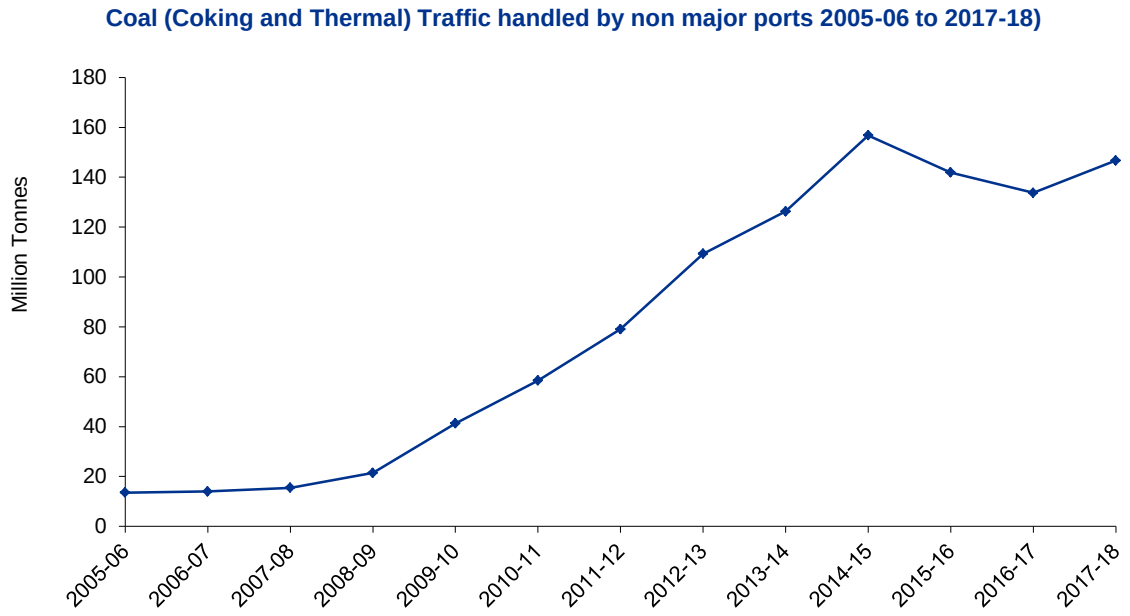


Figure 17: Coal Traffic handled by non-major ports

5.1.4 Coal Traffic Forecasting methodology

Coking Coal

Key drivers

The prime driver of demand for coking coal is steel. The steel production increased at the rate of 7.09% per annum from 89.26 MTPA in FY 13 to 134.6 MTPA in FY 18[26].

Table 5-2:Production of steel during FY13-FY18 (in MTPA)

Parameter	FY 13	FY 14	FY 15	FY 16	FY 17	FY 18
Steel Production	89.26	95.77	100.68	102.90	115.91	134.6

It is estimated that to manufacture 1 tonne of steel, 770 kg of coking coal is required assuming Blast Furnace-Blast Oxygen Furnace route[27]. Blast Furnace-Blast Oxygen Furnace route is the most commonly used method of producing steel.[28] The policies of the Government of India driving the demand for steel are as under:

Steel Policy, 2017

Steel Policy, 2017 envisages production capacity of 300 MTPA of steel by 2030-31, which in 2018 was 137 MTPA[29]. The objective of the above policy is as follows:

India to become net exporter of steel by 2025-26 The target of 300 MTPA by 2030-31 is to be achieved in a phase wise manner as depicted in table below.

[26] Steel, September 2018, IBEF
[27] http://criticalrawmaterials.org/coking-coal/
[28] http://criticalrawmaterials.org/coking-coal/
[29] https://www.thehindubusinessline.com/companies/india-can-meet-300-mtpa-steel-production-target-by-2030/article24658640.ece

Table 5-3 Phase wise steel production capacity to produce 300 MTPA by FY 31

Phase	Capacity (MTPA)
FY 16	122
FY 16 - FY 21	147
FY 21 - FY 26	236
FY 26 - FY 31	300

The major sectors wherein steel is used and the likely demand in FY 31 is presented in table below.

Table 5-4 Major sectors driving demand for steel[30]

S.No.	Sector	Demand in FY16 (MT)	Projected demand in FY31 (MT)
1	Infrastructure (Highways, sea ports, urban infrastructure etc.)	9.5	90
2	Construction (Real estate)	23.5	45
3	Engineering & Fabrication	35	43
4	Automotive	2.5	10
5	Railways	2	5
6	Packaging	2	6
7	Energy	3	11
8	Ship building	4	3
9	Oil and Gas Pipelines		4
10	Defense		2
11	Others		11
Total demand		**81.5**	**230**

The table below provides the installed capacity and capacity addition required to attain the goal of producing 300 MTPA of steel[31].

Table 5-5 Comparison of East India vs Rest of India-Steel capacity

Zone	Present Capacity (MTPA)	Additional Capacity Required (MTPA)	Envisaged Total Capacity (MTPA)
East India			
Jharkhand	20.5	56.8	77.3
Orissa	16.2	59.4	75.6
Chhattisgarh	18	17.3	35.3
West Bengal(partly)	7.3	23	30.3

[30] National Steel Policy 2017

[31] Infrastructure Study Report for 300MT steel by 2025, 2015, MECON Limited

Zone	Present Capacity (MTPA)	Additional Capacity Required (MTPA)	Envisaged Total Capacity (MTPA)
Andhra Pradesh(partly)	6	19	25
Total (East India)	**68**	**175.5**	**243.5**
Rest of India	30.3	25.7	56
Total	**98.3**	**201.2**	**299.5 ~ 300**

It is observed that the eastern region accounts for nearly 70% of the present capacity of steel production and is envisaged to go up to 80% of the total steel production in FY 31. It is estimated that approximately 100 MTPA of steel production capacity shall be met by setting up Greenfield steel units.[32]

Domestically Manufactured Iron and Steel Products (DMI&SP) Policy

This policy makes it mandatory to give preference to locally produced steel in government procurement. The list of items covered under the policy is presented in table below. This is expected to generate demand for steel manufactured in India.

Table 5-6 List of items covered under DMI&SP Policy

S.No.	Iron & Steel Products	Inputs (Imported or domestic)	Minimum value addition
1	Ductile Iron pipe	Pig iron/liquid iron	15%
2	Wet road& TMT bar	Billet	15%
3	Structural/sections	Bloom	15%
4	HR coils, strips, sheet and plate	Slab	15%
5	HR universal/quarto plates	Slab	15%
6	CR coils/strips	HR coil	15%
7	Coated flat steel products/GP/GC sheets/Al-Zn coated	Slab/HR Coil/Cold roll coils/strips	15%
8	Color coated, painted sheets	Slab/HR Coil/Cold roll coils/strips	15%
9	All kinds of steel pipes and tubes	Slab/Plate/HR Coil	15%
10	Seamless tubes and pipes	Bloom	15%
11	Rails	Bloom	15%

Hinterland analysis

[32] https://www.thehindubusinessline.com/companies/india-can-meet-300-mtpa-steel-production-target-by-2030/article24658640.ece

The hinterland for the Kolkata Port is the steel plants located in states of Jharkhand, West Bengal, Orissa, Andhra Pradesh, Chhattisgarh and Karnataka. The cost of transporting coking coal from KoPT to major steel plants has also been calculated.

There are 9 major steel plants in the hinterland having capacity of 24.39 MTPA. These are presented as under.

Figure 18:Location of major steel plants in the hinterland

Table 5-7 Existing steel plants in the hinterland[33]

S.No.	Company	Location	State	Current approximate Capacity*
1	Tata Steel Limited	Jamshedpur	Jharkhand	6.8
2	Steel Authority of India Limited	Bokaro	Jharkhand	4.36
3	Steel Authority of India Limited	Bhilai	Chhattisgarh	3.93
4	Jindal Steel & Power Limited	Raigarh	Chhattisgarh	2.4
5	Steel Authority of India Limited	Rourkela	Orissa	1.90
6	Steel Authority of India Limited	Durgapur	West Bengal	1.80
7	Bhushan Steel Limited	Angul-Dhenkanal	Orissa	1.5
8	Bhushan Power & Steel Limited	Jharsuguda	Orissa	1.2
9	Steel Authority of India Limited	IISCO, Burnpur	West Bengal	0.50
Total (MTPA)				**24.39**

[33] http://pib.nic.in/newsite/PrintRelease.aspx?relid=77494

Estimation of addressable demand for coking coal

In order to estimate the addressable demand for coking coal, it is important:

- To establish the production capacity of existing steel plants
- To determine the expansion plans (enhanced production capacity) of the existing steel plants
- To determine the location of new plants being set up in the hinterland

The production capacity of existing steel plants has been provided above. The expansion plans of major steel plants in the hinterland are as under.

Table 5-8 Steel production capacity enhancement of major steel plants in the hinterland[34]

Name of Industry	Existing Capacity (MTPA)	Planned Capacity (MTPA)
SAIL	13	50
JSW Steel	-	12 (Orissa)
Tata Steel	3	8 (at Kalinganagar)
SAIL+ Arcelor Mittal	-	1.5
Total		**71.5**

In addition to the above, some new plants are planned to be constructed. The table below provides a list of the same.

Table 5-9 Proposed Steel Plants[35]

S.No.	Company	Location	Installed Capacity (MTPA)	Expected demand for coking coal (MTPA)
1	Posco India	Jagatsinghpur(Orissa)	12	8.88
2	Arcelor Mittal	Keonjhar(Orissa)	12	8.88
3	Arcelor Mittal	Bokaro	12	8.88
4	Tata Steel	Seraikala(Jharkhand)	12	8.88
5	Essar Steel	Paradip(Orissa)	6	4.44
5	Tata Steel	Bastar(Chhattisgarh)	5.5	4.07
6	ISPAT	Jharkhand	5	3.70
7	Vedanta[36]	Bokaro	4.5	3.33
8	Essar Steel	Bastar(Chhattisgarh)	3.2	2.37
9	NMDC Limited	Bastar(Chhattisgarh)	3	2.22
10	Essar Steel	Chaibasa(Jharkhand)	3	2.22
11	ISPAT	Karnataka	2.8	2.07
12	Visa Steel	Raigarh	2.5	1.85
13	Electro Steel	Bokaro	2.2	1.63

[34] Steel, September 2018, IBEF
[35] http://pib.nic.in/newsite/PrintRelease.aspx?relid=77494
[36] https://www.businesstoday.in/current/corporate/vedanta-to-set-up-45-million-tonne-steel-plant-in-jharkhand/story/304214.html

S.No.	Company	Location	Installed Capacity (MTPA)	Expected demand for coking coal (MTPA)
14	Monnet Ispat	Bokaro	1.5	1.11
15	Visa Steel	Jajpur	1.5	1.11
16	Monnet Ispat	Angul(Orissa)	1.05	0.78
Total			**89.75**	**66.41**

The potential (additional) capacity of steel production in the hinterland is approximately 161.25 MTPA (summation of planned capacity of 71.5 MTPA and installed capacity of 89.75 MTPA

Estimation of total addressable cargo demand for coking coal

Based on the above the total addressable demand for coking coal is approximately 124.16 MTPA~**125 MTPA**. This is derived by aggregating the proposed production capacity in the hinterland (161.25 million tons *0.77= 124.16 million tons).

Long term estimation of demand for coking coal

The methodology adopted to estimate the demand for coking coal is depicted in the figure below.

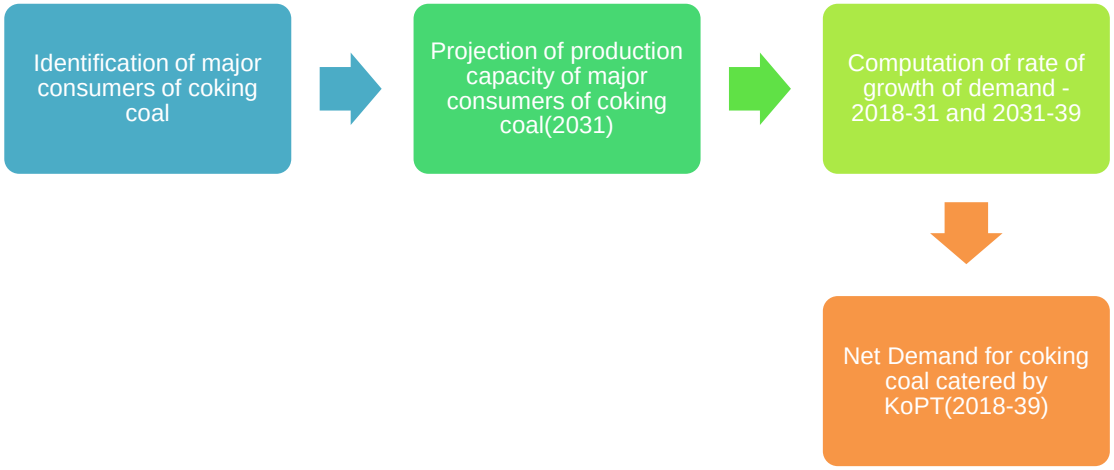


Figure 19 Methodology to estimate demand for coking coal

Identification of major consumers of coking coal

Kolkata and Haldia ports shall cater to the demand for coking coal from mainly:

- Steel plants of SAIL
- Tata Steel-Jamshedpur plant

It is evident from the data obtained from KoPT for the period April - December 2018, regarding major consumers of imported coking coal that:

Demand for coking coal from SAIL steel plants for the period mentioned above is 4.34 MTPA. Assuming the same rate of growth, the demand for FY 18-19 is 5.78 MTPA

Demand for coking coal from Tata Steel Jamshedpur plant for the period mentioned above is 1.32 MTPA. Assuming the same rate of growth, the demand for FY 18-19 is 1.76 MTPA

The total demand for coking coal for the above period is 6.74 MTPA. Assuming the same rate of growth, the demand for FY 18-19 is 8.97 MTPA. The quantity of coking coal handled at KoPT in FY 18 was 7.49 MTPA

SAIL and Tata Steel account for 64.4% and 19.7% of the total demand respectively. Together these plants account for 84.1% of the total demand

Table 5-10 Demand for coking coal by major consumers

Major consumers of coking coal	Demand for coking coal (MTPA)		% contribution
	Apr-Dec '18	FY 18-19	
SAIL steel plants	4.34	5.78	64.4
Tata Steel Jamshedpur steel plant	1.32	1.76	19.7
Others	1.08	1.43	15.9
Total demand at KoPT	**6.74**	**8.97**	**100**

Projected production capacity of the major consumers of coking coal (2031)

Since, SAIL and Tata Steel are the major consumers of coking coal, their current and the enhanced production capacity in 2031 were studied. The current production capacity of SAIL is approximately 21 MTPA which is expected to increase to 50 MTPA by 2025[37]. Correspondingly, the existing and enhanced production capacity of Jamshedpur plant of Tata steel is 10 MTPA and 13.5 MTPA respectively[3839]. The details are presented as under.

Table 5-11 Existing and projected production capacity of major steel plants

Steel Plant Location	Manufacturer	Existing production capacity (MTPA)(A)	Projected production capacity in 2031(MTPA)(B)	Ratio (B/A)
Bokaro[40]	SAIL	5.7	15.7	2.75
Bhilai[41]		5	7.5	1.50
New Unit in Rourkela		-	3	-
Burnpur[42]		2.8	5.6	2.00
Durgapur		2.2	9	4.09
Rourkela[43]		4.5	10	2.22
Jamshedpur	Tata Steel	10	13.5	1.35

Rate of growth of demand for coking coal (2018-25)

[37] https://www.moneycontrol.com/news/business/companies/interview-after-21-mln-tn-capacity-sail-aims-to-achieve-50-in-15-years-with-zero-sales-of-semis-chairman-pk-singh-2582945.html

[38] https://www.thehindubusinessline.com/companies/tata-steel-india-posts-highest-ever-output-at-1248-mt-in-fy18/article23549326.ece

[39] https://economictimes.indiatimes.com/industry/indl-goods/svs/steel/tata-steel-aims-30-million-tonne-india-capacity-by-2025/articleshow/66512074.cms

[40] https://www.projectstoday.com/News/SAIL-to-increase-Bokaro-steel-plant-capacity

[41] https://www.moneycontrol.com/news/business/sails-bhilai-steel-plant-capacity-to-increase-to-7-5-million-tonnes-2499205.html

[42] https://timesofindia.indiatimes.com/business/india-business/Bengal-focus-in-SAIL-expansion-Tomar/articleshow/47227737.cms

[43] https://www.business-standard.com/article/economy-policy/sail-proposes-shore-based-steel-plant-in-odisha-for-rs-15-000-crore-119011400960_1.html

Based on discussion with various stakeholders and decision makers involved in the study, by year 2025, total demand of 20 MTPA will be catered by KoPT. Value of growth rate has been estimated based on fact that 84.1% of traffic will be catered by Tata and SAIL

To enhance production capacities from levels in 2018 to levels of year 2025 the requisite rate of growth for the major consumers of coking coal is:

SAIL 15.64% per annum

Tata Steel 9.24% per annum

Rate of growth of demand for coking coal (2025-39)

The rate of growth of demand for coking coal for both SAIL and Tata Steel plants is assumed to be 5% per annum (2025-39).

Table 5-12 Demand for coking coal in various horizon years

Year	Demand for coking coal at KDS (MTPA)	Demand for coking coal at HDC (MTPA)	Demand for coking coal at KOPT(MTPA)
2025	0.46	19.54	20.00
2026	0.48	20.52	21.00
2027	0.51	21.55	22.05
2028	0.53	22.62	23.16
2029	0.56	23.75	24.31
2030	0.59	24.94	25.53
2031	0.62	26.19	26.81
2035	0.75	31.83	32.58
2039	0.91	38.69	39.60

Thermal Coal

Key drivers

The key drivers of demand for thermal coal are coal based thermal power plants.[44] It is estimated that 1 Megawatt (MW) of installed capacity of thermal power plant generates a demand of approximately 3175 tons of coal[4546]. The installed thermal power capacity in 2019 is 223,027 MW[47]. The sources of energy to generate power in India is depicted in the table below.

Table 5-13 Sources of Power generation in India

Source of power generation	Capacity (MW)	% contribution
Thermal	223,027	55.8
Hydro	45,399	11.4
Renewables	74,082	18.5
Captive(>1MW)	50,289	12.6
Nuclear	6,780	1.7
Total	**399,577**	**100**

[44] http://www.coaljunction.in/misc/show/Coaljunction-Product-Details_1#sthash.qGYwQ2we.wxfdH1xI.dpbs
[45] http://indiaenergy.gov.in/wp-content/uploads/2017/10/Draft-National-Energy-Policy.pdf
[46] KPMG analysis based on data provided in 27
[47] http://www.knowindia.net/infraindia2.html

It is evident from the table above, that thermal energy is the main source of producing power in India. These thermal power plants mainly use coal as fuel to generate power. The policies of the Government of India driving the demand for thermal energy (thermal power plants) are as under.

National Energy Policy (NEP), 2017

The objective of the NEP 2017 is to:

- Achieve 1,75,000 MW renewable energy capacity by 2022
- Achieve more than 40% share of non-fossil fuel-based capacity in the electricity mix by 2030[48]

The estimated total installed capacity in 2032 is 7,00,000 MW[49]. As per inputs provided to the NEP, it is stated that thermal generation capacity accounts for 80% of the country's installed capacity and 83% of total generation. The trends in installed thermal capacity in India is as under:

Table 5-14 Trends in installed thermal capacity in India[50]

Year	Installed Thermal Capacity (MW)
2008	92,000
2012	1,25,000
2015	1,92,000
2019	223,027
2022	2,85,000
2032	3,50,000
2040	3,30,000-4,41,000*[51]

It is evident from the above that rate of growth of installed thermal capacity during 2008-19 is 8.4% per annum, while the required rate of growth to realize the installed capacity in 2040 is 3.3% per annum (2019-40).

According to NEP 2017, share of coal in energy supply was 55% in 2015-16 and is expected to continue to be the main source of energy in 2040 as well (48%-54%). Imports contributed to 25% coal in 2015-16 (imports accounted for approximately 200 MT of the total supply of 840 MT of coal) and are expected to remain high in future as well.[52]

It is envisaged that in 2040, coal-based generation capacity shall be 3,30,000-4,41,000 MW which shall generate 1.1-1.4 billion tons of demand for coal.

Ban on use of Petroleum Coke as fuel

The Government of India banned import of petroleum coke for use as fuel in August 2018 because it emits 11% more emissions than coal and is a major source of air pollution in cities[53]. India is the largest consumer of petroleum coke globally and imports nearly 50% of its demand (approximately 13.5 MT) from USA[54].

[48] http://indiaenergy.gov.in/wp-content/uploads/2017/10/Draft-National-Energy-Policy.pdf
[49] http://www.world-nuclear.org/information-library/country-profiles/countries-g-n/india.aspx
[50] http://indiaenergy.gov.in/wp-content/uploads/2017/10/Coal-and-thermal-power-generation-Inputs-to-National-Energy-Policy-2015.pdf
[51] http://indiaenergy.gov.in/wp-content/uploads/2017/10/Draft-National-Energy-Policy.pdf
[52] http://indiaenergy.gov.in/wp-content/uploads/2017/10/Draft-National-Energy-Policy.pdf
[53] https://www.thehindubusinessline.com/markets/commodities/india-bans-pet-coke-import-for-use-as-fuel/article24716341.ece
[54] https://www.thehindubusinessline.com/markets/commodities/india-bans-pet-coke-import-for-use-as-fuel/article24716341.ece

Prospective Policy on making India self-sufficient in coal

NITI Aayog is planning to come out with a policy to decrease imports of fossil fuel over 10 years (2019-29) and the ways in which India should meet its demand for coal in domestic power and non-power sectors[55]. This would be a comprehensive policy for production and consumption of coal in the country within the framework of the National Energy Policy.

This shall involve estimation of long-term infrastructure, requirement of coal production and transportation to meet the coal demand from domestic sources.

This in turn entails estimation of need of coal for power and non-power sectors by 2030, domestic production feasibility of different types of coal, assessment of demand-supply gap and requirement of rail infrastructure and rakes.

Thermal Coal forecasting Methodology

In FY 18, Kolkata Port handled 3.1 million tonnes of thermal coal traffic out of which 99.7% was handled by HDC and 0.3% was handled by KDS.

Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO) is major consumer of KoPT, which contributed 91.6% of thermal coal traffic handled at KoPT. TANGEDCO has plans to increase capacity to 10,000 MW by the year 2021. TANGEDCO's existing capacity is 4320 MW.

Based on above fact, thermal coal traffic is estimated for 2025. Further, based on traffic estimates of 2025 and existing thermal coal traffic of 2018, CAGR is calculated. Calculated CAGR i.e. 32.13% is used to estimate year wise. traffic upto 2025. Thereafter, stabilisation of traffic is projected.

Table 5-15: Projected Demand for Thermal Coal

Year	Demand for thermal coal at HDC (MTPA)
2025	Up to 7
2032	Up to 7
2035	Up to 7
2039	Up to 7

Upside Potential

Efficient transport facility unlocks production potential of coalfields. Coordinated and Integrated Eastern Coal Field and Rail Sea Rail movement will further increase traffic to KoPT.

For Thermal Coal traffic, KoPT can act like Private Port. It will allow them to enter in fixed term contract with TANGEDCO to provide end to end solution.

Downside Risks

There is some risk associated with projected traffic which will have negative impact of thermal coal traffic. One of the major risks is, TANGEDCO may not reach its target of 10,000 MW capacity. It will reduce KoPT traffic demand in future.

[55] https://economictimes.indiatimes.com/news/economy/policy/niti-aayog-plans-policy-for-coal-self-sufficiency/articleshow/66613369.cms

With efficient and well-connected rail network, rail can provide alternative to port traffic. It will lead to shifting of movements towards railways.

Non-Coking Coal

Key drivers

The prime driver of demand for non-coking coal is steel and cement. It is estimated that to manufacture 1 million tonne of steel, 0.16 million tonne of non-coking coal is required assuming Blast Furnace-Blast Oxygen Furnace route[56].

It is estimated to manufacture 1 MT of cement, approximately 0.2 MT of non-coking coal is used

The policies of the Government of India influencing the demand for steel have been described in previous section of coking coal.

Identification of hinterland and estimation of addressable demand for non-coking coal in the hinterland

The primary hinterland has been identified based on major consumers of non-coking coal handled by KoPT (2017-18)[57]. The total quantity of non-coking coal handled by KoPT in FY 18 is 5.07 MTPA. The steel plant locations of the major consumers of non-coking coal are depicted in figure below, while the list of major consumers is provided in Table below.

[56] Infrastructure Study Report for 300MT steel by 2025, 2015, MECON Limited

[57] Data received from KoPT officials

Figure 20 Identification of primary hinterland-non coking coal

Table 5-16 Major consumers of non-coking coal (handled at) KoPT- FY18

Steel Manufacturer	Location of Steel Plant	Quantity of imported non-coking coal handled by KoPT in FY 18 (MTPA)
SAIL	Bokaro, Durgapur, Bhilai, Rourkela, Burnpur	0.52
Tata Steel	Jamshedpur	0.39
Electrosteel Ltd	Bokaro	0.13
Rawmet Resources Pvt Ltd	Ananthpur	0.01
Orissa Metaliks Pvt Ltd	Paschim Mednipore, West Bengal	0.10
Rungta Mines	Seraikela	0.12
Electrosteel Castings	Kharadaha, West Bengal	0.12
Cement manufacturers	West Bengal, UP, Jharkhand, Bihar	2.78
Others	-	0.9
Total		**5.07**

It is evident from the table above that the major consumers account for only 28% (1.4 MTPA) of the total quantity of non-coking coal handled at KoPT, while 72% is accounted for by other manufacturers.

Estimation of total addressable cargo demand for non-coking coal

Based on the above, the total addressable demand for non-coking coal is approximately **5.07 MTPA**. Non coking coal cargo traffic is mainly handled in HDC, with an exception noted in 2018. SAIL & Tata Steel are key players in terms of steel manufacturer. Electrosteel plan to expand its production capacity from 2.5 MTPA in 2018 to 7 MTPA by 2024. It is estimated that cement production capacity will increase from 390 mtpa of year 2015 to 550 mtpa of 2025 i.e. 3.5% CAGR. Other players expected to grow at the rate of 3.5% for entire period.

Rate of Growth of demand for non-coking coal (2018-31)

SAIL and Tata Steel are major consumers of non-coking coal. It is estimated that for period of 2018-2025 and 2025-2031, growth of demand will be (15.64% and 5% for SAIL) and (9.24% and 5% for Tata Steel) respectively.

Similarly, for Electrosteel, rate of growth of demand will be 18.72% (2018-20125) and 5% (2025-2031) respectively.

However, for other plants growth rate is estimated as 12.44% (2018-25) and 5% (2026-31). Growth rate of 12.44% is based on average growth rate at which non coking coal imports of Tata Steel and SAIL are expected to increase while for 2026-31 is based on GDP growth rate.

Production capacity of cement expected to grow at 3.5% up to FY25. Infrastructure developments could boost this further. It is observed that 25% of total non-coking coal demand in India is met by imports.

Long term rate of growth (2025-2039) will be based on GDP. (5%). Growth rate can be calculated by multiplying GDP with output multiplier of 1.2 for cement which comes out to be 6%.

Other industries' growth rate will be 3.5%

Table 5-17: Projected Demand for non-coking coal

Year	Demand for non-coking coal at KDS (MTPA)	Demand for non-coking coal at HDC (MTPA)	Demand for non-coking coal at KOPT (MTPA)
2025	0.7	11.46	12.15
2031	0.86	15.14	16
2035	0.88	18.24	19.12
2039	0.89	21.99	22.88

5.2 Iron Ore

Minerals are important part of economic growth of any nation and India always has been gifted with source of mineral resources. Mining is the extraction of minerals and metals from the earth and is considered one of the core sectors that boost the growth in economy, providing raw materials to basic industries like steel, power, automobiles, construction, etc. The importance of this sector to a country's growth is paramount, as without the mining sector, many industries, especially manufacturing can get negatively impacted. The environmental and social impact of mining has negative effects on society and nature.

5.2.1 Global Perspective

Iron ore is one of the key raw materials for making steel. Iron ore is mined in about 50 countries. Globally, Australia and Brazil are leading the chart and cumulatively producing around 60% of the world's production[58]. Other iron ore producing nations which has significant contribution to iron ore industry includes China, India, Russia, South Africa, etc. Australia exports major portion of iron ore produced. In year 2017, Australia exported 872.8 million tonnes of steel which is highest among all countries. While, China is the highest importer of iron ore. China imported 1075.4 million of iron ore in the year 2017[59].

Following chart depicts world production, EXIM and consumption statistics for years 2013-17

[58] Iron Ore Industry Care Rating Report
[59] World Steel Association, World Steel in Figures 2019

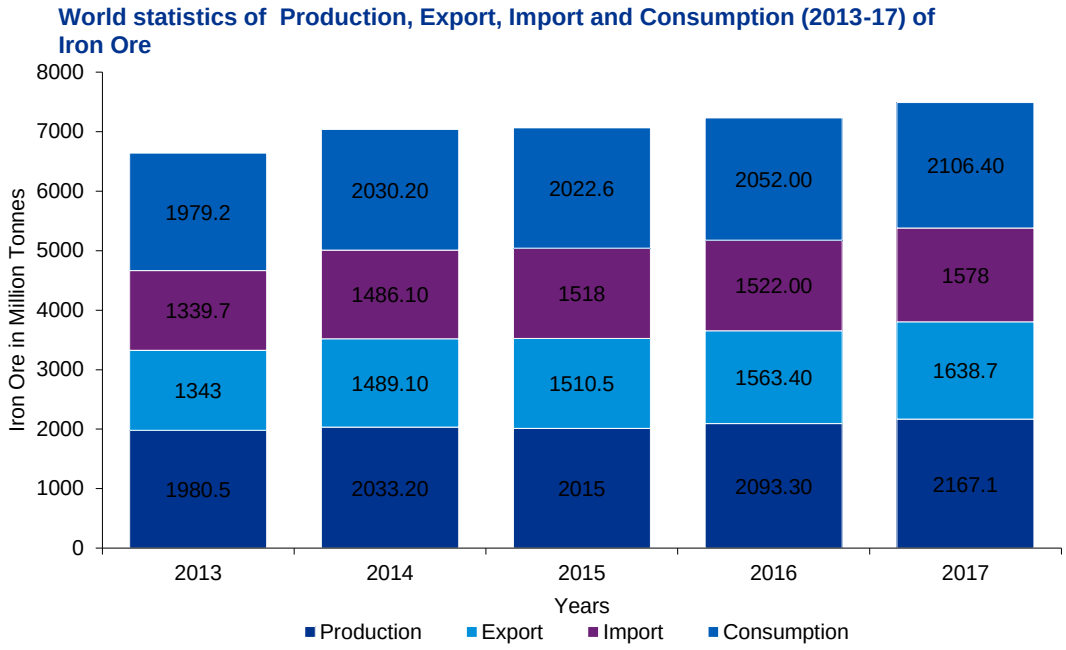


Figure 21:World Production, Export, Import and Consumption statistics of Iron Ore

5.2.2 Indian Scenario

India has produced around 200.95 million tonnes of iron ore in FY 2018, which resulted in 3 % year on year growth. In India, the main deposits of iron ore are in the states of Odisha, Jharkhand, Chhattisgarh, Karnataka and Goa. Odisha contributes 50% of India's total production.

India is self-sufficient in terms of mineral production. India is producing around 98 minerals. India stands 4th largest country in terms of iron ore production. Initiatives like "Make in India" has identified mining as one of the core sectors by government.

Indian exports of iron ore stood at 24.38mn tonnes and imports were 8.71 mn tonnes in FY18[60].

Indian tax rates are highest amongst the iron ore producing countries. India also has minimal spends on exploration. This kind of factors are hindering the development of mining industry in India.

5.2.3 Production:

The production of iron ore constituting lumps, fines and concentrates was 200.95 million tonnes in the year 2017-18, showing an increase of about 3% compared to previous year. Grade wise analysis of total output of 200.95 million tonnes in FY 2017-18, iron ore lumps constituted 64.99 million tonnes (i.e., about 32.34%), fines constituted 135.62 million tonnes (i.e., about 67.49%) and concentrates constituted 0.35 million tonnes (i.e., about 0.17%). Among the States, Odisha recorded the highest production of 102.17 million tonnes, i.e., about 50.84% of the country's total production in 2017-18. Chhattisgarh was at the second place with a production of 34.54 million tonnes, i.e., about 17% of the total production followed by Karnataka with a production of 28.72 million tonnes, i.e., about 14.29% and Jharkhand with 21.84 million tonnes, i.e., about 10.87% of the country's production. Following graph represents Iron Ore Production by category for FY 2013-2018.

[60] Indian Bureau of Mines Indian Minerals Yearbook 2015,2016,2017, 2018

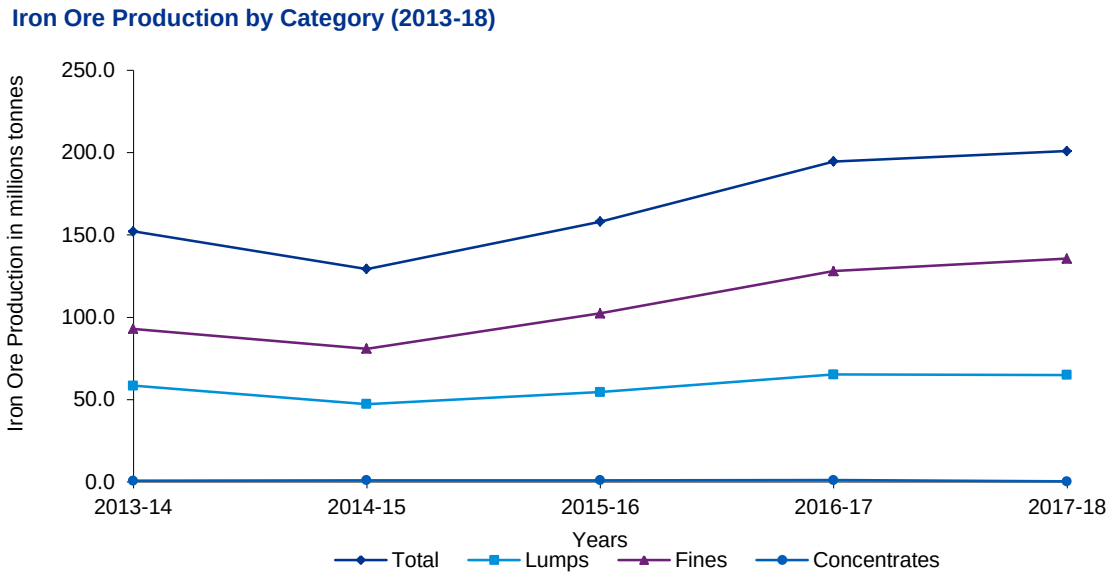


Figure 22:Iron Ore Production by Category (2013-18)

Iron ore production has 7.2 percent of 5-year CAGR for FY 2013-14 to FY 2017-18. Most of the iron ore produced is consumed by domestic steel industry and the consumption has increased with growth in the steel capacities.

The country's largest iron ore producers: National Mineral Development Corporation (NMDC) and Steel Authority of India (SAIL) had a finished iron ore production capacity of 43mn tonnes and 37mn tonnes respectively, in FY18. The total iron ore production of NMDC and SAIL stood at 35.5mn tonnes and 27mn tonnes in FY18, with a contribution of 17% and 13%, or cumulatively 1/3rd of India's total production during the year[61].

With Slowdown in sectors like real estate and automobile industries in the county, Domestic iron ore production in future will have slow growth

Foreign Trade

Government of India has introduced some policy changes to benefit the foreign trading. To encourage beneficiation and pelletisation of iron ore fines in the country, basic custom duty (Import Duty on Iron Ore @ 2.5%) on the plants and equipment required for initial setting up or for substantial expansion of iron ore pellets plants and iron ore beneficiation plants has been reduced from 7.5% to 2.5% w.e.f. 17th March 2012. To ensure easy availability of raw material in domestic market at reasonable prices, export duty on iron ore is @ 30% for both lumps and fines varieties of 58% Fe content and above. The export duty is @ 0% for both lumps and fines varieties of iron ore less than 58% Fe content. The export duty on iron ore pellets is NIL. Export duty on iron ore originated from NMDC is @ 10% when exported by MMTC Ltd under LTA to Japan and South Korea. As per the Foreign Trade Policy (FTP) for 2015-20 and the amended Export and Import Policy incorporated in the FTP, the imports of iron ore lump, fines, concentrates and agglomerated pellets are freely allowed.[62]

Imports:

In FY18, India imported 8.71 mn tonnes of iron ore. Imports of iron ore increased to 8.71 million tonnes in 2017-18 from 4.61 million tonnes in the previous year. India mainly imports iron ore from countries like from Australia, South Africa, Brazil and Bahrain. The imports in

[61] Iron Ore Industry CARE Rating Report
[62] Indian Bureau Mines, Indian Minerals Year Book 2018

2017-18 comprised iron ore Fines (44%), non-agglomerated concentrates (25%), lumps (24%), iron ore pellets (7%) and negligible quantity of iron ore pyrites. Imports of iron ore were from Australia (33%), South Africa (31%), Brazil (25%), Bahrain (6%), Oman (3%) and Iran & Russia (1 % each). Highest import was observed in the FY 2014-15. It was around 12.1 Million tonnes while lowest was observed in FY 2013-14 which was around 0.37 million tonnes. Following graph shows Indian Iron Ore import by category for a period FY 2014 to FY 2018.

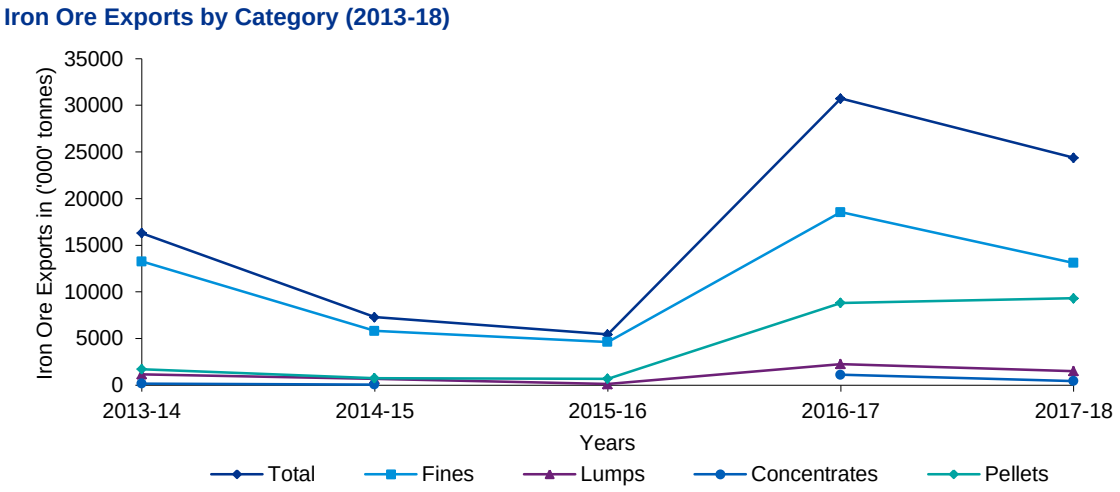


Figure 23: Indian iron ore import by category ('000 tonnes)

Exports:

About 90% of the total domestic production of 200.95 mn tonnes in FY18 was for domestic use, and just about 11% was cumulatively exported. Exports of iron ore decreased to 24.38 million tonnes in 2017-18 from 30.73 million tonnes in the previous year. The exports of iron ore in 2017-18 in terms of volume comprised iron ore fines (54%), iron ore pellets (38%), iron ore lumps (6%), iron ore non-agglomerated concentrate (2%) and negligible quantity of iron ore pyrites. Exports were mainly to China (76%), Japan (12%), Rep. of Korea (5%), Oman (2%) and the remaining 5% of the exports was to Indonesia, Vietnam, Malaysia, Singapore, Korea Dem. Rep., UK etc.

Following figure represents India's iron ore export figures by category for FY 2013-14 to FY 2017-18.

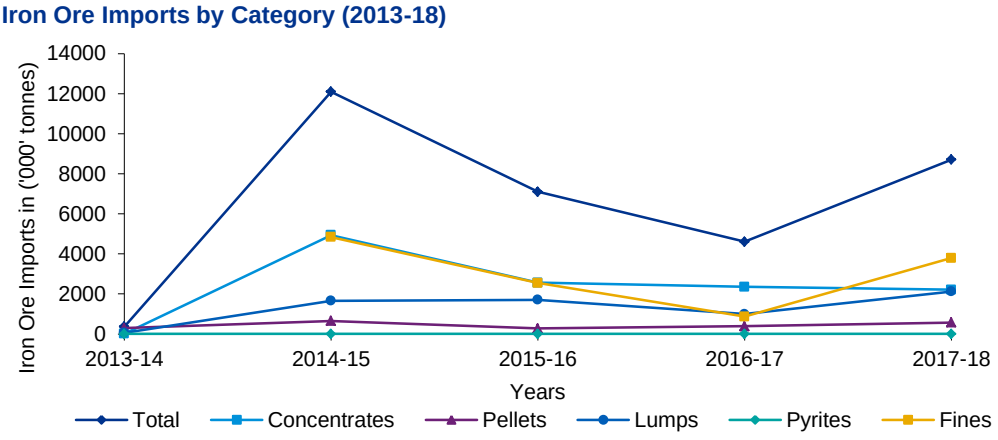


Figure 24:Indian exports of iron ore by category ('000 tonnes)

Overall iron ore exports have peaked in FY2016-17 at 30.73 MT. China is the largest importer of iron ore from India and the decline after FY2016-17 is also partly driven by environmental restrictions in China on iron ore fines imports, the largest category of exports from India

Vedanta and Rungta mines are the largest private exporters in India and NMDC is the second largest followed by Vedanta.

Following table represents five mines which contributes almost 26 percentage of iron ore production. It clearly shows that most of them are in Odisha. Paradip Port, one among the major ports of India is in Odisha. Certainly, due to this factor Paradip port has the largest share in the exports

Table 5-18: Mines having highest contribution in Iron Ore Production

Name of mine	Location of mine	Name & address of mine owner
Jajang	Odisha	Rungta mines Ltd., West Bengal
Balda block	Odisha	Serajjudin & Co.., West Bengal
Baildila iron ore mine, deposit no.14, Kirandul complex	Chhattisgarh	National Mineral Development Corp. Ltd, Hyderabad
Joda east	Odisha	Tata Steel Ltd., Mumbai
Bailadila iron ore mine (deposit no. 5)	Chhattisgarh	National Mineral Development Corp. Ltd., Hyderabad

5.2.4 Port Traffic Scenario

Iron Ore Traffic at Major Ports

To have general idea about the iron ore traffic handled by major ports, traffic data of 13 years have been plotted. However, there is no identical trend is observed for growth of iron ore traffic handled by major ports. Most of the iron ore traffic is handled by major ports CAGR of -5.31% is observed from 2005-06 to 2017-18. Highest traffic i.e. 100.89 Million tonnes was handled in the year 2009-10. Following table depicts growth of traffic handled at major ports of India.

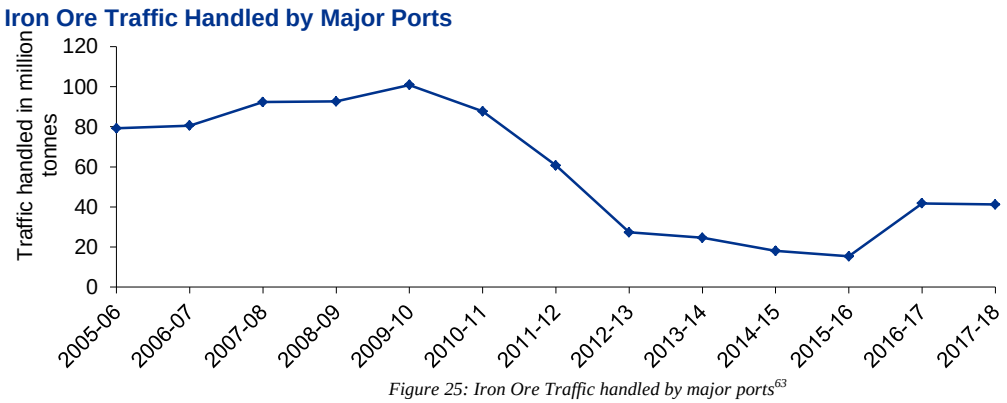


Figure 25: Iron Ore Traffic handled by major ports[63]

[63] Basic Port Statistics of India 2017-18

Out of 12 major ports in India, 6 major ports handle the traffic related to iron ore. In 2017-18, Paradip port has highest share of traffic handled pertaining to iron ore amongst all major ports. It has handled iron ore traffic of 12.19 million tonnes. Following table detailed out iron ore traffic handled by various major ports in the year 2017-18.

Table 5-19: Iron Ore traffic handled by major ports

Traffic handled at major ports in 2017-18	
Major Ports	**Iron Ore ('000 tonnes)**
Deendayal	1371
Mumbai	
J.L.Nehru	
Mormugao	10259
New Mangalore	4903
Cochin	
V.O.Chidambaranar	
Chennai	
Kamarajar	
Visakhapatnam	10872
Paradip	12189
Haldia Dock Complex	1576
Kolkata Dock System	
All Ports	**41170**

Iron Ore Traffic at Non-Major Ports

Non major ports from Andhra Pradesh are the main contributor to iron traffic. Followed by ports from Odisha in later part of time period and Karnataka in starting part of time periods contributed to the traffic at non major part. Highest iron traffic of 48.8 million tonnes was observed in the FY 2009-10. Following graph depicts the iron ore traffic handled by non-major ports.

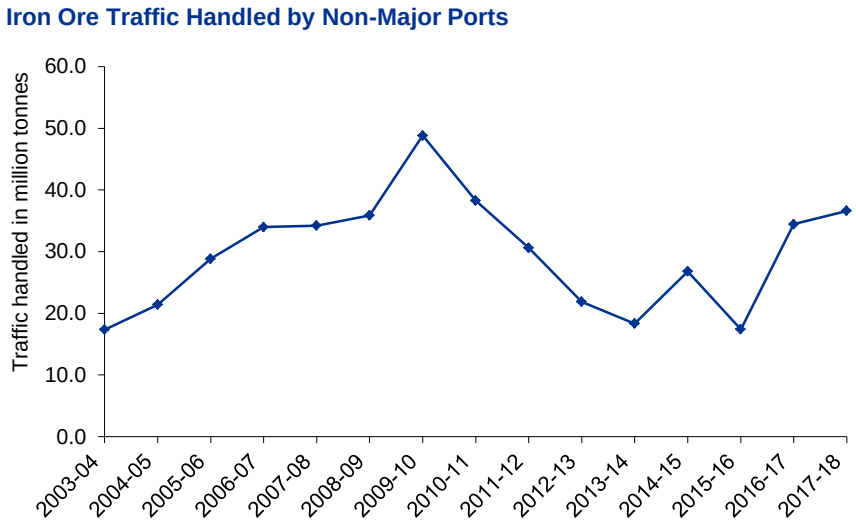


Figure 26: Iron Ore Traffic handled by non-major ports

5.2.5 Iron Ore Forecasting methodology

Kolkata Port

Hinterland to Kolkata Port comprises of states like Odisha and Chhattisgarh due to their proximity to the port. Traffic generated from mines presented in these states have significant impact on Kolkata Port iron ore traffic. Kolkata Port is divided in two parts Haldia Dock Complex (HDC) and Kolkata Dock System (KDS). Traffic handled by both KDS and HDC for FY 2013-14 to 2017-18 is represented by following graph. Highest traffic was observed in 2017-18 for both HDC (40.50MTPA) and KDS (17.39 MTPA). In 2017-18, 1.58 MTPA iron ore has been exported from Kolkata port while there no mention of import.[64]

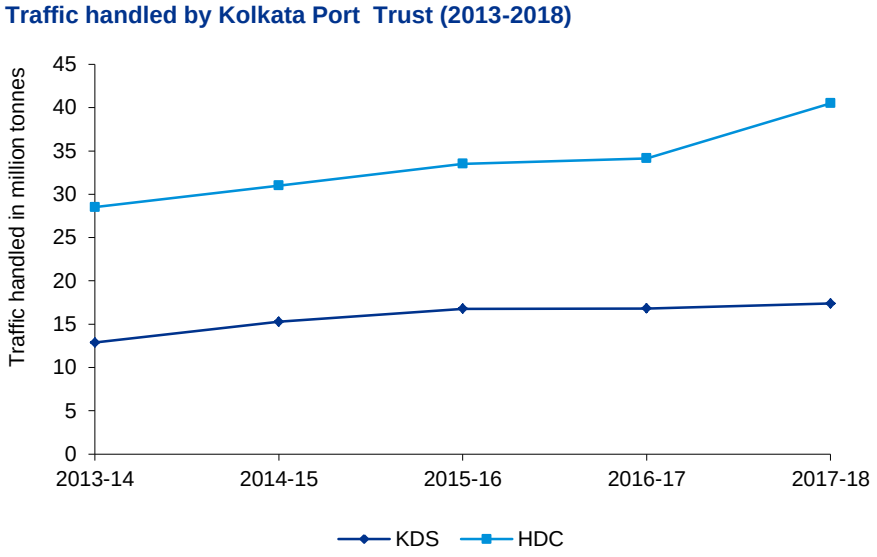


Figure 27: Traffic Handled at Kolkata Port

Methodology

India's finished steel consumption is estimated to increase to 230 Million tonnes by 2030-31 from 90.68 Million tonnes from 2017-18[65] which will have positive impact on iron ore industry. As stated previously, most of iron ore mines are in Odisha and Chhattisgarh. Therefore, cargo traffic generated from these mines are led to Paradip Port since it is located near to these mines. However, Paradip Port has limited berth to cater these iron ore demand and have poor rail connectivity. Remaining traffic is catered by Kolkata Port. HDC has 2 berths for Iron Ore and Kolkata has very good rail connectivity across regions.

Private operators for iron mines are having lease till March of 2020. Therefore, A sudden surge is expected in the production and exports of iron ore during FY20. It will eventually settle down after expiry date of lease. After FY 2021, iron export will come to standstill or will observe very limited growth. Consultant aligned Iron Ore traffic estimates for Kolkata Port based on this information.

Paradip Port has planned to add one more berth to handle the iron ore traffic and there are plans to improve rail connectivity to Paradip Port. It will negative impact on the iron ore traffic at Kolkata Port due to proximity of Paradip port to the iron ore mines.

Therefore, after FY 2021, Consultant limited it traffic estimates to 0.5-1 MTPA.

[64] http://www.kolkataporttrust.gov.in/showfile.php?layout=2&lang=1&lid=1287
[65] https://www.ibef.org/industry/steel.aspx

Output

Based on various scenarios explained in previous section, consultant estimated iron ore traffic for future years which is presented in below table.

Table 5-20: Iron Ore Exports at KoPT

Year	Iron ore exports at KDS (MTPA)	Iron ore exports at HDC (MTPA)	Iron ore exports at KOPT (MTPA)
2018	0.35	1.22	1.57
2019	0.10	0.36	0.46
2020	0.44	1.56	2
2021	0.11	0.39	0.5
2022	0.12	0.43	0.55
2023	0.13	0.47	0.6
2024	0.15	0.55	0.7
2025	0.17	0.59	0.75
2026-2030	0.22	0.78	1
2031-2039	0.22	0.78	1

5.3 Container

Container shipping is different from conventional shipping because it uses containers of standard size. Most commonly used container sizes are Twenty-foot Equivalent Unit (TEU) and Forty-foot Equivalent Unit (FEU). During the 1980s, a large portion of growth in the container trade, recorded at an annual average rate of 7.8 per cent. In this period, much of the cargo that previously travelled in loose form was converted to containers; at the same time ports developed infrastructure and acquired handling equipment to cater for the increasing number (and growing size) of container vessels. However, international container trade has continued to increase at a rate far exceeding that of maritime trade long after this effect has begun to wane[66]. In 2017, Asia and Oceania handle handles 61 percent of port container traffic which is almost two third of Port container traffic[67].

5.3.1 Global Scenario

In 2018, Globally 793 million twenty-foot equivalent units (TEUs) of containers were handled in ports. World container port throughput grew by 4.7 per cent between 2017and 2018. This was the second highest growth after growth between 2016 and 2017 recorded over the last five years. CAGR of 3.6 was observed during last 5 years of traffic. China, USA and Singapore are leading the chart in terms of world container throughput. In the year 2018, China handled 225.8 million TEUs of port traffic which is 28.5% of World throughput of port container traffic. Followed by China, USA and Singapore handled container port traffic of 54.7 million TEUs (6.9%) and 36.6 million TEUs (4.6%). Collectively, they handled 40 percent of the World throughput of port container traffic[68]. Following graphs represents the last 5-year port container traffic.

[66] Study on Regional Shipping and Port Development: Container Traffic Forecast 2007 Update
[67] https://stats.unctad.org/handbook/MaritimeTransport/Indicators.html#ref_Unctad_2018c
[68] https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx

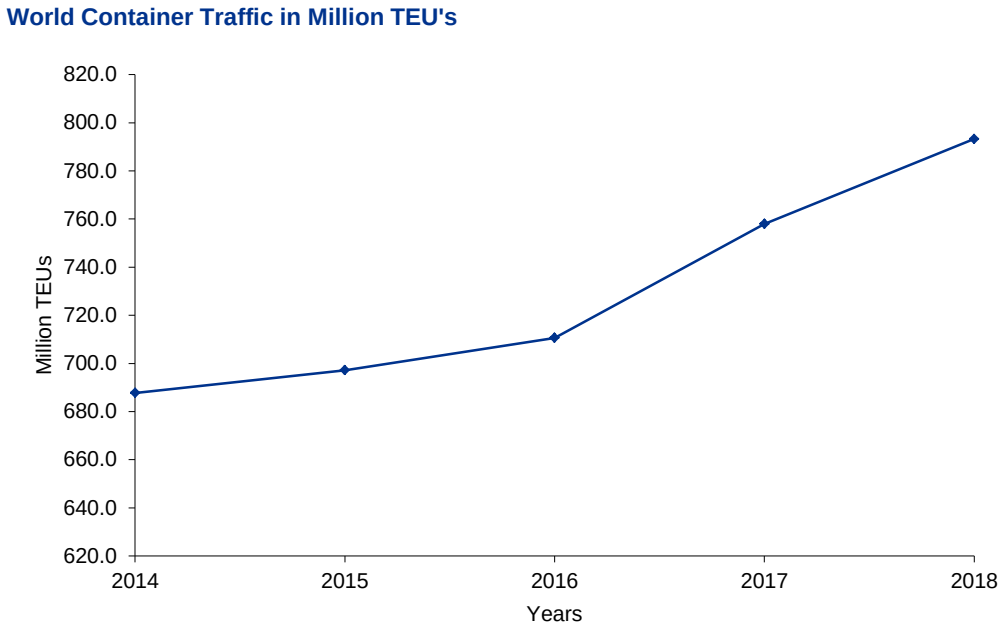


Figure 28: World Container Throughput in Million TEUs

5.3.2 Indian Container Port Traffic Scenario

In India, Containerization has started in 1973 by creating interim container handling facilities at Mumbai and Cochin Ports. Since then, container traffic has increased at rapid pace over the years, in line with the increasing use of containers in international trade. Container traffic has experienced about eight fold increase from 1.05 million Twenty Feet Equivalent Units (TEUs) (11.9 million tonnes) in 1993-94 to 8.4 million TEUs (124.7 million tonnes) in 2016-17 and further increased to 9.1 million TEUs (133.7 million tonnes) in 2017-18 Over the same period non-containerized cargo grew from 167.1 million tonnes to 545.74 million tonnes i.e. about more than threefold increase during these periods. To get clear idea about the historical growth of container port traffic, container traffic data starting from 2006-07 to 2017-18 have been plotted. During this period CAGR of 5.6% is observed. Following graph depicts the trend of container traffic handled at major ports

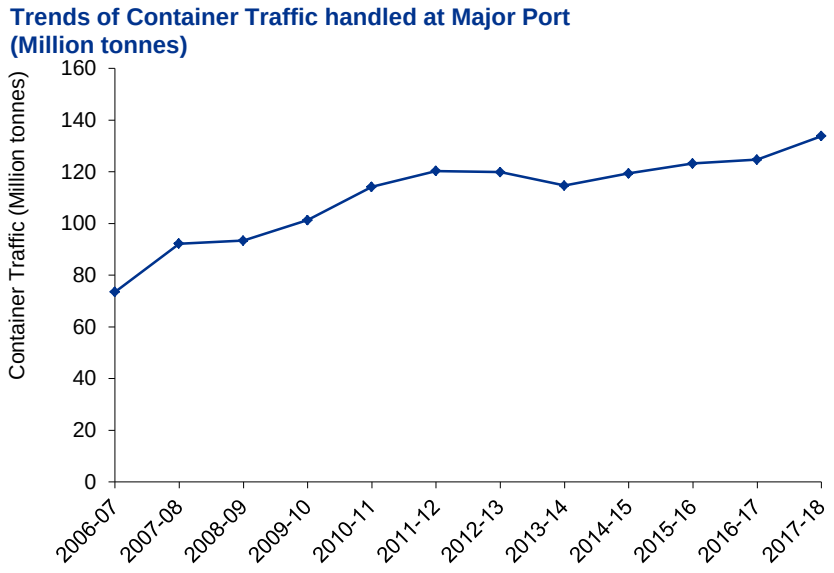


Figure 29::Containers Traffic Handled at Major Ports

Major ports have lost a significant share of container traffic to non-major ports during the last decade. The market share of non-major ports has surged by more than five times in the previous 13 years from 2005. The market share of terminals (in terms of traffic) operating in major ports plummeted from 92% in 2005 to 59% in 2017. The rapid expansion of private terminal operators in non-major ports diverted a significant chunk of cargo to these private ports. The market share (in terms of container traffic) of non-major ports collectively rose to a whopping 41% in 2017 from a paltry 3% in 2005. Krishnapatnam and Katupalli on the east coast of India, operational since 2013, have amassed significant volume in four years. These ports have been adding to the growth story of non-major ports, previously driven by Mundra and Pipavav. In 2017, among non-major ports, only Pipavav has registered a 3% decline in container traffic. Neighboring port Mundra handled 22.4% more boxes over 2016 and Hazira's container traffic increased by 27.6%[69] . West coast ports have largest share of the container infrastructure and throughput in India. More than 70% of the country's containers are handled at the west coast ports.

Following table represents container traffic handled by major ports of India.

Table 5-21: Container Traffic handled by major ports

Name of Port	2016-17		2017-18	
	000' Tonnes	TEUs	000' Tonnes	TEUs
Kolkata D.S	9887	636	9760	640
Haldia D.C	2467	136	2672	156
Paradip	42	2	113	7
Vishakhapatnam	6428	367	6835	389
Kamarajar	1	0	52	3
Chennai	28850	1495	29905	1549
V.O.Chidambarnar	12991	642	14191	698
Cochin	6840	491	7694	556
New Mangalore	1411	95	1744	115
Mormugoa	402	30	425	32

[69] INDIAN CONTAINER MARKET REPORT 2018: Drewry maritime Research

Name of Port	2016-17		2017-18	
	000' Tonnes	TEUs	000' Tonnes	TEUs
J.L.Nehru	54530	4500	57866	4833
Mumbai	639	43	630	42
Deendayal	175	5	1839	117
All Ports	124663	8442	133726	9138

The share of JNPT during 2017-18 in total container traffic stood at 52.9% (in TEUs) and 43.3% (in tonnage) making it the premier container port in India. Other important container handling ports, in the order of their share in India's total container traffic in terms of TEUs were Chennai (17.0%), V.O. Chidambaranar (7.6%), Kolkata D. S. (7.0%), Cochin (6.1%) and Vishakhapatnam (4.3%). The share of Mumbai Port in container traffic has seen a decline from 38.7% in 1994-95 to less than one per cent from 2010-11 onwards due to diversion of container traffic to JNPT. During 2017-18 also, the share of Mumbai Port in container traffic was 0.5 percent only. Concomitantly, the share of JNPT has surged ahead from 19.4% to 52.9% during the same period[70].

Foreign Trade

The rise in dependency on eastern countries is due to India's increased sourcing of goods from China and other Asian countries. This further cemented with China's official entry in the World Trade Organization (WTO) 2001. While India's dependency on the east as the export destination did not change much, but as the import source, the importance of the east increased drastically. 49% of India's import was from the east in 2017, which was just 30% in 2000.

China's position as an export partner has strengthened tremendously in the last 20 years – the country, which stood 13th in 1997, stood at the third position in 2017– within two decades. The US has been the preferred destination of Indian exports and has remained at the top for many decades. The UAE, which stood at the fourth position in 1997 became the second preferred export destination by 2007 and maintained its rank until 2017. India, in 2017, exported more than a quarter of its global exports to the US, China and the UAE. Vietnam is perhaps the only country that has shown tremendous interest in Indian products - the highest improvement in the last 20 years – from 38th position in 1997 to fourth in 2017. The country ranks first in India's exports of Reefer Food Products. About 26% of India's total exports of Reefer Food Products are destined for Vietnam. India's exports are more diversified than imports. Imports from the top 20 countries accounted for nearly 81% of India's total imports in 2017. By comparison, the top 20 export destinations (countries) constituted only 67% of India's global exports.

Import

The RMG and Textile sector has traditionally maintained its top position in India's export basket. Exports in this sector rose from $4.7 billion in 1997 to $22.6 billion in 2017, a nearly five-fold increase in the last 20 years. Chemicals followed RMG/Textiles with an export value of $20 billion in 2017, from a mere $2 billion in 1997. Other sectors that witnessed a massive surge in India's exports are Steel Products, Reefer Food Products and Fabric/Yarn.

Export

On the import front, the Electric and Electronic Goods segment is the largest product category imported into India. In the calendar year 2017, India imported $46 billion worth of

[70] BASIC PORT STATISTICS OF INDIA 2017-18

electrical and electronic goods compared with just $18 billion in 2007. Rising income levels, as well as the invention of user-friendly technology, combined with economies of scale in the production process in the Far Eastern countries, have led to high demand for electronic goods in India and elsewhere. Advanced mechanization and industrialization in the country have pushed imports of machinery and spare parts to a new level. The country imported $29 billion worth of machinery and spare parts in 2017 over $19 billion a decade ago. In India's import basket, Chemicals and Steel Products occupy third and fourth positions respectively, followed by Polymer and Polymer products.

5.3.3 Container Traffic Forecast Methodology

Kolkata Port

Hinterland to Kolkata Port for container traffic comprises of states like Nepal, Bangladesh, North Eastern states, Bihar, Jharkhand, West Bengal and Orissa. Kolkata Port has two container terminals namely Bharat Kolkata Container Terminal and Haldia International container terminal.

Bharat Kolkata Container Terminal

Bharat Kolkata Container Terminal has registered container throughput of 6,40,182 TEUs in FY 2017-18, surpassing previous volume of 6,35,848 TEUs in FY 2016-17. It has capacity of 8,50,000 TEUs which means it was utilized 75.32% in the year 2017-18. Competition from the Vizag port is intensifying and so BKCT is taking key measures to encourage Nepalese importers to use port by improving transparency, reducing the turnaround time and ironing out procedural hassles. This terminal is situated at 704 kilometers from Nepal's only rail-linked Inland Clearance Depot, Birgunj. BKCT is nearest container terminal to Nepal by distance as even Haldia is also located around 100 km faraway from Nepal compared to BKCT.

Haldia International Container Terminal (HICT)

This terminal achieved throughput of 1,56,028 TEUs in FY 2017-18 with a progressive growth of 14.87% over 1,35,828 TEUs in FY 2016-17. In the year 2017-18. it has utilized 62.68% of capacity 2,50,000 TEUs. HICT has achieved another milestone with the commencement of a new Bangladesh service from Haldia In February 2018 under the Indo-Bangladesh Coastal Protocol. Located 90 km from Kolkata, the Petrapole- Benapole border handled $3.4 billion (Rs22,000 crore) of the $6 billion bilateral trade with Bangladesh. In 2016-17, Indian exports accounted for more than 70 per cent of the trade through this gate. However, due to the slow pace of border clearance, a truck normally takes 22 days, including two weeks on the Indian side, to complete its trade run. The Bangladesh trade was eagerly seeking an alternate efficient mode, delivered by a short coastal route with reliable vessel service, delivering goods right up to Dhaka and Chittagong Ports. A ray of hope has emerged, from the immense efforts put in by the J M Baxi Group, which has come up with a robust vessel service in accordance with the India-Bangladesh Coastal Protocol.

Methodology

Following flow chart briefly summarizes the methodology adopted for container traffic projection.

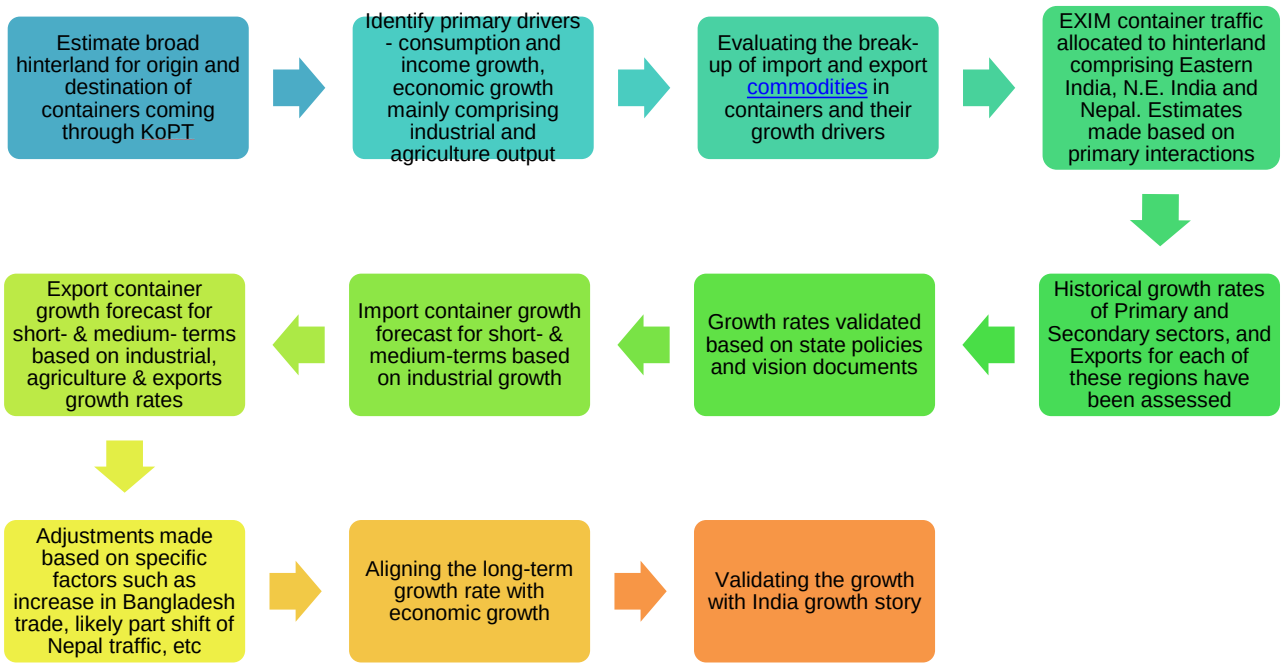


Figure 30: Flow Chart for Container Traffic Projection Methodology

Hinterland analysis is carried out. Container traffic passing through Kolkata Port both HDC and KDS is classified based on their origin and destination. It was further classified into type of trade i.e. import and export and type of commodities. After classification, it was further divided based on their origin/destination state. Broadly, container traffic is segregated into 3 groups based on their origin/destination states/nation

- West Bengal
- Nepal
- Assam, Uttar Pradesh, Jharkhand and Bihar

Proportion of import and export container traffic is worked out for above states and nations. Following table depicts proportions of import and export container traffic for different states and nation

Table 5-22: Break-Up of contribution of hinterland to export and import container cargo

State	Break-up of contribution of hinterland to export and import container cargo	
	Import	Export
West Bengal	50%	55%
Nepal	20%	5%
Assam, UP, Jharkhand, Bihar, Orissa	30%	35%

Container commodities for a period of 2015 to 2019 listed out based on import and export. CAGR for mentioned period is worked out. Income growth for broad classification of Commodities (CAGR) for a period of FY 2008 to FY 2018 is worked out. Calculated Income growth is assigned to the subcategories of the classified import and export commodities. Before assigning, it is adjusted against change in price of rupee and dollar i.e. percentage change in rupee value of dollar from 2008 to 2018 is subtracted from income growth. Import/Export commodities is multiplied with the arrived growth factor. Summation of all the import and export commodities for year 2019 is calculated and noted for further calculation

Traffic growth factor has correlation with economic indicators. Based on type of commodities 2 economic indicators have been identified. Following are the indicators which are used to find growth factors

- Agricultural Output
- Industrial Output

Growth rates of economic indicators are calculated for a period of 2011-12 to 2017-18.

It is assumed that, for Import, growth is dependent of the industrial output, therefore for West Bengal, Assam, UP, Jharkhand and Bihar, growth of industrial output (CAGR) is taken as a growth rate for further projections. However, for West Bengal, industrial Output growth of West Bengal is used. While for other states average of industrial output growth of mentioned states is used. For Nepal, CAGR of imports from 2010 to 2017 is used as growth rate in import part calculation. However, it is assumed that 15 percent of container traffic will divert through Vishakhapatnam Port.

For Export, it is assumed that growth will be driven by agricultural output, industrial output and overall export growth. However, only 65 percent of agricultural output growth is taken into consideration since at National Level, Agri Gross Value Added ranged between 14.9 - 17% out of which Livestock and Forestry contributed to 35% which doesn't impact Container. For Nepal growth of export is negative for a period 2010-2017. Hence 1 percent of growth is assumed. Following table represents final calculated growth factor for import and export.

Table 5-23: Final calculated Growth rates up to FY 25

Region	Estimated Growth Rate up to FY25	
	Export	Import
West Bengal	6%	9%
Nepal	1%	10%
Other States	7%	9%

Based on estimated growth factors and used assumption container traffic up to FY 2025 is calculated. Post FY 2025 and upto FY 2030 growth factor of 4.5 % is applied to estimate the container traffic. After FY 2031, growth factor further reduced to 3.5% and applied for future years of traffic. Following table shows final estimated container traffic for future years. It also includes 14% and 28% of empties of KDS and HDC respectively. As trade improves, proportion of empties will decrease and stagnant at acceptable percentage.

Table 5-24: Final Projected Container Traffic

Year	Containers Traffic at KDS –Million TEU	Containers Traffic at HDC – Million TEU	Containers Traffic at KOPT – Million TEU
2025	0.92	0.21	1.13
2031	1.21	0.28	1.49
2035	1.38	0.32	1.71
2039	1.59	0.37	1.96

However, there are some key challenges which needs urgent attention, for Nepal cargo setting up a container freight station dedicated to the Nepalese customers should be on active consideration in facilitating the trade. There is urgent need to invest in port infrastructure, which will further improve the trades between countries. It will have positive impact on repositioning of empties container which is currently at higher percentage. Investment in the ecosystem will allow to create space for allied services to the container traffic. Free Trade and Warehousing Zones are one of those thing where different stakeholders can take benefit of free currency. Ventures like food processing zone make a way for perishable items.

5.3.4 Potential Upsides to the container traffic

Increased Growth of North East

Government of India is very keen towards act East policy and North East is gateway for India's Act East policy. Pertaining to this reason, in future focus will on development of North East Region. It will help in nurturing the food and food industry. It will also open door to MSME sector inside the region. This all activities certainly create demand for container traffic especially Food production container exports. It is expected that around 15-20K TEU container traffic will be generated after FY 2025.

Increased Containerization

Containerization is a sign of increase global trade. Structural changes that container shipping is undergoing, will provide large economies of scale and the demand and supply ratio will continue to put pressure on container freight rates. This will increase the attractiveness of container shipping. Because of these reasons all general cargos are moving towards containerization. It is expected that addition 15-20 percent of cargo will be containerized.

Consolidation Hub

It was quite certain that Indian ports have built huge capacities not only to serve EXIM cargo but also to recapture the transshipment volume which has been handled by neighboring ports. There are not much effective strategies implemented by major ports still, but on the other side private port operators are striving to bring back the lost cargo from neighboring foreign ports. It will have result in higher transshipment and base cargo. It is estimated that 0.5-.0.75 MTEUs will increase after FY 2022-23.

Following table represents container traffic estimates after potential upsides.

Table 5-25: Container Traffic Estimates post potential upsides

Scenario	Containers Traffic at KOPT – Million TEU
Increased growth of NE	FY 25 – 1.16
	FY30 – 1.54
Increased Containerization	FY 25 – 1.35
	FY30 – 1.80
Consolidation Hub for Region	FY 25 – 1.50
	FY30 – 2.00

5.4 Vegetable Oil

Vegetable oil includes oil obtained from the crushing of soybeans and other oilseeds. Edible oils constitute an important component of food expenditure in Indian households. Edible oil industry is one of the most important industries of agriculture sector in India.

5.4.1 Global Scenario

The vegetable oil sector was characterized by a slowdown in global trade, largely reflecting a decrease in edible oil imports by India in 2018. This resulted from an expansion in domestic oilseeds production, combined with increased import tariffs. Several countries also expanded their crushing capacity, thus increasing their seed imports at the expense of oil and meal purchases. Accordingly, exports by the main suppliers of vegetable oil, such as Indonesia and Malaysia, expanded less than average, leading to rising stocks and lower prices. The combination of these factors led to the introduction of higher biodiesel mandates in Indonesia, which drove domestic take up of palm oil for biodiesel production from 3.5 million litres in 2017 to 5.1 million litres in 2018. Vegetable Oil from Soybean about 55% of world vegetable oil production, palm oil (35%), as well as palm kernel, coconut and cottonseed oils. Despite a slowdown in the expansion of the mature oil palm area, significant production growth is projected in Indonesia (4.6 Mt) and Malaysia (2.3 Mt). However, the rise in Indonesia's domestic biodiesel requirement will place pressure on vegetable oil supplies in the medium term. Global demand for vegetable oil will expand by 28 Mt by 2028, which is likely to draw down high inventories and support vegetable oil prices over the outlook period.[71]

Vegetable oil has one of the highest trade shares (40%) of production of all agricultural commodities. Indonesia and Malaysia, the world's two main suppliers of palm oil – the greatest single component of vegetable oil – will continue to dominate vegetable oil trade exporting over 70% of their combined production and jointly accounting for nearly 60% of global exports. Data of Vegetable oils for 5 years is evaluated and plotted on chart. Following figure depicts information related to world statistics for production, import, consumption, export.

[71] OECD-FAO AGRICULTURAL OUTLOOK 2019-2028

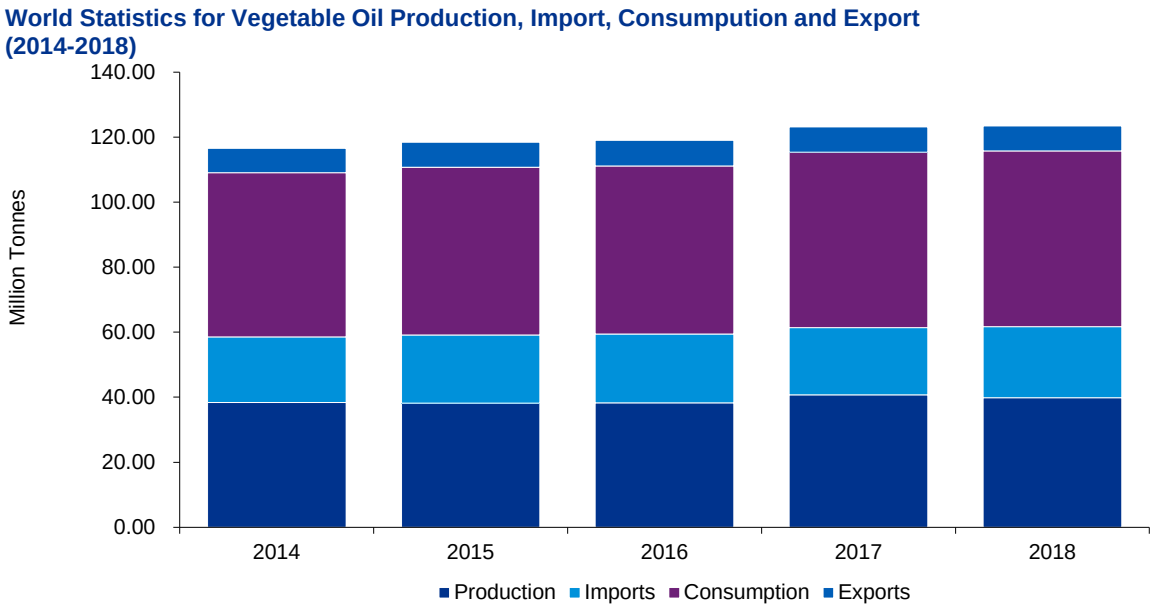


Figure 31: World Statistics for Production Consumption and EXIM of Vegetable Oil[72]

5.4.2 India Scenario

India, the second largest consumer and number one importer of vegetable oil in the world, is projected to maintain a high per capita consumption growth of 3.1% p.a. and to reach 15 kg per capita in 2028. This substantial growth will be the result of both expansion of its domestic production, sourced in the intensification of oilseed cultivation, and a further increase in imports of mainly palm oil from Indonesia and Malaysia.

Production

India's edible oil production remained in the range of 6.6-8.2 million tonnes during the last five oil years November 2012-October 2017. The country's edible oil production grew by 15.2% y-o-y to 7.6 million tonnes during 2016-17. In the ongoing oil year, domestic production of edible oil from oilseeds is expected to remain almost flat on the back of an estimated 2% y-o-y decline in oilseed production to 30.6 million tonnes during the year. The fall in oilseed output will be driven by 16.9% decline in soybean production due to unfavorable climatic conditions. Lower prices for the crop in the last year are also believed to have impacted its production during the year. Mustard output is estimated to rise by a marginal 1.5%. The groundnut, mustard and soybean oilseeds cover about 90% of the country's total oilseed production estimated for 2017-18.[73] Following table shows 5 years of edible oil production statistics starting from 2012-13 to 2016-17. Highest production was observed in the year 2013-14.

[72] OECD-FAO Agricultural Outlook (Edition 2019) Datasets
[73] Edible Oils Update & Outlook: May 2018 CARE Rating

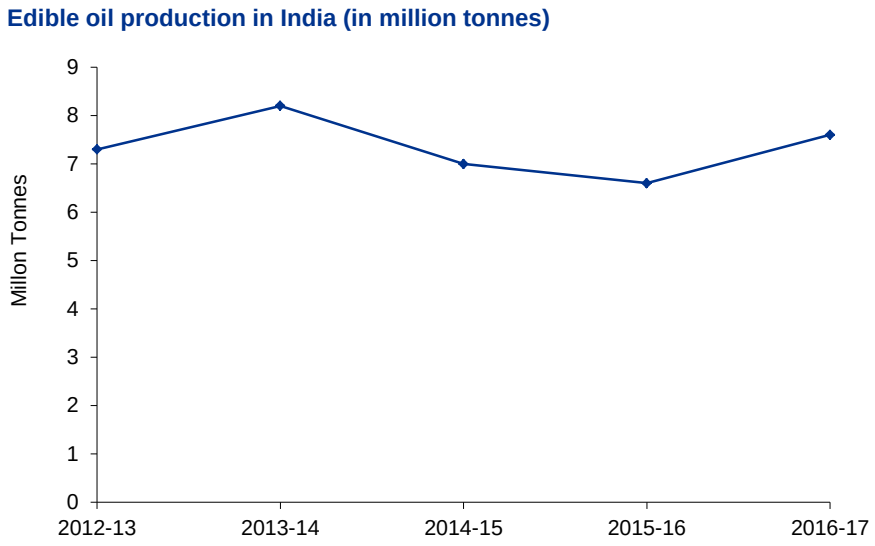


Figure 32: Edible oil production in India (in million tonnes)[74]

Major oilseeds production in India for year 2016-17 and 2017-18 are presented below.

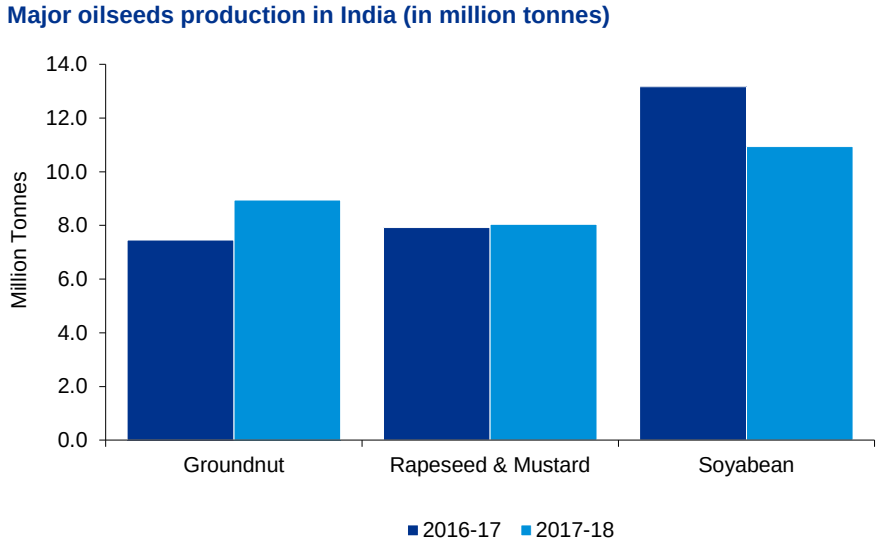


Figure 33: Major oilseeds production in India (in million tonnes)[75]

Imports

While India's edible oil output from oilseeds is expected to remain flat, the country's demand for edible oil is likely to increase steadily during the oil year 2017-18. Thus, the country will continue to depend on imports of edible oil to meet the domestic requirements. India meets a large part of the internal needs through imports and the country's dependence has increased over the years and currently around 65-70% of the domestic edible oil requirements are met through this route. Following table depicts India's edible oil import by last 5 years starting from 2012-13.

[74] CMIE
[75] Department of Agriculture Co-operation

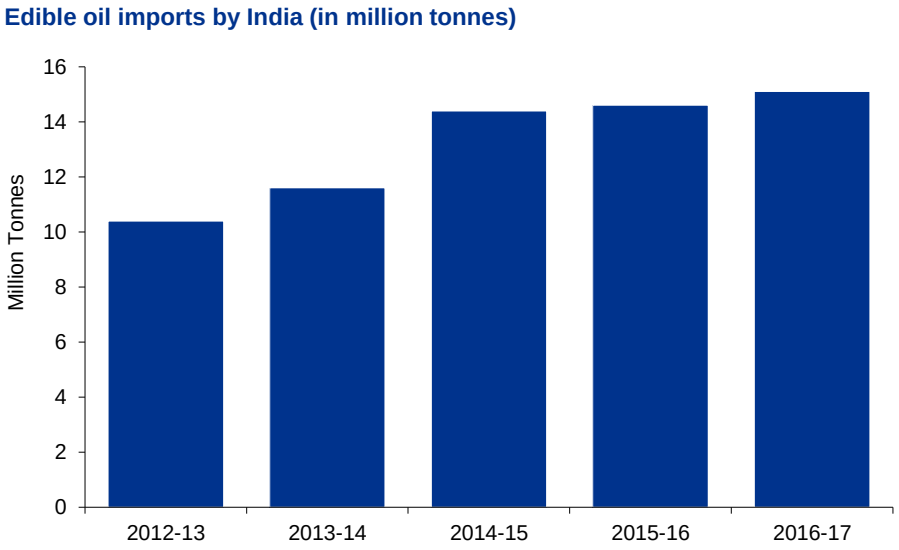


Figure 34: Edible oil imports by India (in million tonnes)[76]

India's edible oil import requirements grew by a sharp 45.2% from 10.4 million tonnes in 2012-13 to 15.1 million tonnes in 2016-17 as per the Solvent Extractors' Association of India (SEA). The country's edible oil imports had increased by 3.5% yo-y to 15.1 million tonnes in the last oil year. In the first half of the current oil year, the imports grew by 2.1% y-o-y to 7.1 million tonnes.

Out of total edible oil imported by India, palm oil accounts for the largest share as it is one of the cheapest variants of edible oils available. During November 2017-April 2018, palm oil imports stood at 4.6 million tonnes and accounted for the highest share of 64% followed by sunflower oil with a share of 18.4% (1.3 million tonnes), soybean oil with a share of 15.3% (1.1 million tonnes) and rapeseed oil with share of 2.2% (1.6 lakh tonnes).

5.4.3 Port Traffic Scenario

To have clear idea about the amount port traffic is carried by KoPT, historical data for edible of 5 years have listed out. Further traffic proportion handled by Haldia and Budge Budge port have been worked out. Following series of tables describes the port traffic based on type of oil it handled.

Table 5-26:KoPT historical traffic share of Edible Oil Imports-Refined Oils

[76] Solvent Extractors' Association of India

	Refined Oils					
NOV-OCT	14-15	15-16	16-17	17-18	18-19 (8 months)	Average
Haldia Port	120040	207283	196744	161626	222992	171423.25
Budge Budge	21093	61996	74266	63386	32857	55185.25
Total	141133	269279	271010	225012	255849	226608.5
India	1659070	2623002	2870928	2135780	1825663	2322195
Haldia Port	7.24%	7.90%	6.85%	7.57%	12.21%	7.38%
Budge Budge	1.27%	2.36%	2.59%	2.97%	1.80%	2.38%
Total	8.51%	10.26%	9.44%	10.54%	14.01%	9.76%

Table 5-27: KoPT historical traffic share of Edible Oil Imports- Crude Oils

	Crude Oils					
NOV-OCT	14-15	15-16	16-17	17-18	18-19 (8 months)	Average
Haldia Port	1926170	1734720	2044547	2057258	1252178	1940673.8
Budge Budge	656737	448102	466776	349805	165276	480355
Total	2582907	2182822	2511323	2407063	1417454	2421028.8
India	12762201	11948336	12206492	12380752	7630232	12324445
Haldia Port	15.09%	14.52%	16.75%	16.62%	16.41%	15.75%
Budge Budge	5.15%	3.75%	3.82%	2.83%	2.17%	3.90%
Total	20.24%	18.27%	20.57%	19.45%	18.58%	19.65%

Table 5-28: KoPT historical traffic share of Edible Oil Imports- Total

	TOTAL					
NOV-OCT	14-15	15-16	16-17	17-18	18-19(8 months)	Average

	TOTAL					
NOV-OCT	**14-15**	**15-16**	**16-17**	**17-18**	**18-19(8 months)**	**Average**
Haldia Port	2046210	1942003	2241291	2218884	1475170	2112097
Budge Budge	677830	510098	541042	413191	198133	535540.25
Total	2724040	2452101	2782333	2632075	1673303	2647637.25
India	14421271	14571338	15077420	14516532	9455895	14646640.3
Haldia Port	14.19%	13.33%	14.87%	15.29%	15.60%	14.42%
Budge Budge	4.70%	3.50%	3.59%	2.85%	2.10%	3.66%
Total	18.89%	16.83%	18.46%	18.14%	17.70%	18.08%

5.4.4 Vegetable Oil forecasting methodology

Kolkata Port

Hinterland pertaining to vegetable oil traffic for Kolkata Port comprises of following states

- Nepal
- Orrisa
- Jharkhand
- Bihar
- West Bengal

There are 10 major vegetable oil refineries and traders are present inside the hinterland. These refineries have significant impact port traffic in connection with vegetable oil. Following table represents list of all 10 oil refineries/traders in the vicinity of Kolkata Port.

Table 5-29: Refineries and Traders inside hinterland

S.No.	Manufacturer
1	Emami Agrotech Ltd
2	Adani Wilmar Ltd
3	Ruchi Soya Industries Limited
4	JVL Oil refinery
5	Golden Agri Resources India Pvt. Ltd.
6	Budge Budge Refineries Ltd.

S.No.	Manufacturer
7	Shree Shiv Shakti Ghee Udyog Pvt. Ltd. (Nepal)
8	Sakuma Exports Ltd.
9	Annapurna Vegetable Products Pvt. Ltd. (Nepal)
10	Swastik Oil Industries Pvt. Ltd. (Nepal)

Methodology

Flow chart below briefly summarises the methodology adopted for vegetable oil traffic projections.

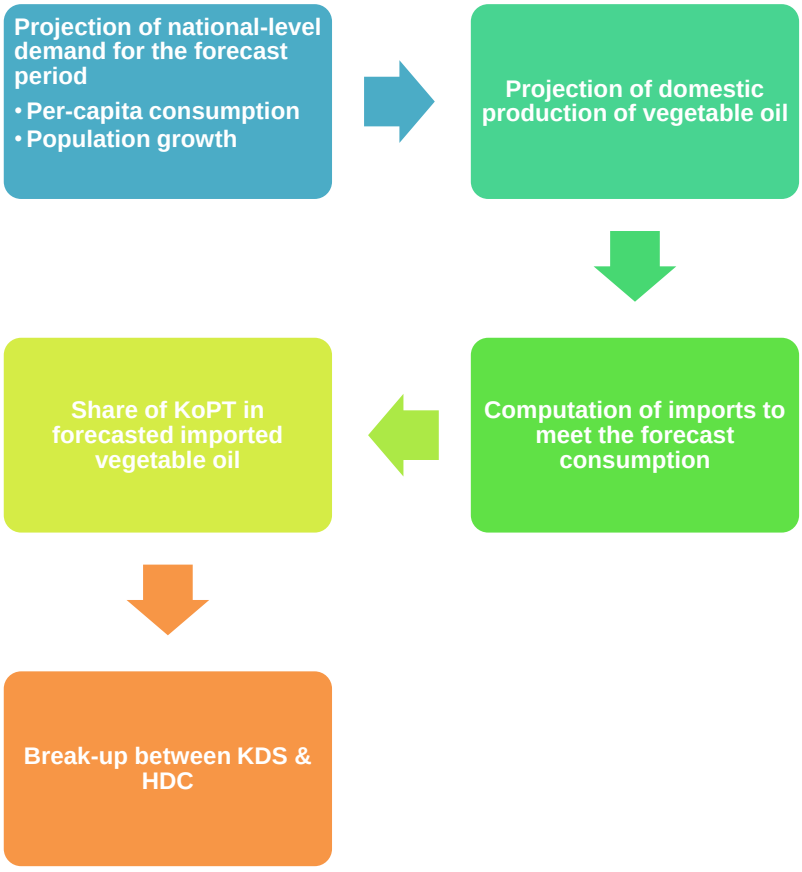


Figure 35: Flow chart for methodology of Vegetable Oil Projection

The edible oil consumption is directly influenced by two factors – consumption per capita and growth in population. The import demand depends on multiple factors including the domestic production of oil seeds and oil, exports of domestically produced edible oil and also nature of individual oil seeds and oils, applicable import duties on crude/ refined oils imports. The current approach factors in the overall oil seeds and oils production as well as potential for exports (especially of rice bran oils in the near future).

Strong increase witnessed in recent years with per-capita consumption going up from about 11 kgs in FY01 to 17 kgs in FY17. However, in the year 2017, global average was 25 Kg.

Domestic production of oil seeds marred with low yields and low acreage haven't kept pace with growing demand leading to high dependence on imports of crude and refined oils. The ratio keeps varying depending on the import duty structures. Highly skewed towards crude oil imports. KoPT has historically been handling close to 16-20% of the overall edible oil imports into the country.

Certain assumptions are made for undertaking the traffic projections:

Based on the publications reviewed, India's population growth rates may be around 0.9%-1%. One percent growth rate up to 2040 has been assumed for the projections

As indicated earlier, the per capita consumption of India has been growing over the years but remains much below the global average. It is observed that the per capita consumption is likely to grow driven by increasing per capita incomes (purchasing power) as well as increased consumption of snacks, etc. The publications of SEA expect that the Indian consumption may meet the global averages over time, and it is assumed it would happen by 2029-30 and will remain constant thereafter

It is expected that the domestic oil seeds production may grow to 30-33 million tonnes by 2025 from the current levels of around 24 million tonnes. This will convert into 10 million tonnes of oil production. Beyond FY25, it is expected that the production will grow by 5%, given the higher focus of the government on improving yields and acreage of the oil seeds cultivation.

Post 2025, it is also expected that India will look at exporting certain categories of the vegetable oil – mostly rice bran oil. It is assumed that exports will comprise 5% of the domestic production of the edible oil.

Summarizing the above, the national imports of edible oil have been computed based on the below:

Total Consumption = Population Growth x Per-Capital Consumption

Total Imports = Total Consumption – Domestic Production – Exports

Kolkata Port has been playing a vital role in handling India's edible oil imports. The role is likely to grow in significance going forward owing to the increase driven by imports from Nepal, increased connectivity, per-capita incomes and consumption from North-East India – to which Kolkata Port will remain the key gateway. It is expected that Kolkata Port will continue to handle about 18% of the India's total imports which will gradually grow to 20% in the next five years.

Output

Based on above discussion of forecasting methodology, imports for both KDS and HDC have been calculated. Based on previous data, share among KDS and HDC is assumed as 38.30 percentage and 61.70% respectively. Following table depicts vegetable oil import for future years.

Table 5-30: Import Demand of Vegetable oil for KDS and HDC

Year	Vegetable oil imports at KDS (MTPA)	Vegetable oil imports at HDC (MTPA)	Vegetable oil imports at KoPT (MTPA)
2025	1.85	2.97	4.82
2031	2.06	3.32	5.38

Year	Vegetable oil imports at KDS (MTPA)	Vegetable oil imports at HDC (MTPA)	Vegetable oil imports at KoPT (MTPA)
2035	1.98	3.18	5.16
2039	1.85	2.98	4.83

5.4.5 Drive to increase the traffic

The key to improve oilseeds production lies in ensuring the availability of quality seeds, bridging the awareness gap in farmers regarding better techniques, developing supportive infrastructure facilities and ensuring an efficiently managed market for better price recovery. New location-specific high yielding varieties should be developed. Investment in oilseeds research and development is a key element and should be stepped up. Dissemination of technology is equally important and needs to be strengthened through effective agricultural extension system.

Further, it will be critical to encourage oil refining eco-system by providing dedicated spaces, port connectivity and highway connectivity to increase the import potential from KoPT.

'National Mission on Oilseeds and Oil Palm (NMOOP)' is to encourage the adoption of newly released varieties and improved agro-techniques in oilseed crops.

5.5 Pulses

Pulses are edible dry seeds of plants belonging to the Leguminosae family. They are consumed in the form of whole seed, split grain, dehulled split grain and flour. Many different types of pulses are grown the world over. Of these, the major ones, in terms of global production and consumption quantities, are the common bean, chickpea, dry pea, lentil, cowpea, mung bean, urad bean and pigeon pea. In addition, there are large number of minor pulses that are grown and consumed in different parts of the world. While pulses are primarily grown for human consumption, there is, in addition, substantial demand for them as animal feed in some of the developed countries. Of the various pulses, dry pea, faba bean and lupins are widely used as animal feed.[77]

5.5.1 Global Perspective

The total world area coverage under pulses as recorded during 2014 is about 851.91 lakh ha with production at 774.73 lakh tones. In the world, pulses are grown by 198 countries. Beans dry was cultivated by 152 countries, which contributed about 35.93 % area to total world area, Chickpea by 58 contributed about 16.41%, Peas dry by 98 contributed 8.14%, Pigeon pea by 23 contributed 8.26 %, Lentil by 56 contributed by 5.31% and others 25.95%. The share to World production of Beans dry was 31.64% followed by Chickpea 17.72%, Peas dry 14.44%, Pigeon pea 6.31%, Lentil 6.23% and others 23.66%. Following table depicts global ranking based of the type of pulses.[78]

Table 5-31:Global Ranking of Pulses-Crop Wise (2014)

Crop	Area (lakh ha)	% total production	Production (lakh tonne)	% total production

[77] http://www.fao.org/3/i7108en/I7108EN.pdf
[78] FAO statistics 2014

Chickpea	139.81	16.41	137.31	17.72
Lentil	45.24	5.31	48.27	6.23
Pigeon Pea	70.33	8.26	48.9	6.31
Pea	69.32	8.14	111.86	14.44
Beans	306.13	35.93	245.16	31.64
Total Pulses	851.91		774.73	

The total world area coverage under pulses as recorded during 2014 is about 851.91 lakh ha with production at 774.73 lakh tones and productivity 909 kg/ha. India ranked first in area and production with 35% and 25% respectively of world area and production. However, in case of productively Bahrain stood first with 18485 kg/ha. Thus, it is also evident that the country's productivity at 660 kg/ha is far below the world average productivity of 909 kg/ha. Following global statistics reveals some useful insights about pulses global production.

Table 5-32: Global Statistics on Pulses Production

Country	Area(lakh ha)	% Cont	Country	Production (lakh tonnes)	% Cont	Country	Yield
India	303.09	35.58	India	199.8	25.79	Bahrain	18485
Niger	54.7	6.42	Myanmar	59.77	7.72	Ireland	5886
Myanmar	42.03	4.93	Canada	58.28	7.52	Israel	5576
Nigeria	38.49	4.52	China	41.13	5.31	Belgium	4445
Brazil	32.09	3.77	Brazil	33.06	4.27	Tajikistan	3985
Canada	28.7	3.37	Ethiopia	26.13	3.37	Denmark	3952
China	23.85	2.8	USA	23.95	3.09	Trinidad Tobago	3919
Tanzania	20.68	2.43	Russian Fed.	22.94	2.96	United Kingdom	3755
Mexico	18.35	2.15	Australia	22.47	2.9	Netherlands	3639
Kenya	17.19	2.02	Nigeria	22.05	2.85	Switzerland	3638
Others	272.74	32.02	Others	265.15	34.22	Others	1068
World	851.91		World	774.73		World	909

From last four decades, there has been a steady increase in the quantity of pulses traded internationally. Between the years ending 1971 and 2013, the quantity of pulses exported reached new heights, from only about 1.9 million tonnes to over 13 million tonnes. In the years ending 1971, only 4 percent of total pulse production was traded internationally; by the years ending 2013, this had increased to 18 percent. With an increase in trade liberalization across the world, the last two decades have seen a particularly large increase in international trade.44 percent of all pulses that were exported were from North America. It particularly dominated the world exports of lentil and dry pea, with 76 percent of lentil exports and 71 percent of dry pea exports originating in North America. Other than North America, Oceania is a net exporter of pulses with 10 percent of the exports of pulses originating there; it accounts for only 0.3 percent of world imports. Oceania specializes in the production of chickpea and faba bean: it accounted for 34 percent of world exports of chickpea and 42 percent of world exports of faba bean. Asia, Africa, Europe, and Latin America and the Caribbean have a greater share in world imports than in world exports. Asia, with a large demand for pulses, accounts for 64 percent of global imports. Asia's share in imports is

higher than its share in exports for all pulses other than dry bean. There has been a sharp increase in Asia's dependence on imports of pulses since 2001. This is primarily on account of an increasing shortfall in the domestic supply of pulses in India, and China's transformation from being a net exporter of pulses to be a net importer .In contrast, imports by European countries, which surged in the 1980s, declined sharply after the mid-1990s. A substantial part of pulses in Europe is used for animal feed. Since the 1990s, Europe's dependence on pulses declined as it shifted to soybean as the primary source of plant protein in animal feed.

5.5.2 Indian Scenario

Production

The total world area coverage under pulses is about 85.40 (Mha) with production of 87.40 (Mt) at 1023 kg/ha yields level. India, with more than 29 Mha pulses cultivation area, is the largest pulse producing country in the world. It ranks first in area and production with 35*per cent* and 29*per cent* respectively. During 2017-18 our productivity at 841kg/ha, has also increased significantly over Eleventh (662 kg/ha) and Twelfth plan (745 kg/ha).

The multi-pronged strategy of the government to protect the interest of farmers and the consumers has resulted into enhanced per cent contribution of about 9 per cent pulses to total food grains during 2017-18 from 6-7 percent till 2015-16 which is the ever highest after 1980-81. 1990-91 the production of food grains and contribution of pulses to total foodgrains basket is depicted under

Table 5-33: Contribution of pulses to food grain basket[79]

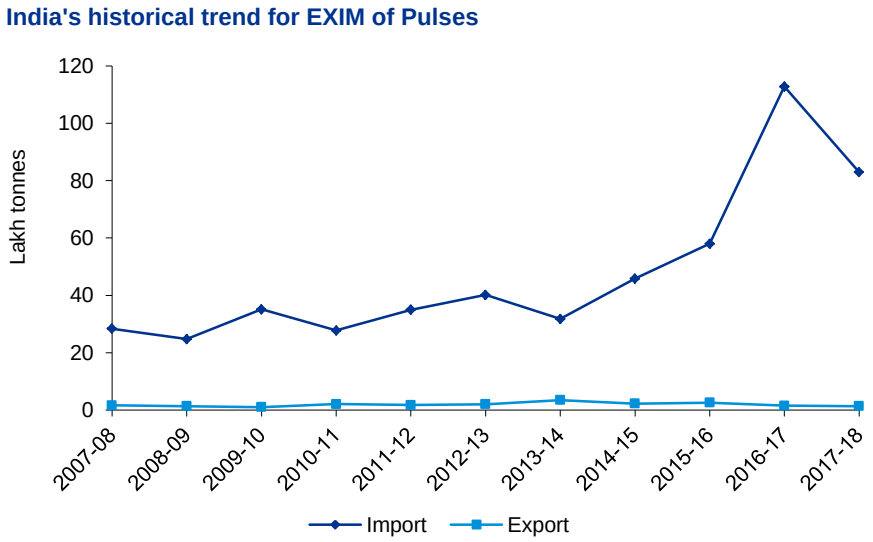
Year	Pulses			Food Grains			pulses share to food grain share percentage	
	Area (lakhs Ha)	Production (lakh tonnes)	Yields kg/ha	Area (lakhs Ha)	Production (lakh tonnes)	Yields kg/ha	Area	Production
1950-51	19.09	8.41	441	97.32	50.82	522	19.62	16.55
1960-61	23.56	12.7	539	115.58	82.02	710	20.38	15.48
1970-71	22.54	11.82	524	124.32	108.42	872	18.13	10.9
1980-81	22.46	10.63	473	126.67	129.59	1023	17.73	8.2
1990-91	37.25	20.36	547	140.83	182.49	1300	26.45	11.16
2000-01	20.35	11.08	544	121.05	196.81	1626	16.81	5.63
2010-11	26.4	18.24	691	126.67	244.49	1930	20.84	7.46
2011-12	24.46	17.09	699	124.76	259.32	2079	19.61	6.59
2012-13	23.25	18.34	789	120.77	257.12	2129	19.25	7.13
2013-14	25.21	19.25	764	125.04	265.04	2120	20.16	7.26
2014-15	23.1	17.16	743	122.07	252.67	2069	18.92	6.79
2015-16	24.91	16.35	656	123.22	251.57	2042	20.22	6.5
2016-17	29.44	23.13	786	129.23	275.11	2129	22.78	8.4
2017-18	29.99	25.23	841	127.56	284.83	2233	23.51	8.85

[79] DES, Ministry of Agri. &FW (DAC&FW), Govt. of India; 2017-18*- IVth Adv. Est.

In India, total pulse area and production during 2017-18 has been more than 299 Lha and 252 lakh tonnes respectively. Out of the total area more than 74 Lha is confined to Madhya Pradesh alone, earning a prime status in pulse production commodity contributing a remarkable 25% of the country's pulse area with 32% production, thereby ranking first both in area and production followed by Rajasthan and Maharashtra with 13% each and Uttar Pradesh at 9%. Compared to normal production, the estimated production during 2017-18 is 30% higher in case of total pulses, 32% gram, 27% arhar, 58% urdbean, 18% mungbean and 40% higher lentil production. More than 90 per cent of total pulse production has been contributed by 10 states of MP, Rajasthan, MS, UP, Karnataka, AP, Gujarat, Jharkhand, Tamilnadu and Chhatisgarh[80]

Foreign Trade

Despite being highest producer of Pulses in the world, India's import is highest to meet its growing demand. Following graph representing historical trend of import and export clearly



demonstrates India's growth story in terms of import and export of pulses.

Figure 36:India's historical trend for EXIM of Pulses

Import

Farmer friendly policy measures have helped reduce import of pulses. Import of pulses declined by 30 lakh tonnes from previous year, resulting in saving of foreign exchange amounting to Rs 7,698 crore. The government ensured the availability supply as per demand by way of enhanced imports between 2014-15 to 2016-17 at about 5-6 million tons per year in their buffer stock on one hand and swung in to action to combat the natural calamities through development programmes risk management through PMFBY, PSS and PSF procurement on the other. Because of back to back record production, import duty on chickpeas has been fixed at 60%, while that for yellow peas is 50%, 30% for lentils and 10% for tur. Peas which accounted for major share in India's pulses import declined. The government has also imposed a quantitative cap of 2 lakh tonnes per year on tur dal (Mozambique) and 3 lakh tonnes on urad and moong (Mynmar). Recently, the government had imposed quantitative restrictions on some of the pulses to check cheaper imports.

[80] Pulses in India: Retrospect and Prospects 2018

Export

The duties on import were imposed and export was also encouraged to support the farmers. The Cabinet Committee on Economic Affairs (CCEA) has given its approval for removal of prohibition on export of all types of pulses to ensure that farmers have greater choice in marketing their produce and in getting better remuneration for their produce. The government lifted ban on export of tur, urad and moong dal, although shipments of these varieties were allowed only through permission from agriculture export promotion body APEDA. All varieties of pulses, including organic pulses, have been made 'free' for export and Kabuli Chana has also been permitted in a limited quantity. Gram which accounted for major share in India's pulses export increased. Opening of exports of all types of pulses will help the farmers dispose of their products at remunerative prices and encourage them to expand the area of sowing.

Following table represents import and export statistics India by type of pulses

Table 5-34: Major Pulse importing and exporting countries

Pulses	Top 5 Export Destinations	Top 5 Import Sources
Peas (PisumSativum)	Sri Lanka (96.3%), Myanmar (1.6%), Bhutan (1.4%), Nepal (0.5%), UAE (0.09%).	Canada (54.5%), Russia (10.3%), Luthuania (9.0%), France (6.8%), USA (6.4%)
Chickpeas (Garbanzos)	Pakistan (21.6%), UAE (10.6%), Algeria (11.6%), Saudi Arabia (9.5%), Sri Lanka (7.3%)	Australia (85.1%), Russia (4.7%), Tanzania (3.8%), USA (1.4%), Canada (0.91%),
Moong/Urad	USA (39.96%), Sri Lanka (13.05%), UK (9.86%), Australia (7.77%), Malaysia (7.63%)	Myanmar (70.37%), Kenya (7.43%), Australia (6.32%), Tanzania (3.15%), Uzbekistan (2.60%).
Lentils (Masur)	Sri Lanka (43.39%), Bangladesh (18.11%), UAE (8.35%), Egypt (3.98%), USA (3.67%)	Canada (89.58%), USA (7.47%), Australia (2.88%), Turkey (0.03%), Mozambique (0.03%).
Pigeon Peas (Tur)	USA (40.79%), UAE (18.28%), Canada (11.28%), UK (10.75%), Singapore (5.11%),	Myanmar (46.35%), Tanzania (18.71%), Mozambique (15.36%), Malawi (12.56%), Sudan (3.36%)

5.5.3 Pulses demand forecasting methodology

Background

There are various factors which direct impact on demand of pulses. Pulse demand is driven by factors like per capita income, average per capita consumption growth, shift towards vegetarian food, protein intake by vegetarian and finally population growth. Population of India is rampantly so is the demand. Increased urbanization and infrastructure development

resulted in increased per capita income. However, office jobs people are more prone to sedentary life and lifestyle related diseases. To overcome this, people have started thinking about various options like increase in protein intake, shift towards vegan food. Due to all these reasons, Pulses being one of the most favorable food items amongst people. Pulses have high nutritional value and protein intake because of these reasons' pulses are natural choice among people with sedentary life. There eventually leads to increase in consumption of Pulses.

People generally consumes pulses directly or in the form value added snacks. Domestic production of pulses in not keeping the pace with increase demand of pulses. So, the requirement of pulses is occurred. Though, there are gradual increase in yields of pulses for production and even Government of India took some initiatives to increase the yield of pulses in the country. Targets to increase production of pulses from 25 MT in 2018 to 35 MT in 2030. It is enough since consumption growth of India is almost increasing by 8 percent for short term further it will drive by above stated factors.

However, government is imposing some regulatory restrictions to the import of pulses to safeguard the interest of farmers.

Methodology

KoPT is the only port in the Eastern India that imports pulses and supplies to the entire region. Based on previous traffic handling data pertaining to type of pulses, proportions of Peas like Chikpeas, Moong, Lentils and Pigeon Peas have been worked out. Prior to this, proportion of various type of pulses to that of total pulses is worked out by taking average proportion of FY 16 to FY 18. Following table depicts estimated overall and KOPT port level proportion for pulses

Table 5-35: Average import proportion of Pulses

Key Categories of Pulses	Average share of Imports	% Imported from KoPT
PEAS	48%	34%
CHIKPEAS	18%	16%
MOONG	9%	3%
LENTILS	17%	24%
PIGEON PEAS	9%	0%
	100%	

Peas constitutes highest percentage among all other types of pulses.

Following flow chart rightly elaborates the procedure followed for pulse future demand estimation

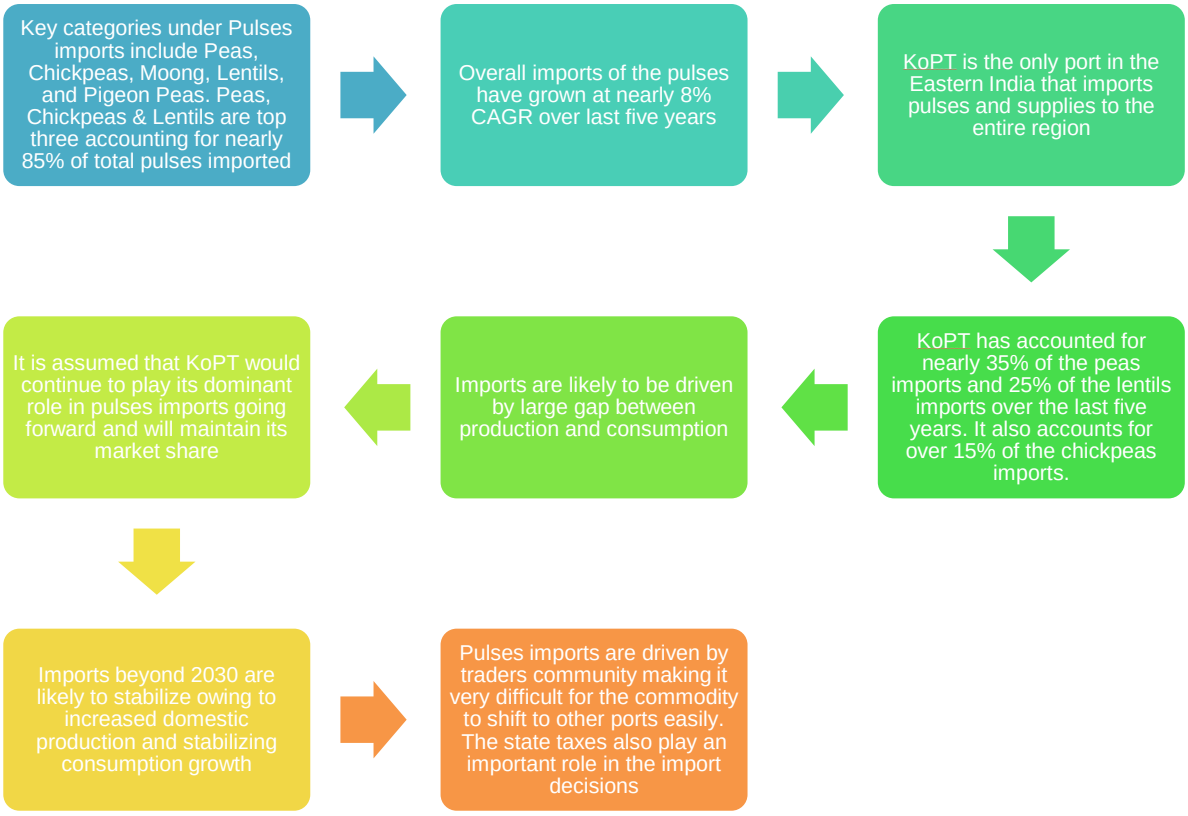


Figure 37: Pulses demand estimation procedure flow chart

Estimation of Growth Rate

To find out growth rate for production, consumption and import various policy and GOI initiatives are considered. Government of India's aim to reach production of pulses to 35 MT by 2030 is one of them.

For production related estimation, historic data of year starting from FY2014 to FY 2018 is listed out. Based on government's plan to increase production by 35 MT in 2030, CAGR is worked out between FY 2018 and FY 2035. It was approximately estimated as 3 %. Using 3 percent growth production quantity for horizon years is found out.

For Consumption related estimation, CAGR between FY 2014 and FY 2018 consumption growth has been found out i.e.7.97%. Consultant assumed that current consumption growth would increase till 2025. Thereafter for a period of FY 2026-30, it would get halved and after FY 2031, it would further get halved. Reason being, per capita income would increase by FY25 and after that it will be incremental increase based on population growth and partial increase in consumption.

For Import calculation for horizon years, difference between consumption and production is used.

Output

Calculated Import quantity further proportioned using overall proportionate percentage of different type of pulses at overall level first then at KOPT level. Following table replicates future estimated demand for Pulses

Table 5-36: Pulses Forecasted demand for horizon year

Year	Production (India) (in MT)	Consumption (India) (in MT)	Imports (India) (in MT)	PEAS	CHIK PEAS	MOONG	LENTILS	PIGEON PEAS	TOTAL (KoPT)
				Share of Imports at KOPT					
FY 17	20.5	27.9	5.1						
FY18	25.2	30.6	5.6						
FY20	26.8	35.7	8.9	1.5	0.2	0	0.4	0	**2.1**
FY25	31	50.5	19.4	3.2	0.5	0	0.8	0	**4.6**
FY30	36	61.3	25.4	4.2	0.7	0.1	1	0	**6**
FY35	41.7	67.7	26	4.3	0.7	0.1	1.1	0	**6.1**
FY39	46.9	73.3	26.3	4.3	0.7	0.1	1.1	0	**6.2**

5.6 Lime Stone

Limestone is a sedimentary rock composed mainly of calcium carbonate (CaCO3) in the form of the mineral calcite. About 10% of sedimentary rocks are limestone and most cave systems are through limestone bedrock. The two most important constituents of limestone are calcite and dolomite.

5.6.1 Global Scenario

In 2018, the estimated total production of lime worldwide was 420 million metric tons. CAGR of last 5 years is found to be 3.9%. Highest growth of lime production is recorded as 18% between year 2016 and 2017. However, lime production year on year growth for 2017 to 2018 is low. It was recorded as 1.7%. Globally, China is leading the chart and it is producing around 300 MTPA (71%) of the world's lime production. Other lime producing nations which are second and third on list are United States and India. Compared to China, their contribution to world's lime production is much lesser. They produced around 19 MTPA (4.5%) and 16 MTPA (3.8%) respectively[81]

[81] Statistica

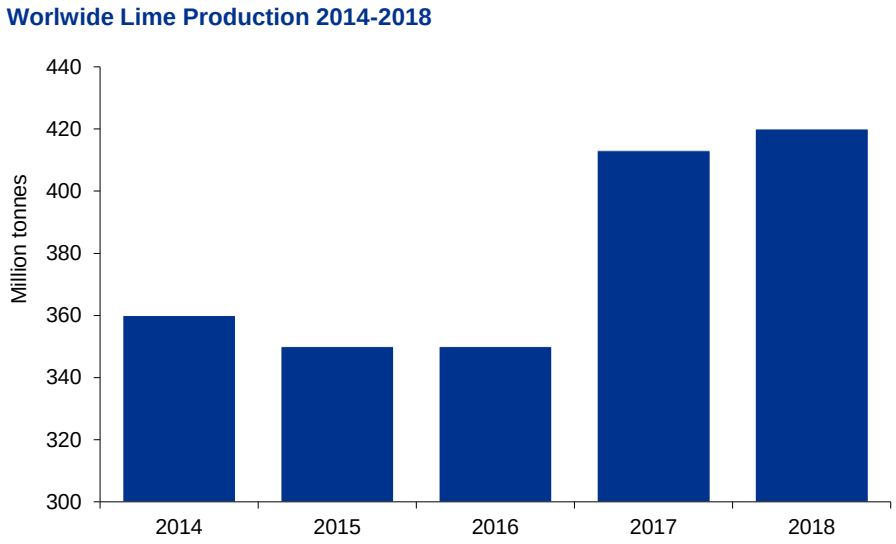


Figure 38: Worldwide Lime Production 2014-2018

5.6.2 Indian Scenario

The total reserves of limestone of all categories and grades as per NMI database based on UNFC system as on 1.4.2015 has been estimated at 2,03,224 million tonnes, of which 16,336 million tonnes (8%) are placed under Reserves category and 1,86,889 million tonnes (92%) are under Remaining Resources category. Karnataka is the leading state having 27% of the total resources followed by Andhra Pradesh & Rajasthan (12% each), Gujarat (10%), Meghalaya (9%), Telangana (8%) and Chhattisgarh & Madhya Pradesh (5% each). The remaining 12% is shared by other states. Grade-wise, cement grade (Portland) has leading share of about 70% followed by Unclassified grades (12%) and BF grade (7%). The remaining 11% is shared by various other grades [82]

Production

The production of limestone in 2017-18 at 338.55 million tonnes increased by about 7.59% as compared to that of the previous year. There were 711 reporting mines in 2017-18 as against 832 during the previous year. Ten principal producers contributed about 53% of the total production. About 3.28% of the production was reported by Public Sector mines as against 3.35% in the previous year. About 97% of the total production of limestone during 2017-18 was of cement grade and the remaining 3% was of other grades.

Rajasthan is the leading producing State accounting for (22%) of the total production of limestone, followed by Madhya Pradesh (13%), Andhra Pradesh & Chhattisgarh (11% each), Karnataka (9%), Telangana (8%), Gujarat (7%) and Tamil Nadu (6%). The remaining 13% was contributed by Maharashtra, Himachal Pradesh, Meghalaya, Odisha, Uttar Pradesh, Assam, Jharkhand, Jammu & Kashmir, Kerala and Bihar. Mine-head closing stocks of limestone for the year 2017-18 were 15.2 million tonnes as against 14.6 million tonnes in previous year.

Consumption

In 2017-18, the total consumption of limestone, as reported by different industries was 288.43 million tonnes. Cement was the major consuming Industry accounting for 94%

[82] Indian Minerals Yearbook 2018

consumption, followed by Iron & Steel (4%) and Chemical (2%). Negligible consumption was reported by aluminum, sugar & other industries.

Foreign Trade

Export

As per the Foreign Trade Policy 2015-20, the exports of limestone and lime shell are free. Exports of limestone decreased drastically by 35% to 2.81 million tonnes in 2017-18 from 4.33 million tonnes in the previous year. Limestone in bulk was exported mainly to Bangladesh (95%) and UK (2%) Overall exports were mainly to Bangladesh (80%), Oman (10%) and Democratic Republic of the Congo & Angola (5% each).

Import

Foreign Trade Policy 2015-20 has provision for the free import of limestone and lime shell. Imports of limestone increased considerably by 14% to 20.83 million tonnes in 2017-18 from 18.30 million tonnes in the previous year. Limestone was imported mainly from UAE (78%), Oman (13%), Vietnam (4%) and Malaysia (3%). India is largest importer of limestone, with 48% market share, followed by Japan, South Korea, Germany and Netherlands.

5.6.3 Forecasting methodology for Lime stone

Kolkata Port

The hinterland for Kolkata Port comprises of West Bengal, Jharkhand and Odisha, where most of India's large steel manufacturing plants are located. Hence the largest consumers of steel grade limestone are in the hinterland. In the year 2018, 2.2 MTPA limestone traffic was handled.

Methodology

Projection of limestone port traffic is derived from the steel estimates mentioned in Steel Policy about steel manufacture. In 2018, steel manufactures stand at 137 MTPA, whereas limestone traffic recorded as 2.2 MTPA for Kolkata port. As per steel policy, by the year of 2030, steel manufacture will reach figure of 300 MTPA[83]. In line with this information, limestone traffic is calculated for year 2031. After calculating limestone traffic for 2030, CAGR between 2018 and 2031 is calculated. Calculated CAGR is used to find yearly traffic for Kolkata Port from 2018 to 2030. Post 2031, growth rate 7% derived from GDP (5%) and output multiplier (1.4) is used.

Split between limestone traffic of KDS (4%) and HDC (96%) of year 2018 is used for future years.

Following table represents limestone traffic for future years.

Table 5-37: Limestone Imports at KoPT in MTPA

Year	Limestone imports at KDS (MTPA)	Limestone imports at HDC (MTPA)	Limestone imports at KoPT (MTPA)
2025	0.13	3.22	3.36
2031	0.19	4.63	4.82
2035	0.25	6.07	6.32
2039	0.33	7.95	8.28

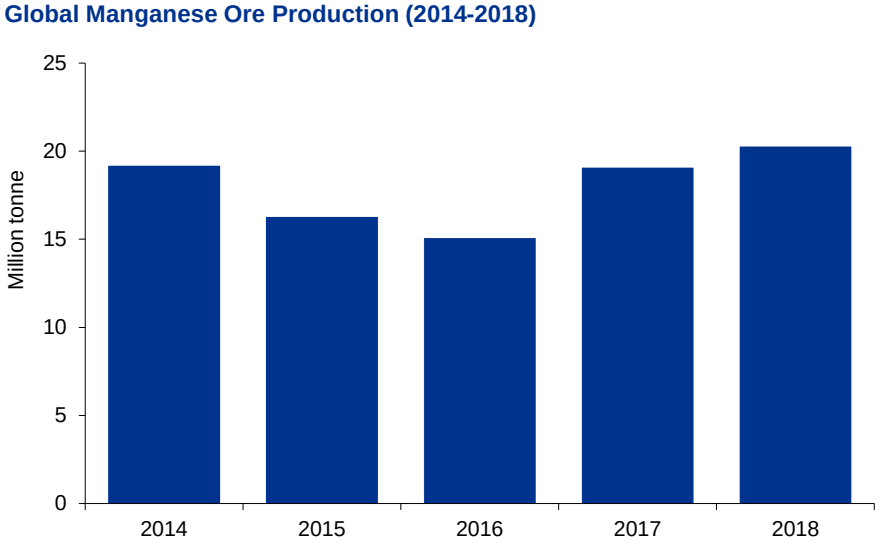
[83] Steel Policy 2017

5.7 Manganese Ore

Manganese occurs as silvery grey in color and is very hard and brittle in nature. It is always available in combination with iron, laterite and other minerals. Manganese in alloy form is an essential input in steel making and steel is one of the most important key indicators in the industrial economy of any country. Manganese ores of major commercial importance are pyrolusite Psilomelane, manganite and braunite.

5.7.1 Global Scenario

The world's output of manganese ore increased in 2018 for the second consecutive year, on rising demand from manganese alloy smelters. It reached 20.3 million dry mt (Mn contained), up by 6% or 1.2 million dry mt from 2017, exceeding 2014 production of 19.3 million mt and marking a new record high. The additional supply mostly came from Africa and Australia, driven by China, where output decreased because of mine depletion and stricter safety regulations. Following table represents global Manganese Ore production for period of 2014-



2018[84].

Figure 39: Global Manganese Ore Production (2014-2018)

South Africa is major contributors to the production of manganese ore. In 2018, It produced almost 32 percentage of Manganese ore. Followed by South Africa, Australia and Gabon have 17% and 12 % share of global manganese ore production.

China is the largest importer of manganese ore followed by India and South Korea.

5.7.2 Indian Scenario

The total reserves/resources of manganese ore in the country as on 1.04.2015 have been placed at 495.87 million tonnes as per NMI database, based on UNFC system. Out of these, 93.47 million tonnes are categorised as reserves and the balance 402.40 million tonnes are in the remaining resources category. Gradewise, Ferromanganese grade accounts for 7%, Medium grade 11%, BF grade 28% and the remaining 54% are of Mixed, Low, Others,

[84] IMnI

Unclassified, and Not-known grades including 0.17 million tonnes of battery/chemical grade. Odisha tops the total reserves/ resources with 44% share followed by Karnataka 22%, Madhya Pradesh 12%, Maharashtra & Goa 7% each, Andhra Pradesh 4% and Jharkhand 2%. Rajasthan, Gujarat, Telangana and West Bengal together shared the remaining about 2% resources.

Production

The production of manganese ore was 2,589 thousand tonnes during 2017-18 which increased by about 8% as compared to that in the previous year. As regards grade-wise composition of production in 2017-18, 66% of the total production was of lower grade (below 35% Mn), 23% of medium grade (35-46% Mn) and 10% was of high grade (above 46% Mn). Production of manganese dioxide was 15,782 tonnes (1%) during the year.[85]

Madhya Pradesh being the leading manganese ore producing State accounted for 32% of the total production in 2017-18. Next in the order of production were Maharashtra (28%) and Odisha (20%)

Consumption

The consumption of manganese ore in all industries was about 2.65 million tonnes in 2017-18 as against 2.87 million tonnes in 2016-17. Ferro-alloys industries accounted for about 94% consumption followed by Iron & Steel (5%). The remaining (1%) was shared by Battery, Electrode, Chemical, Zinc Smelter and Alloy Steel industries.

Foreign Trade

Export

Exports of manganese ore increased substantially to 44,167 tonnes in 2017-18 from 244 tonnes in 2016-17. Out of the total exports in 2017-18, negligible quantity of manganese ore having +46% Mn of value in `29,000 was exported. Exports of manganese ore (others) were 19,367 tonnes. More than 98% of exports was to China and 1% exports to Netherlands.[86]

Import

Imports of manganese ore increased to 3.57 million tonnes from 1.91 million tonnes in the previous year. South Africa (58%), Australia (14%) and Gabon (13%) were the main suppliers of manganese ore in 2017-18. Out of the manganese ore (total) imported, manganese ore having +46% Mn contributed 3,27,431 tonnes, manganese ore having 35-46% Mn was 20,095,807 tonnes, manganese ore having 30 to 35% Mn was 4,94,928 tonnes and manganese ore (others) was 5,98,421 tonnes.

5.7.3 Forecasting methodology for Manganese Ore

The hinterland for Kolkata Port comprises of West Bengal, Jharkhand and Odisha, where most of India's large steel manufacturing plants are located. Hence the largest consumers of steel grade Manganese Ore are in the hinterland. In the year 2018, 1.56 MTPA Manganese Ore traffic was handled.

Methodology

Projection of Manganese Ore port traffic is derived from the steel estimates mentioned in Steel Policy about steel manufacture. In 2018, steel manufactures stand at 137 MTPA, whereas Manganese Ore traffic recorded as 1.56 MTPA for Kolkata port. As per steel policy,

[85] Indian Minerals Yearbook 2018

by the year of 2030, steel manufacture will reach figure of 300 MTPA[87]. In line with this information, CAGR for Steel quantity from 2018-2031 is calculated. Calculated CAGR is used to find yearly traffic for Kolkata Port from 2018 to 2030. Post 2031, growth rate 5% derived from GDP (5%) is used.

Output

Split between Manganese Ore traffic of KDS (5%) and HDC (95%) of year 2018 is used for future years. Following table depicts manganese ore import for KDS and HDC.

Table 5-38: Manganese Ore Imports at KoPT in MTPA

Year	Manganese Ore imports at KDS (MTPA)	Manganese Ore imports at HDC (MTPA)	Manganese Ore imports at KoPT (MTPA)
2025	0.12	2.26	2.38
2031	0.18	3.24	3.42
2035	0.21	3.94	4.15
2039	0.26	4.79	5.05

5.8 Fly Ash

Fly Ash is Finely divided residue resulting from the combustion of ground or powdered coal which is transported from the fire box through the boiler by flue gases.

5.8.1 Global Perspective

During the last few decades, there has been a sudden increase in coal ash production in the world due to increased amounts of energy being generated by coal-fired power plants. The countries which are moving toward rapid industrialization, such as China, and India, are showing increasing demand for coal. Asia Pacific accounted for larger share of global fly ash market in 2015. Growing urbanization in and growing population in the region have led to increasing demand for constructional activities. Improvement in the road constructions and steps adopted for ease in transport through building highways, etc has also led to high demand for fly ash thereby promoting growth of global fly ash market. Increasing demand from building and construction industry in North America is also expected to boost growth of fly ash market. Europe is projected to fuel demand for fly ash due to environmental measures adopted in the region. Middle East and Africa and Rest of the World demonstrated steady growth for fly ash in the year 2015 but are anticipated to augment during the forecast period. Hence, fly ash market is expected to experience strong demand from several countries to meet the needs of the constructional sector worldwide. Fly Ash market was valued at US$ 39,548.1 Mn in 2015 and is expected to reach US$ 64,761.9 Mn by 2022, growing at a CAGR of 7.3% during the period 2016-2022.

Cement concrete technologies have been going through immense evolutionary changes. Apart from factors such as strength, economy and durability are also playing an important role globally. Initially, cement did not possess properties of strength and durability, therefore, to make concrete durable and strong, cementious material such as fly ash was started as a practice which is now used on a large scale worldwide. Portland cement accounted for the largest share of global fly ash market in 2015 and is expected to retain its position during the period from 2016 to 2022.[88]

[87] Steel Policy 2017

[88] https://www.ripublication.com/ijac17/ijacv13n1_03.pdf

5.8.2 Indian Scenario

Based on fly ash utilization and generation data received from 167 coal/lignite thermal power stations following brief summary about fly ash is prepared and presented in the table

Table 5-39: Fly Ash Brief Summary: India

Description	Year 2017-18
Nos. of Thermal Power Stations from which data was received	167
Installed capacity (MW)	177070.00
Coal consumed (Million tons)	624.88
Fly Ash Generation (Million tons)	196.44
Fly Ash Utilization (Million tons)	131.87
Percentage Utilization	67.13
Percentage Average Ash Content (%)	31.44

5.8.3 Fly Ash Forecasting methodology

Key drivers

The key drivers of demand for fly ash are the coal based thermal power plants and cement industries. Fly ash is a byproduct of coal based thermal power plants[89]. It is estimated that 1 Megawatt (MW) of installed capacity of thermal power plant generates a demand of approximately 1326 tons of fly ash[90]. The installed thermal power capacity in 2019 is 223,027 MW[91]. Cement industry has huge demand for cement production.

Thermal energy is the main source of producing power in India. The trends in installed thermal capacity in India is as under:

Table 5-40 Trends in installed thermal capacity in India[92]

Year	Installed Thermal Capacity (MW)
2008	92,000
2012	1,25,000
2015	1,92,000
2019	223,027
2022	2,85,000

[89] https://bdnews24.com/business/2007/02/11/specialfly-ash-use-in-cement-rises-rapidly
[90] KPMG analysis
[91] http://www.knowindia.net/infraindia2.html
[92] http://indiaenergy.gov.in/wp-content/uploads/2017/10/Coal-and-thermal-power-generation-Inputs-to-National-Energy-Policy-2015.pdf

Year	Installed Thermal Capacity (MW)
2032	3,50,000
2040	3,30,000-4,41,000*[93]

Table 5-41 Trends in generation of fly ash in India[94]

Year	Installed Capacity-Thermal Power Plants (MW)	Fly Ash Generation (MT)
FY 14	1,33,381	172.87
FY 15	1,38,915	184.14
FY 16	1,45,044	176.74
FY 17	1,57,377	169.25
FY 18	1,77,070	196.44

The generation of fly ash has increased at 2.6 % per annum in the last 5 years. The policies/initiatives of the Government of India with respect to utilization of fly ash are presented below.

Fly Ash Mission[95]

Management of Fly Ash at coal/lignite based Thermal Power Stations in the country is a challenging task in view of large quantity of ash being generated and target of achieving 100% utilization of rly ash in time bound manner as prescribed in MoEF Notification of 14th September 1999 and its subsequent amendment. The land for creating ash dykes for ash disposal facilities at thermal power plants is becoming difficult to be acquired.

Fly Ash Mission, a Technology Project in Mission Mode of Government of India was commissioned during 1994 as a joint activity of Department of Science & Technology (DST), Ministry of Power (MOP) and Ministry of Environment & Forests (MoEF) with Department of Science & Technology as nodal agency. The Fly Ash Mission was set up to promote research in the area of fly ash utilization so that fly ash could be gainfully utilized instead of its disposal in ash ponds. Ministry of Environment & Forests, Government of India also issued 1st Notification on Fly Ash Utilization in September, 1999, which was subsequently amended in 2003,2009 and 2016 stipulating targets for fly ash utilization for Thermal Power Stations and use of fly ash by construction agencies within prescribed radius of any thermal power station. MoEF&CC issued the amendment dated 25th January 2016 to existing notification enjoining upon power utilities/Thermal Power Stations for 100% fly ash utilization by 31st December 2017.

Fly Ash Utilization Policy

These initiatives and policy decisions by Government of India have led to increased utilization of fly ash in various construction activities like making of fly ash-based building products, manufacturing of Portland pozzolana cement, construction of roads/highways/ flyovers, reclamation of low-lying areas, back filling and stowing of mines, waste land development, construction of Roller Compacted concrete dams etc.

Further fly ash utilization policy states the following:

- All the coal or lignite based thermal power plants shall ensure the 100 per cent utilization of ash in the construction of road.

[93] http://indiaenergy.gov.in/wp-content/uploads/2017/10/Draft-National-Energy-Policy.pdf
[94] Compiled from various reports on fly ash generation at coal/lignite based thermal power stations and its utilization in the country
[95] Report on fly ash generation at coal/lignite based thermal power stations and its utilization in the country 2017-18, CEA, 2018

- The ash would also be used in the production of bricks and other construction material, besides helping in setting up of ash-based construction material production unit within its vicinity.
- The use of fly ash is to be increased to a radius of 300 km. The thermal plants would use the ash in the construction of roads under Pradhan Mantri Gram Sadak Yojana.
- The ash is to be used in soil conditioning for improving its quality which would help in increasing the crop yield, within the radius of 300 km.[96]

5.8.4 Identification of hinterland and estimation of addressable demand for fly ash in the hinterland

The hinterland for fly ash comprises of thermal power plants located in UP, Bihar, Jharkhand, West Bengal and Orissa. In addition to the above fly ash is exported to Bangladesh.

Reasons for fly ash export to Bangladesh**:**

- **Low cost Substitute**: Fly ash is used as a low-cost substitute for clinker.[97]
- **High Export Price for Indian Exporters:** The price difference in the international market vis-vis domestic market is substantial. The traders can sell fine fly ash in retail in the domestic market at the rate of Rs 1,200 to 1,400 per tonne, while the reported international price of fly ash per tonne ranges from $70 to $130. [98]
- **Lack of coal-based power plants in Bangladesh:** Bangladesh has very few coal based thermal plants. In 2011, coal supplied only 2.5% of the electricity generated. In May 2011, Bangladesh's overall coal production was around 3,000 tons a day.[99]

5.8.5 Estimation of addressable demand for fly ash in the hinterland

TPPs located in the hinterland have installed capacity of 49,652 MW which in turn generate 69.89 MT of fly ash. The details are presented in the tables below, while the number of TPPs in states comprising the hinterland are depicted in the figure below.

[96] https://www.makaan.com/iq/news-views/maharashtra-becomes-first-indian-state-to-adopt-fly-ash-utilization-policy
[97] https://bdnews24.com/business/2007/02/11/specialfly-ash-use-in-cement-rises-rapidly
[98] https://economictimes.indiatimes.com/free-fly-ash-at-whose-cost/articleshow/1521385.cms
[99] https://www.sourcewatch.org/index.php/Bangladesh_and_coal

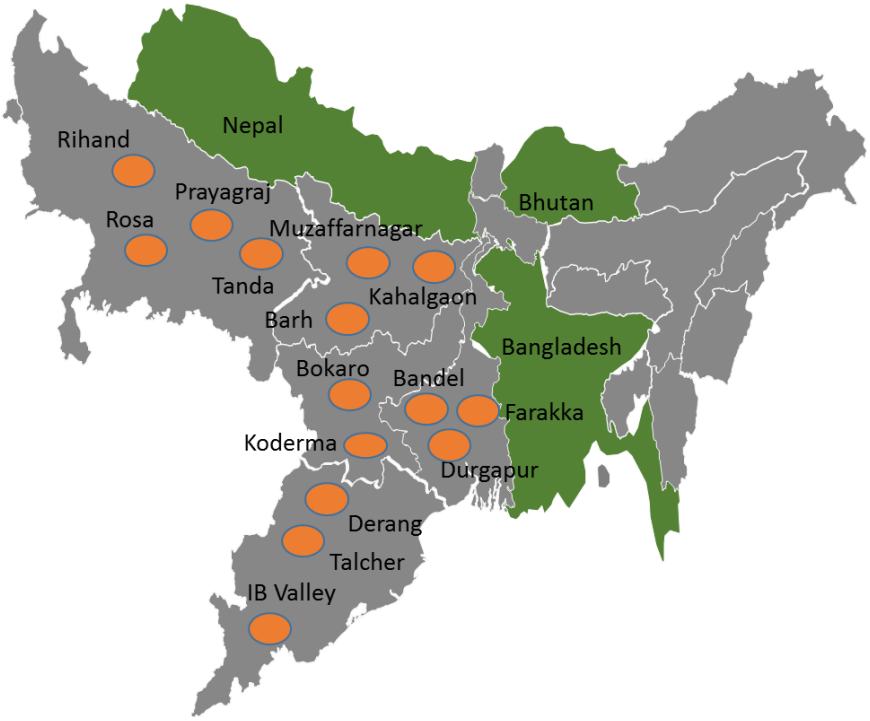


Figure 40 Major TPPs in the hinterland

Table 5-42 TPPs in the hinterland[100]

Name of TPP	State	Installed Capacity (MW)	Quantum of fly ash generated (MT)
Barkhera	Uttar Pradesh	90	0.0630
Khambar Khera	Uttar Pradesh	90	0.0605
Kundarki	Uttar Pradesh	90	0.0567
Maqsoodpur	Uttar Pradesh	90	0.0545
Utraula	Uttar Pradesh	90	0.0578
Lalitpur	Uttar Pradesh	1980	1.7026
Dadri	Uttar Pradesh	1820	2.1540
Singrauli	Uttar Pradesh	2000	3.4830
Rihand	Uttar Pradesh	3000	4.3440
Unchahar	Uttar Pradesh	1050	1.6800
Tanda	Uttar Pradesh	440	0.7080
Prayagraj	Uttar Pradesh	1980	1.0065
Rosa	Uttar Pradesh	1200	1.6195
Anpara	Uttar Pradesh	2630	4.3296
Hardauganj	Uttar Pradesh	670	0.9625
Obra	Uttar Pradesh	1000	1.0592
Panki	Uttar Pradesh	210	0.1099
Parichha	Uttar Pradesh	1140	1.7985

[100] Report on fly ash generation at coal/lignite based thermal power stations and its utilization in the country 2017-18, CEA, 2018

Name of TPP	State	Installed Capacity (MW)	Quantum of fly ash generated (MT)
Subtotal		**19,570**	**25.25**
Kahalgaon	Bihar	2340	4.1850
Barh	Bihar	1320	2.4850
Nabinagar	Bihar	500	0.2699
Muzaffarnagar	Bihar	610	0.4411
Subtotal		**4,770**	**7.37**
Bokaro	Jharkhand	710	0.8753
Chandrapura	Jharkhand	630	1.0041
Koderma	Jharkhand	1000	1.5238
Patratu	Jharkhand	455	0
Jojobera	Jharkhand	547.50	0.7987
Tenughat	Jharkhand	420	0.6034
Maithon	Jharkhand	1050	1.7026
Subtotal		**4,812**	**6.50**
BBGS	West Bengal	750	1.2956
SGS	West Bengal	135	0.0510
TGS	West Bengal	240	0
Durgapur	West Bengal	210	0.2835
Meja	West Bengal	2340	3.6852
Durgapur Steel	West Bengal	1000	1.7101
Raghunathpur	West Bengal	1200	0.6347
DPPS	West Bengal	660	0.6047
Farakka	West Bengal	2100	3.0190
Kolaghat	West Bengal	1260	1.4990
Sagardighi	West Bengal	1600	1.3805
Bandel	West Bengal	455	0.5742
Santaldih	West Bengal	500	0.0806
Barkeshwar	West Bengal	1050	1.6996
Haldia Energy	West Bengal	600	1.0290
Dishergarh	West Bengal	12	0.0353
Subtotal		**14,112**	**17.58**
GMR Kamalanga	Orissa	1050	1.3929
Indian Metals & Ferro Alloys	Orissa	258	0.4235
Derang	Orissa	1200	1.1325
Talcher	Orissa	460	1.2300
Talcher	Orissa	3000	7.9190
IB Valley	Orissa	420	1.0961

Name of TPP	State	Installed Capacity (MW)	Quantum of fly ash generated (MT)
Subtotal		**6,388**	**13.19**
Total		**49,652**	**69.89**

5.8.6 Total addressable demand for fly ash in the hinterland

Based on the above, the total addressable demand for fly ash in the hinterland is~ **70 MT**

Entire fly ash generated is exported to the Bangladesh. However**,** only a fraction i.e. 2.98MT [HDC-1.11; KDS-1.87] out of potential 70 MT of the fly ash generated is being handled (exported) by KoPT due to the following reasons:

- Only 67% of the fly ash generated is utilized as of date
- Fly ash is used extensively in cement industry in Bangladesh – which has shortage of domestic fly ash

Estimation of Growth Rate

Growth rates have been estimated based on Bangladesh's economic activity. It is estimated that GDP of Bangladesh will grow by 5 percentage for a period 2016-2050[101]: Output multiplier for cement industry for GD is 1.69[102].

Growth rate is found out by multiplying output multiplier with GDP growth rate i.e.8.44%.

Output

Forecast year fly ash traffic is calculated using growth rate f 8.44%. However, because Bangladesh shall have 3840 MW of TPP, the demand for fly ash is expected to stagnate post 2035. Considering all mentioned facts, KoPT Traffic is capped at 10MTPA. In year 2034, KoPT (HDC and KDS) would reach 10 MTPA traffic.

Following table represents forecasted traffic for fly ash

Table 5-43: Forecasted Fly Ash Traffic for horizon years

Year	Demand for fly ash at KDS (MTPA)	Demand for fly ash at HDC(MTPA)	Demand for fly ash at KOPT (MTPA)
2025	3.31	1.95	5.26
2031	5.38	3.17	8.55
2035	6.32	3.73	10.05
2039	6.32	3.73	10.05

[101]https://www.dhakatribune.com/bangladesh/2017/02/08/report-bangladesh-become-28th-powerful-economy-13-years

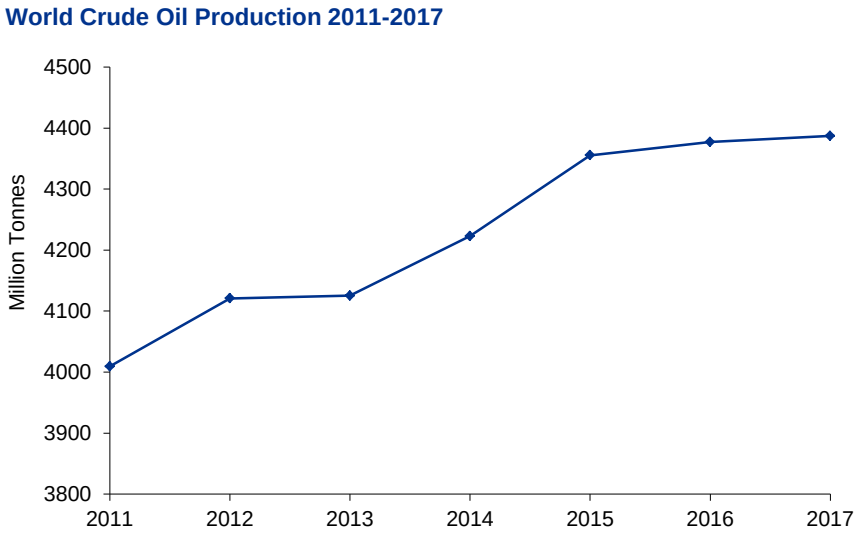
[102] https://www.researchgate.net/publication/319976537_ECONOMY WIDE_MATERIAL_FLOW_ANALYSIS_OF_CEMENT_INDUSTRY_IN_BANGLADESH

5.9 Petroleum, Oil and Lubricants (POL)

Petroleum is a naturally occurring, yellowish-black liquid found in geological formations beneath the Earth's surface. It is commonly refined into various types of fuels. The name petroleum covers both naturally occurring unprocessed crude oil and petroleum products that are made up of refined crude oil.

5.9.1 Global Scenario

Global crude oil production rose (+0.2%) driven by growth in the United States. OPEC members in June 2018 agreed to increase oil production to prevent a supply shortage and reduce prices after previous production cuts were deemed excessive and raised prices too much. This stabilised global prices, before rising again on anticipation of US sanctions on Iranian oil exports. To have clear picture of growth of crude oil, historical data of crude oil



production starting from 2011 to 2017 have been plotted and represented in below figure.

Figure 41: World Crude Oil Production (2011-2017)

Crude oil production in the United States saw a significant increase as exploration and extraction of oil from its plentiful shale reserves grew, causing the largest ever annual increase by a single country. This was due to new projects coming online, a persistent demand for oil and higher prices (US$14 per barrel higher than 2017). Oil production also continued to increase in Russia, the Middle East (except Iran) and in Africa.

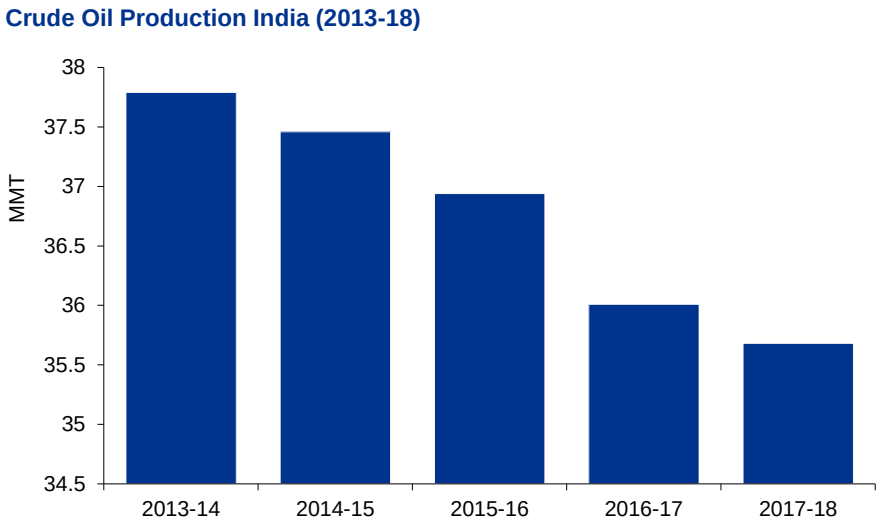
On the other hand, Latin America experienced an overall decline. Political issues mounting in Venezuela and, paired with sanctions from the United States, saw oil production drop. Similarly, Iranian oil production tumbled, down, after international sanctions were reinstated. In 2017, United States, Saudi Arabia and Russia are top 3 crude oil producing countries. Collectively, they produced 38.4 percent of World's crude oil production in 2017.[103]

5.9.2 Indian Scenario

Production

[103] EnerData Global Statistics Yearbook 2019

The crude oil production during the year 2017-18 is at 35.68 Million Metric Tonnes (MMT) as against production of 36.01 MMT in 2016-17, showing a decline of 0.9%. Shortfall in production by ONGC was mainly due to delay in deployment of MOPU-Sagar Samrat, non-realization of production from Integrated Development of B-127 Cluster due to delay in implementation', ESP related issues in NBP field of western offshore and increase in water cut in wells of Heera, Neelam & B-173 fields[104]. Following graph depicts 5 years of crude oil



production statistics.

Figure 42: Crude Oil Production of India (2013-18)

Indian refinery industry has done well in establishing itself as a major player globally. India, which is second largest refiner in Asia after China, is emerging as a refinery hub with refining capacity exceeding demand. The country's refinery capacity has increased to 247.57 MMTPA in 2018-19 Refinery Crude Throughput (Crude Oil Processed) for the year 2017-18 is 251.93 MMT as against 245.36 MMT in 2016-17, showing an increase of about 2.68%. Following chart represents refinery capacity and refinery throughput for last 5 years.

[104] INDIAN PETROLEUM & NATURAL GAS STATISTICS 2017-18, Ministry of Petroleum and Natural Gas Economic & Statistics Division

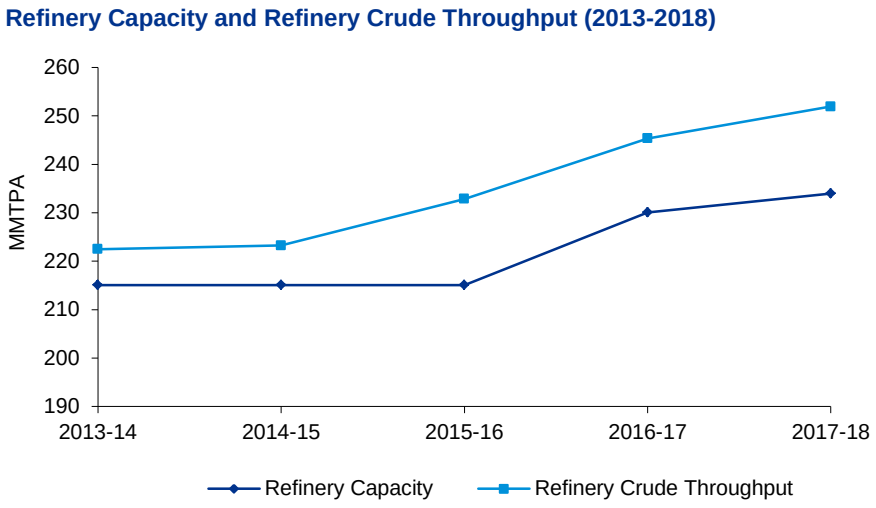


Figure 43: Refinery Capacity and Refinery Crude Throughput (2013-2018)

The production of petroleum products is at 254.40 MMT in year 2017-18 as against 243.55 MMT achieved in 2016-17, showing an increase of about 4.46%. During the year 2017-18, the consumption of petroleum products in India was 204.92 MMT with a growth of 5.31 % as compared to consumption of 194.60 MMT during 2016-17.

Foreign Trade

In 2016, trade deficit of India stands at 176.4 of million tonnes which was of 81.4% of India's overall consumption of oil. In 2017, the trade deficit further increases to 181.4 million tonnes. It was recorded as 81.8% India's overall consumption for that year.

Import

Import of crude oil in the country during 2017-18 was 220.43 MMT which marked a growth of 3.04% over the imports of crude oil of 213.93 MMT during 2016-17. However, the increase was 20.37% in value terms over the same period.

Import of Crude oil and Petroleum product is plotted for year starting from 2011 to 2018 and it is shown in figure.

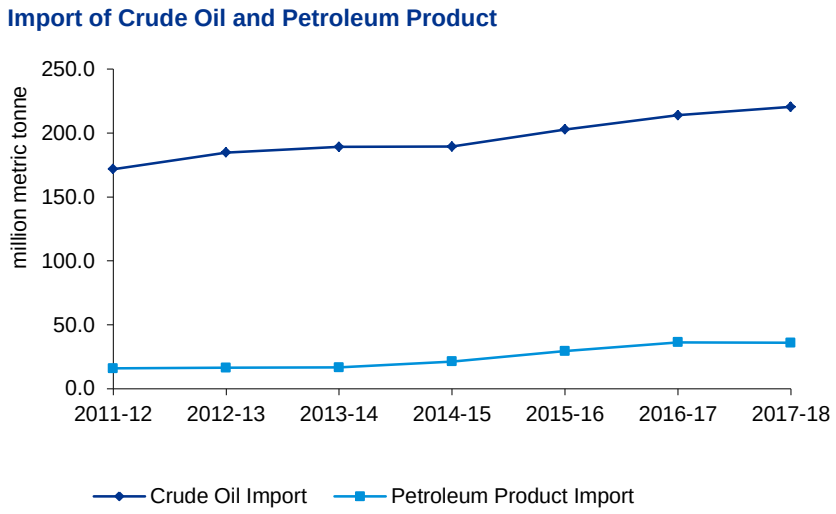


Figure 44: Import of Crude Oil and Petroleum Product

Export

India's crude oil trade deficit is very high; hence it does not have any export figures in this section. However, petroleum product's export scenario for a period 2011-18 is presented in the form of graph. Highest export figures were observed in year 2013-14 which stands at 67.9 MMTPA. However, years after that export for petroleum product dip down for next two consecutive year and started picking up from 2015-16.

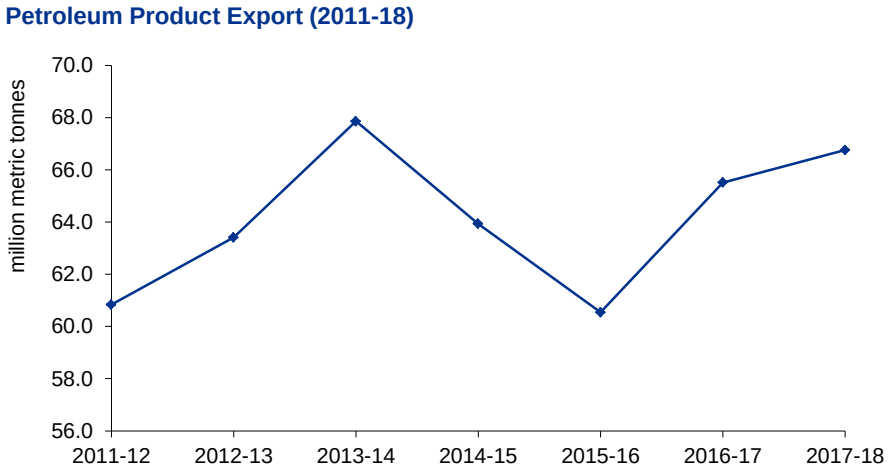


Figure 45: Export Figures for Petroleum products (2011-18)

5.9.3 Port Traffic Scenario

To get clear picture about POL traffic handled by various ports, traffic data from FY 2004-05 to FY 2017-18 have been plotted for all, major and non-major ports ports. No identical trend was observed. Highest traffic was handled in year 2017-18 which was 406.7 Million tonnes for all ports. CAGR of 5.9 percent is observed during this period. Following graph represents details POL about traffic handled by all ports for a period of 2004-2018. POL & its products continue to be the single largest commodity handled by the ports.

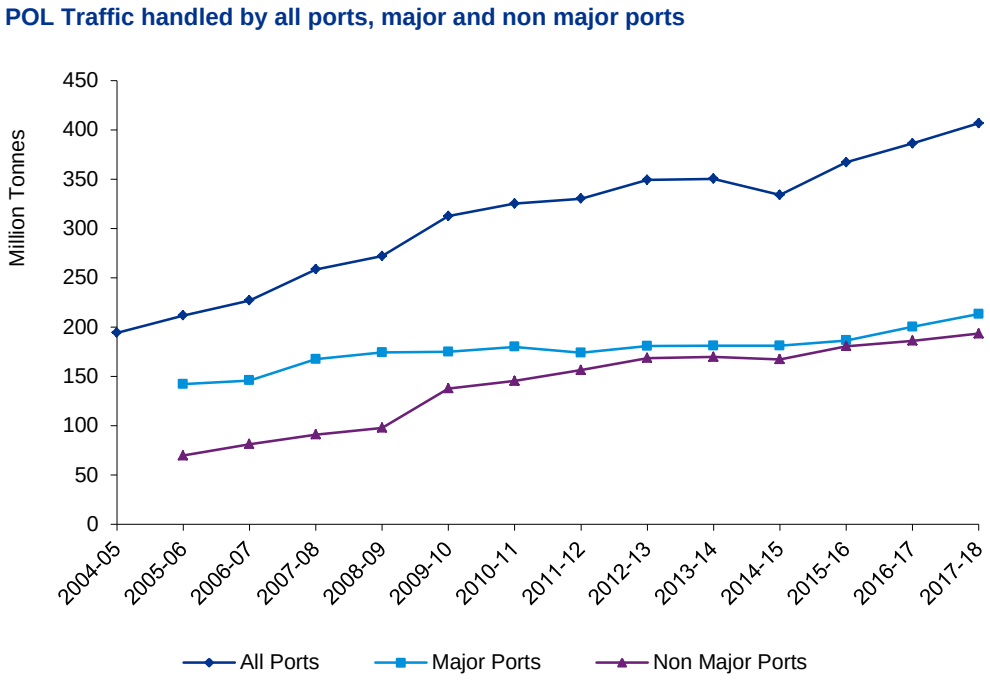


Figure 46: POL Traffic Handled by all ports, major ports and non-major ports (2004-2018)[105]

POL traffic handled by 12 major ports is listed in below table. Highest traffic was handled by Deendayal Port i.e. by Kandla Port. It has handled POL traffic around 60.45 million tonnes.

Table 5-44: POL traffic handled by major ports

Traffic handled at major ports in 2017-18	
Major Ports	**POL ('000 tonnes)**
Deendayal	60452
Mumbai	36745
J.L.Nehru	4013
Mormugao	629
New Mangalore	22509
Cochin	18664
V.O.Chidambaranar	466
Chennai	13497
Kamarajar	3021
Visakhapatnam	13057
Paradip	33776
Haldia Dock Complex	5651
Kolkata Dock System	781
All Ports	213261

[105] BASIC PORT STATISTICS OF INDIA 2017-18

5.9.4 POL forecasting methodology

Kolkata Port

Most of the major oil companies have set up refineries in Haldia - Indian Oil Corporation Limited (IOCL), Bharat Petroleum Corporation Limited (BPCL), Hindustan Petroleum Corporation Limited (HPCL), Reliance Industries Limited (RIL) etc. The biggest oil refinery is IOCL with a capacity of 7.5 million metric tonnes per annum[106]. Moreover, BPCL is in the process of setting up an LPG import terminal at Haldia with a capacity to cater to two 15,000 tonnes vessels[107]. However, it is to be noted that most of the POL products imported using Haldia port are consumed within a radius of 100-300 km of Haldia.[108] Therefore the immediate hinterland for POL is 100-300 km from the port.

However, the hinterland for POL are the states of Orissa, Jharkhand, West Bengal, Bihar, Jharkhand, Uttar Pradesh and North East India. This is primarily governed by the PMUG project.

Based on above discussion, following refineries have been identified in the hinterland.

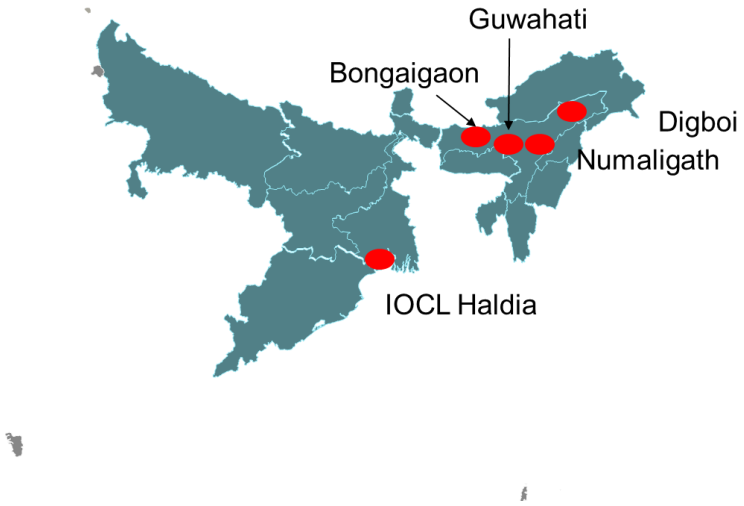


Figure 47: Refinery network in the hinterland

The capacity of identified refineries is presented in below table

Table 5-45: Refinery Capacities in the Hinterland

Refinery Name	Capacity MMTPA
Digboi	0.65
Guwahati	1
Bongaigaon	2.35
Numaligarh	3
Haldia	7.5
Total	**14.5**

In 2018, at KoPT 6.45 MTPA traffic of POL is recorded, out of which 86% was handled by HDC.

[106] https://www.iocl.com/aboutus/HaldiaRefinery.aspx

[107] https://www.projectstoday.com/News/BPCL-LPG-terminal-at-Haldia

[108] Sagarmala National Perspective Plan, Ministry of Shipping, 2016

Methodology

Major growth drivers for demand of POL included Gross Domestic Product and Growth of industries. India is one of the fastest growing economies in the world. The rapid growth of GDP (6.7% in 2017-18) of the country has translated into burgeoning demand for energy, particularly demand for crude oil and other petroleum products.[109] The import of crude oil in FY 18 was 220.43 million tonnes, while the import of petroleum products for the corresponding period was 35.89 million tons. The trends in import of crude oil and petroleum products for the last 7 years is presented below.

Table 5-46 Imports of crude oil and petroleum products in India

Year	Imports-Crude Oil	Growth Rate of imports (%)	Imports-Petroleum Products	Growth Rate of imports (%)
FY 12	171.73	4.97	15.85	-8.8
FY 13	184.80	7.61	16.35	3.18
FY 14	189.24	2.40	16.70	2.10
FY 15	189.43	0.10	21.30	27.57
FY 16	202.85	7.08	29.46	38.28
FY 17	213.93	5.46	36.29	23.19
FY 18	220.43	3.04	35.89	-1.09

Another major contributor to growth of POL is steady growth of automobile sector. Following approach is used to estimate future traffic due to POL.

In 2018, 6.45 MTPA Traffic was handled at KoPT out of which, 87.6 percentage was handled by HDC and 12.4 percentage was handled by KDS.

Government of India's flagship program Sagarmala to enhance the performance of logistic sector projected Kolkata Port's POL traffic as 7.7 MTPA in 2025. In line with this information CAGR between Traffic of 2018 and 2025 is found out. Therefor for a period 2018-2015, growth is calculated as 2.56%. Thereafter for a period of 2026-2030, due to infrastructure trade and industrial development growth will further increase and attain value of 6.1 %. Period starting from 2031, growth will stabilised to 5% in line with GDP.

The Numaligarh Refinery expansion from 3 MMTPA to 9 MMTPA is a part of the ambitious 'Hydrocarbon Vision 2030 for the North East'. The Cabinet Committee of Economic Affairs (CCEA) of the Government of India has given investment approval for Numaligarh Refinery Ltd's 3 to 9 MMTPA expansion project on 16.01.2019. The approved cost of the project is Rs. 22,594 crores. Govt. of India has also approved an amount of Rs. 1,020 crores as capital subsidy for the project.

With and without Numaligarh Refinery expansion project, projections are presented in the below table

Table 5-47: POL traffic projection for KoPT

Year	Demand for POL at KDS (MTPA)	Demand for POL at HDC (MTPA)	Demand for POL at KOPT (MTPA)	Demand for POL at KOPT after Numaligarh Refinery Expansion (MTPA)

[109] Indian Petroleum and Natural Gas Statistics, 2017-18, MoPNG

2025	0.95	6.75	7.7	9.7
2031	1.35	9.52	10.87	
2035	1.64	11.57	13.21	19.21
2039	1.99	14.07	16.06	22.06

5.10 Liquified Natural Gas (LNG)

Natural gas is a naturally occurring hydrocarbon gas mixture consisting primarily of methane, but commonly including varying amounts of other higher alkanes, and sometimes a small percentage of carbon dioxide, nitrogen, hydrogen sulfide, or helium.

5.10.1 Global Scenario

Middle East has reserves of 79.1 Trillion cubic metres of Natural Gas which stands highest share region wise (40.9%) in Proven Reserve of Natural Gas in world (193.5 Trillion cubic metres). Total Europe &CIS (62.2 Trillion cubic metres) followed by Asia Pacific region (19.3 Trillion cubic metre) is having the second and third largest share region wise in World Natural gas reserves. World Natural gas production in 2017 was recorded as 3164.6 Million Tonnes Oil Equivalent (MTOE) as compared to 3052.3 MTOE in 2016, which registered a growth of 3.7%. Total Europe & CIS region accounted for 30.1 % share (951.23 MTOE) in global consumption of natural gas at 3156 MTOE followed by North America at 25.7% (810.7 MTOE). In 2017, United States have maximum share of world natural gas production followed by Russia and Iran. Jointly they constitute 43.4 percent share of World's natural gas production.

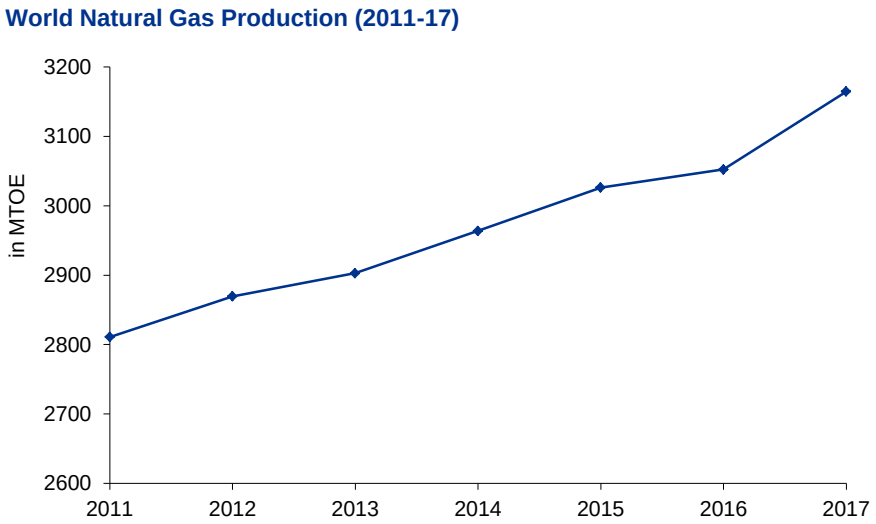


Figure 48: World Natural Gas Production 2011-17

Consumption wise United States, Russia and China stands first, second and third respectively. In 2017, US has consumption of 635.8 MTOE which is 20.1 percent of world's consumption share.

5.10.2 Indian Scenario

It has an existing pipeline of 16,200 km and 15,000 additional km of pipeline are to be added soon. This is being done with an objective of achieving 15% share of LNG in the total energy mix in 2022, which in 2017 was 6.5%. In order to do so, the government has facilitated an enabling regulatory mechanism. Some of the steps taken are as under:

- Ministry of Road Transport & Highways have incorporated LNG as an automotive fuel in Central Motor Vehicle Rules in 2017
- Petroleum and Natural Gas Regulatory Board Regulations, 2008 has included LNG fuel stations under the definition of natural gas stations
- Petroleum & Explosives Safety Organization has formed an expert committee to form regulations for installation of LNG Fuel tank and dispensing stations

Production

Natural Gas production during the year 2017-18 is at 32.65 Billion Cubic Meters (BCM) which is 2.36% higher than production of 31.90 BCM in 2016-17. Gas production was also affected due to number of unscheduled shutdowns of plants of major gas customers like BCPL, BVFCL, NTPF & LTPS and various intermittent problems like bandhs, blockades in operational areas in Assam. The trends for production of natural gas from 2011-12 to 2017-18 has been depicted below. From 2011-12 to 2016-17, production of natural gas is declining. Percentage change of between last two years shows some positive improvement i.e. 2.36%

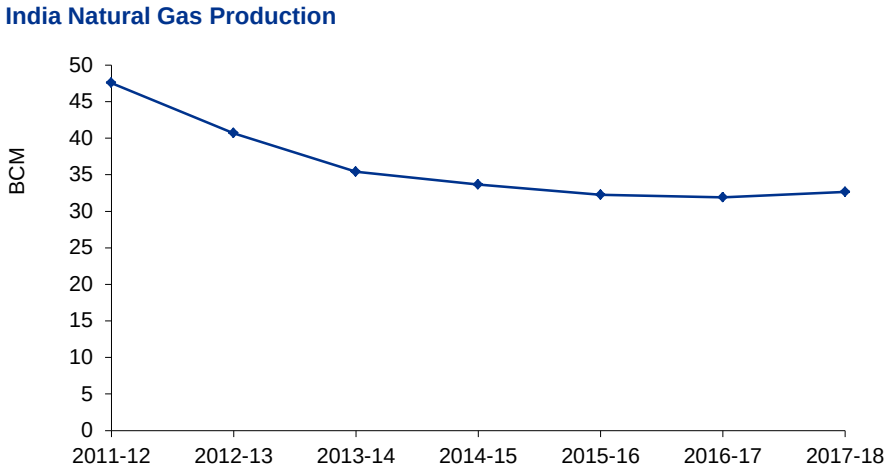


Figure 49: India Natural Gas Production (2011-12 to 2017-18)

Foreign Trade

Import

India is 4th largest importer of LNG in the world. During 2017-18, import of LNG was 19.87 MMT which registered an increase of 6.65% in quantity terms against imports of 18.63 MMT

of LNG during 2016-17. Import for 2011-12 to 2017-18 is presented in the form of charts and presented below.[110]

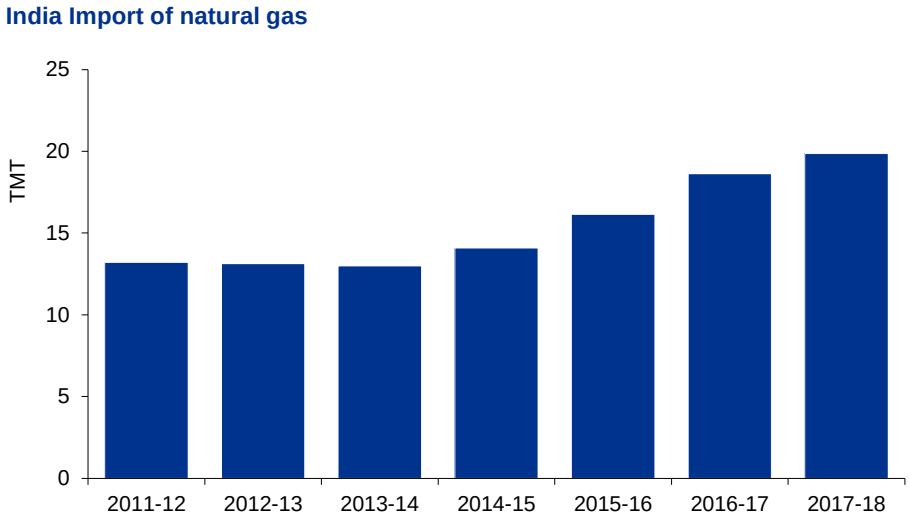


Figure 50: India natural gas import 2011-12 to 2017-18

Export

There is no export quantity recorded under natural gas as a commodity

5.10.3 LNG demand forecasting methodology

LNG demand at Kolkata Port drives by two factor 1) Urja Ganga Phase II pipeline 2) Floating storage and regasification unit (FSRU) at West Bengal

Urja Ganga Phase II pipeline

The Pradhan Mantri Urja Ganga (PMUG) project, was inaugurated in July 2015. The pipeline system will pass through five Indian states including Uttar Pradesh, Bihar, Jharkhand, Odisha and West Bengal.

In Phase-II, the pipeline will be extended to West Bengal and Odisha and connect via en-route spur lines to Barauni, Bokaro, Ranchi, Sindri, Rourkela, Sambalpur, Jharsuguda, Angul, Cuttack, Bhubaneshwar, Paradip, Jamshedpur, Durgapur, Kolkata and Haldia.

The pipeline is also proposed to be extended to Assam via the 729km-long Barauni-Guwahati pipeline by the end of 2021.[111]

Design capacity of 16 million metric standard cubic meters of natural gas a day (Mmscmd)

The potential gas sources for the JHBDPL pipeline include regasified LNG (RLNG) from the Dahej (Gujarat) and Dabhol (Maharashtra) terminals via the Vijaipur-Auraiya-Phulpur pipeline, gas from Reliance Industries' coal bed methane blocks near Shahdol in Madhya Pradesh via the 302km Shahdol-Phulpur gas pipeline, and RLNG from the 5Mtpa Dhamra LNG import terminal.

[110] INDIAN PETROLEUM & NATURAL GAS STATISTICS 2017-18 SEPTEMBER 2018

[111] https://www.hydrocarbons-technology.com/projects/jagdishpur-haldia-and-bokaro-dhamra-pipeline-phase-two/

Contracts for 3,400-km Jagdishpur (Uttar Pradesh) -Haldia (West Bengal) & Bokaro - Dhamra Natural Gas Pipeline (JHBDPL) has already been awarded. 1836 Km stretch will be completed by 2020. Following figure shows site location for Urja Ganga Phase II

Figure 51: Urja Ganga Phase II pipeline

Floating storage and regasification unit (FSRU) at West Bengal

H-Energy is planning to commission its upcoming West Bengal LNG Re-gasification terminal (RLNG) terminal by May 2021 at the cost of Rs 1,500 crore. BCPL intends to develop a small-scale LNG storage and regasification terminal on the banks of Hooghly River, Matriramchak village, East Medinipur, West Bengal.

he LNG terminal will have an initial regasification capacity of 1.5-3 Million Tonne Per Annum (MMTPA), which will be expanded to 5 MMTPA in the future[112]

Considering all these factors demand have been calculated and represented in the form of following charts

[112] https://www.projectstoday.com/News/Work-underway-on-Bengal-Concessions-FSRU-unit

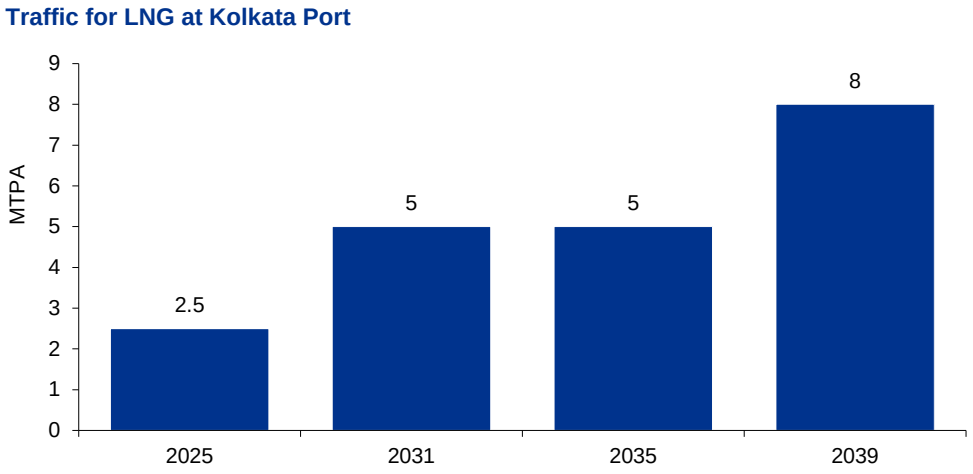


Figure 52: Forecasted Traffic for LNG

Chapter 6:
Traffic Summary

6 Traffic Summary

The traffic forecast discussed in above chapter is summarized in the following table

Table 6-1Traffic summary

Commodity	All figures in Million Metric Tons											
	FY 25			**FY 31**			**FY 35**			**FY 39**		
	KDS	**HDC**	**KoPT**	**KDS**	**HDC**	**KoPT**	**KDS**	**HDC**	**KoPT**	**KDS**	**HDC**	**KoPT**
Imports												
Coking Coal	0.5	19.5	**20.0**	0.6	26.2	**26.8**	0.8	31.9	**32.7**	0.9	38.7	**39.6**
N.Coking Coal	0.7	11.5	**12.2**	0.9	15.1	**16.0**	0.9	18.2	**19.1**	0.9	21.9	**22.8**
Veg Oil	1.8	3.0	**4.8**	2.1	3.3	**5.4**	1.9	3.2	**5.1**	1.8	3.0	**4.8**
Fly Ash	3.3	1.9	**5.2**	5.4	3.2	**8.6**	6.3	3.7	**10.0**	6.3	3.7	**10.0**
POL	0.9	6.7	**7.6**	1.4	9.5	**10.9**	1.6	11.6	**13.2**	1.9	14.1	**16.0**
LPG	0.0	5.1	**5.1**	0.0	7.3	**7.3**	0.0	9.2	**9.2**	0.0	11.7	**11.7**
LNG	2.5	0.0	**2.5**	5.0	0.0	**5.0**	5.0	0.0	**5.0**	8.0	0.0	**8.0**
Pulses	4.6	0.0	**4.6**	6.0	0.0	**6.0**	6.1	0.0	**6.1**	6.2	0.0	**6.2**
Mgnese Ore	0.1	2.2	**2.3**	0.2	3.2	**3.4**	0.2	3.9	**4.1**	0.2	4.8	**5.0**
Limestone	0.1	3.2	**3.3**	0.2	4.6	**4.8**	0.2	6.0	**6.2**	0.3	7.9	**8.2**

CON (MTEUs)	**0.51**	**0.10**	**0.61**	**0.66**	**0.13**	**0.79**	**0.75**	**0.15**	**0.90**	**0.86**	**0.17**	**1.04**
Total Imports*	**14.5**	**53.1**	**67.6**	**21.8**	**72.4**	**94.2**	**23.0**	**87.7**	**110.7**	**26.5**	**105.8**	**132.3**
Exports												
Thermal Coal	0.0	7	**7**	0.0	7	**7**	0.0	7	**7**	0.0	7	**7**
Iron Ore	0.2	0.6	**0.8**	0.2	0.8	**1.0**	0.2	0.8	**1.0**	0.2	0.8	**1.0**
CON (MTEUs)	**0.41**	**0.11**	**0.52**	**0.55**	**0.15**	**0.70**	**0.63**	**0.17**	**0.80**	**0.72**	**0.20**	**0.92**
Total Exports*	**0.2**	**7.6**	**7.8**	**0.2**	**7.8**	**8**	**0.2**	**7.8**	**8**	**0.2**	**7.8**	**8**
Imports+ Exports												
Total Major commodities	20.0	62.0	**82.0**	29.0	82.0	**111.0**	31.3	97.5	**128.8**	36.0	115.9	**151.9**
Other commodities	3.9	13.6	**17.6**	5.7	18.0	**23.7**	6.2	21.4	**27.6**	7.1	25.4	**32.5**
Grand total	23.9	75.6	**99.5**	34.8	99.9	**134.7**	37.4	118.9	**156.4**	43.1	141.4	**184.4**

Chapter 7:
Scenario Analysis

7 Scenario Analysis

Key scenarios considered are:

Scenario 1: Completion of Eastern DFC and increase in cargo traffic from NE India

Scenario 2: Capacity Expansion at Paradip Port and improvements in connectivity at Paradip

Scenario 3: Improvements in connectivity at Dhamra port

Scenario 4: Emergence of Tajpur and Subarnarekha Ports

7.1 Scenario 1: Completion of Eastern DFC and increase in cargo traffic from NE India

- The Eastern Dedicated Freight Corridor is expected to be completed soon
- Eastern Freight Corridor: It has a route length of 1856 km consists of two distinct segments: an electrified double-track segment of 1409 km between Dankuni & Khurja & an electrified single-track segment of 447 km between Ludhiana - Khurja - Dadri
- The total traffic in UP direction is projected to go up to 116 million tonnes in 2021-22. Similarly, in the Down direction, the traffic level has been projected to increase to 28 million tons in 2021-22
- It is also expected that traffic from North Eastern India shall increase significantly in future
- Increase in container traffic originating from North India (10% increase is expected from 2023 onwards)
- However requires port up gradation to be undertaken

7.2 Scenario 2: Capacity Expansion at Paradip Port and improvements in connectivity at Paradip

Table 7-1Proposed projects at Paradip

Project	Capacity Addition	Expected Timelines
Development of New Coal Berth for handling of Coal Imports at Paradip Port on BOT basis	10 MTPA	2021
Development of New Iron Berth for handling of Iron Ore exports at Paradip Port on BOT basis.	10 MTPA	2020
Mechanization of EQ-1, 2, 3 Berths at Paradip Port on BOT basis.	30 MTPA	2021
Mechanisation of CQ-1 & CQ-2 berths on BOT basis	20 MTPA	2023
Outer Harbour Development	Full Cape Handling capabilities	2027 (assumed)
Multi-Purpose Berth to handle clean cargo including container on BOT basis at Paradip port	10 MTPA	2022
Connectivity	Projects in pipeline/various stages of planning/ completion	
New Railway Line between Paradip-Haridaspur		

Project	Capacity Addition	Expected Timelines
Widening of NH-53 from 4 lane to 6 lane		
Development of Rail Connectivity for BOT berths at Paradip		
Doubling of line from Rajatgarh to Barang		
3rd and 4th line from Budhapank- Salegaon via Rajatgarh		
Doubling of line from Sambalpur to Talcher		
Doubling of line from Titlagarh to Sambalpur		
New Line from Angul to Sukhinda		
Third line from Sukhinda Road to Jakhapura		
New line from Jharsuguda to Barpalli		
Heavy Haul Rail Corridor for Salegaon to Paradip Port		
Road cum Flyover serving as 2nd exit to the Paradip port		

- Connectivity improvements in terms of doubling of line from Dhamra to Bhadrak;4 laning of Dhamra Jhamujhadi road; plan to add 30 new rakes under the GPWIS of Indian Railways is expected to attract cargo from KDS and HDC to Dhamra Port
- **Likely Impact on KDS&HDC**
    - Reduction in the following commodities from 2023
    - Coking coal traffic to reduce by 7-8 MTPA
    - Non coking coal traffic to reduce by 15-20%
    - Limestone traffic to reduce by 15-20%

Table 7-2mpact on traffic of Scenario2

Commodity	In Million Metric Tons											
	FY 25			**FY 31**			**FY 35**			**FY 39**		
	KDS	HDC	KoPT	KDS	HDC	KoPT	KDS	HDC	KoPT	KDS	HDC	KoPT
Coking Coal	0.5	12.0	**12.5**	0.6	18.7	**19.3**	0.8	24.4	**25.2**	0.9	31.2	**32.1**
Non coking coal	0.6	9.2	**9.8**	0.7	12.1	**12.8**	0.7	14.6	**15.3**	0.7	17.5	**18.2**
Limestone	0.1	2.6	**2.6**	0.2	3.7	**3.8**	0.2	4.8	**5.0**	0.2	6.3	**6.6**

7.3 Scenario 3: Improvements in connectivity at Dhamra port

Likely Impact on KDS and HDC

- Reduction in the following commodities from 2023
- Coking coal traffic to reduce by 7-8 MTPA
- Non coking coal traffic to reduce by 25%
- Limestone traffic to reduce by 25%

Table 7-3Impact on traffic of Scenario 3

Commodity	In Million Metric Tons											
	FY 25			**FY 31**			**FY 35**			**FY 39**		
	KDS	HDC	KoPT	KDS	HDC	KoPT	KDS	HDC	KoPT	KDS	HDC	KoPT
Coking Coal	0.5	12.0	**12.5**	0.6	18.7	**19.3**	0.8	24.4	**25.2**	0.9	31.2	**32.1**
Non coking coal	0.5	8.6	**9.2**	0.7	11.3	**12.0**	0.7	13.7	**14.3**	0.7	16.4	**17.1**
Limestone	0.1	2.4	**2.5**	0.2	3.5	**3.6**	0.2	4.5	**4.7**	0.2	5.9	**6.2**

Scenario 2 and 3 shall happen simultaneously and the likely fall in traffic is likely to be significantly higher

7.4 Scenario 4: Emergence of Tajpur and Subarnarekha Ports

Likely Impact on KDS&HDC

- It is estimated that there shall be a 40%-50% reduction in all commodities barring LPG and LNG from 2030 onwards
- The revised commodity projections are provided in subsequent slides

Table 7-4mpact on traffic of Scenario 4

Commodity	**All figures in Million Metric Tons**								
	FY 30			**FY 35**			**FY 39**		
	KDS	**HDC**	**KoPT**	**KDS**	**HDC**	**KoPT**	**KDS**	**HDC**	**KoPT**
Imports									
Coking Coal	0.3	14.4	14.7	0.4	17.5	18.0	0.5	21.3	21.8
Non Coking coal	0.5	8.3	8.8	0.5	10.0	10.5	0.5	12.0	12.5
Veg Oil	1.2	1.8	3.0	1.0	1.8	2.8	1.0	1.7	2.6
Fly Ash	3.0	1.8	4.7	3.5	2.0	5.5	3.5	2.0	5.5
POL	0.8	5.2	6.0	0.9	6.4	7.3	1.0	7.8	8.8
Pulses	3.3	0.0	3.3	3.4	0.0	3.4	3.4	0.0	3.4
Manganese Ore	0.1	1.8	1.9	0.1	2.1	2.3	0.1	2.6	2.8

Commodity	All figures in Million Metric Tons								
	FY 30			FY 35			FY 39		
	KDS	HDC	KoPT	KDS	HDC	KoPT	KDS	HDC	KoPT
Limestone	0.1	2.5	2.6	0.1	3.3	3.4	0.2	4.3	4.5
Containers (in MTEUs)	0.4	0.1	0.4	0.4	0.1	0.5	0.5	0.1	0.6
Total (excl Containers)	12.0	39.8	51.8	12.7	48.2	60.9	14.6	58.2	72.8
Exports									
Thermal Coal	0.0	3.9	3.9	0.0	3.9	3.9	0.0	3.9	3.9
Iron Ore	0.1	0.4	0.6	0.1	0.4	0.6	0.1	0.4	0.6
Containers (MTEUs)	0.3	0.1	0.4	0.3	0.1	0.4	0.4	0.1	0.5
Total (excl Containers)	0.1	4.3	4.4	0.1	4.3	4.4	0.1	4.3	4.4
Imports+ Exports									
Total Major Commodities	15.96	45.08	61.04	17.19	53.63	70.83	19.77	63.75	83.53
Other Commodities	3.15	9.89	13.05	3.40	11.77	15.17	3.91	13.99	17.90
TOTAL	**19.12**	**54.97**	**74.09**	**20.59**	**65.41**	**86.00**	**23.68**	**77.75**	**101.43**