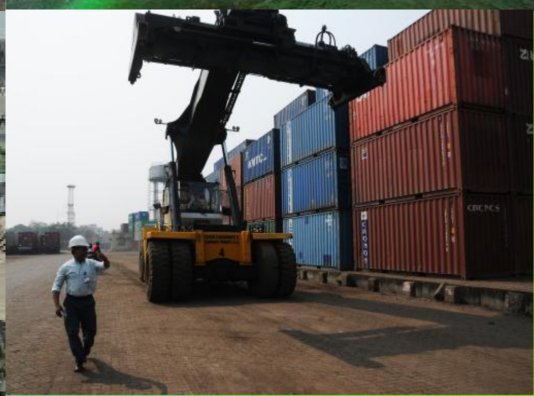
Master Plan Report - Final September 2016

MASTER PLAN FOR KOLKATA PORT





Master Plan for Kolkata Port (KoPT)

Prepared for

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Government of India

Ministry of Shipping/ Indian Ports Association

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September 2016

Quality Information

Client: **Indian Ports Association/ Ministry of Shipping**	Contract No. (if any): NA
Project Title: **SAGARMALA: Master Plan for Kolkata Port (KoPT)**	Project No.: **DELD15005**
Document No: **DELD15005-REP-0000-CP-1010** Share Point Ref:	Controlled Copy No:
Document Title: **Master Plan for Kolkata Port (KoPT)**	
Covering Letter/ Transmittal Ref. No:	Date of Issue: **03 September 2016**

Revision, Review and Approval Records

D.	Master Plan for Kolkata Port (KoPT) - Final	Ritu P. 02.09.2016	Amit M. 02.09.2016	Sanjeev Gupta 03.09.2016
C.	Master Plan for Kolkata Port (KoPT) - Final	Ritu P. 24.08.2016	Amit M. 25.08.2016	Sanjeev Gupta 26.08.2016
B.	Master Plan for Kolkata Port (KoPT) - Final	Ritu P. 27.06.2016	Amit M. 27.06.2016	Sanjeev Gupta 28.06.2016
A.	Master Plan for Kolkata Port (KoPT) - Draft	Ritu P. 31.12.2015	Amit M. 31.12.2015	Sanjeev Gupta 31.12.2015
Revision	**Description**	**Prepared by/ date**	**Reviewed by/ date**	**Approved by/ date**

Document Revision Register

Issue no.	Date of issue	Section	Revision Details	Revision By Name & Position
1.	28.06.2016		Comments on draft Master Plan Report	Ritu Paliwal Senior Env. Consultant
2.	11.08.2016		Comments on final Master Plan Report	Shashank Yadav Engineer
3.	26.08.2016		Comments on final Master Plan Report	Ritu Paliwal Senior Env. Consultant
4.	03.09.2016		Comments on final Master Plan Report	Ritu Paliwal Senior Env. Consultant

Table of Contents

List of Figures

List of Tables

1.0 INTRODUCTION

1.1 Background

The Sagarmala initiative is one of the most important strategic imperatives to realize India's economic aspirations. The overall objective of the project is to evolve a model of port-led development, whereby Indian ports become a major contributor to the country's GDP.

As shown in **Figure 1.1**, the Sagarmala project envisages transforming existing ports into modern world-class ports, and developing new top notch ports based on the requirement. It also aspires to efficiently integrate ports with industrial clusters, the hinterland and the evacuation systems, through road, rail, inland and coastal waterways. This would enable ports to drive economic activity in coastal areas. Further, Sagarmala aims to develop coastal and inland shipping as a major mode of transport for the carriage of goods along the coastal and riverine economic centres.

As an outcome, it would offer efficient and seamless evacuation of cargo for both the EXIM and domestic sectors, thereby reducing logistics costs with ports becoming a larger economy.

Sagarmala aims to optimize the Logistics route for Port and Increase focus on Port led development for the country

	Details	Description
Why is Sagarmala needed?	1 Dual institutional structure at ports	▪ Due to segregation of major and minor ports, ports of India have grown as due unconnected entities and not benefitting from co-location or economics of scale
	2 Weak infrastructure at ports and beyond	▪ Weak modes of evacuation from both major and minor ports leading to sub – optimal modal mix presently ▪ Limited hinterland linkages that increases cost of transportation
	3 Limited economic benefit of location & to community	▪ Limited conscious skill development and leverage to peripheral trades (fisheries, tourism etc.) ▪ Limited development of centres of manufacturing near ports
What does Sagarmala want to achieve?	1 Ports led development	▪ Undertake development of coastal economic zones with projects like – port based industrialization, coastal tourism, Logistics parks, warehousing, fisheries etc.
	2 Port infrastructure enhancement	▪ Action points on transforming existing ports into world class ports be developing deep drafts, mechanization of existing berths, creation of new capacity and greenfield ports
	3 Efficient evacuation	▪ Expansion of rail / road network connected to ports and identification of congested routes ▪ Find optimized transport solution for bulk and container cargo

Figure 1.1 Aim of Sagarmala Development

In order to meet the objectives, Indian Port Association (IPA) appointed the consortium of McKinsey and AECOM as Consultant to prepare the National Perspective Plan as part of the Sagarmala Programme.

1.2 Scope of Work

The team of McKinsey and AECOM distilled learnings from the experience in port-led development and examined major engagement challenges to develop a set of governing principles for our approach as shown in **Figure 1.2**.

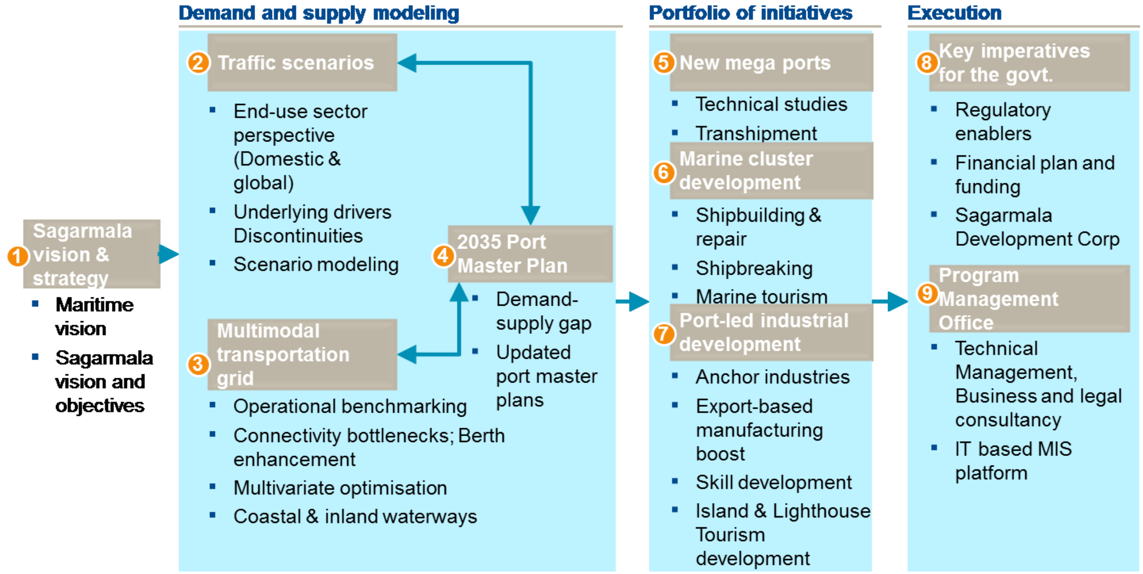

Figure 1.2 Governing Principles of Our Approach

As indicated above, the origin-destination of key cargo (accounting for greater than 85% of the total traffic) in Indian ports have been mapped to develop traffic scenarios for a period of next 20 years. The forces and developments that will drive change in the cargo flows shall also be identified. This would lead to the identification of regions along the coastline where the potential for expansion of existing port exists. The various activities involved in the port led developments are charted in **Figure 1.3**.

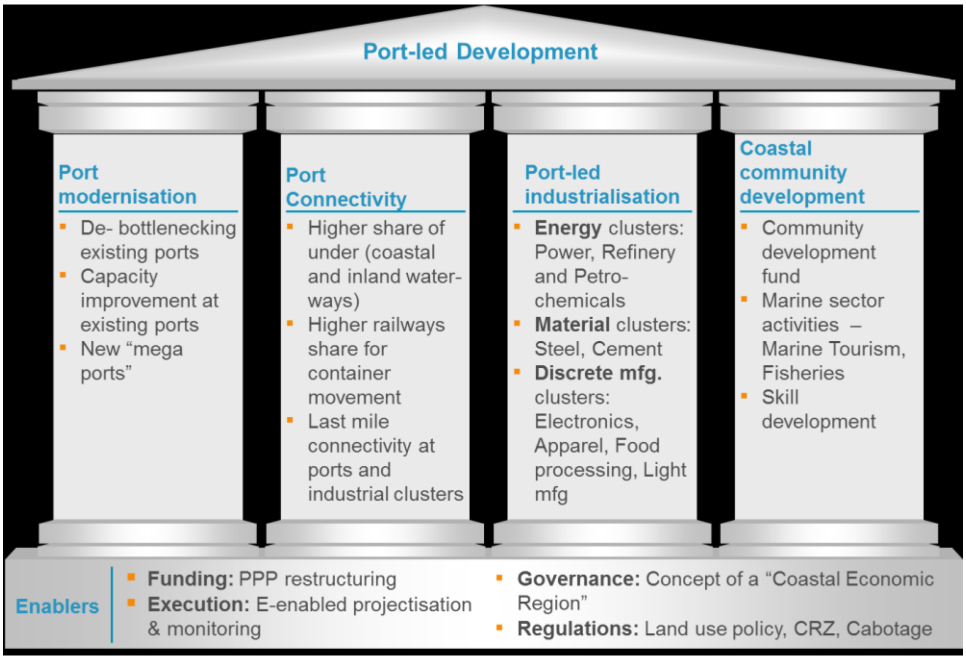

Figure 1.3 Port Led Developments

As part of the assignment, it was also expected to coordinate with the team working on "Benchmarking Operational Improvement Roadmap for Major Ports in India" study (which is being carried out simultaneously along with this assignment) and identify current and future logistic constraints (at the Major Ports) for the top 85% cargo categories based on analysis of current port capacity, productivity levels in comparison to international benchmark and evacuation bottlenecks in the logistics chain. This understanding should be an input in defining the 2035 Master Plan for each port.

Accordingly, this Master Plan report has been prepared taking into consideration the inputs provided on the future traffic and the benchmarking and operational improvements suggested for this port.

1.3 Present Submission

The present submission is the Final Report for Development of Master Plan for Kolkata Port Trust as part of Sagarmala assignment. This report is organised in the following sections:

Section 1 : Introduction
Section 2 : The Port and Site Conditions
Section 3 : Details of Existing Facilities
Section 4 : Performance, Options for Debottlenecking & Capacity Assessment
Section 5 : Details of Ongoing Developments
Section 6 : Traffic Projections
Section 7 : Capacity Augmentation Proposals
Section 8 : Shelf of New Projects and Phasing

2.0 THE PORT AND SITE CONDITIONS

2.1 Kolkata Port

Kolkata Port comprises of two dock systems one at Kolkata and other at Haldia as shown in **Figure 2.1**. Both the docks are riverine in nature and located on the river Hooghly in the State of West Bengal. The Kolkata Dock System (KDS) is situated at Latitude 22° 32’ N, Longitude: 88° 18’ E in the city of Kolkata, while Haldia Dock Complex (HDC) is located at Latitude 22° 02’ N and Longitude 80° 06’ E at about 104 km downstream of KDS.

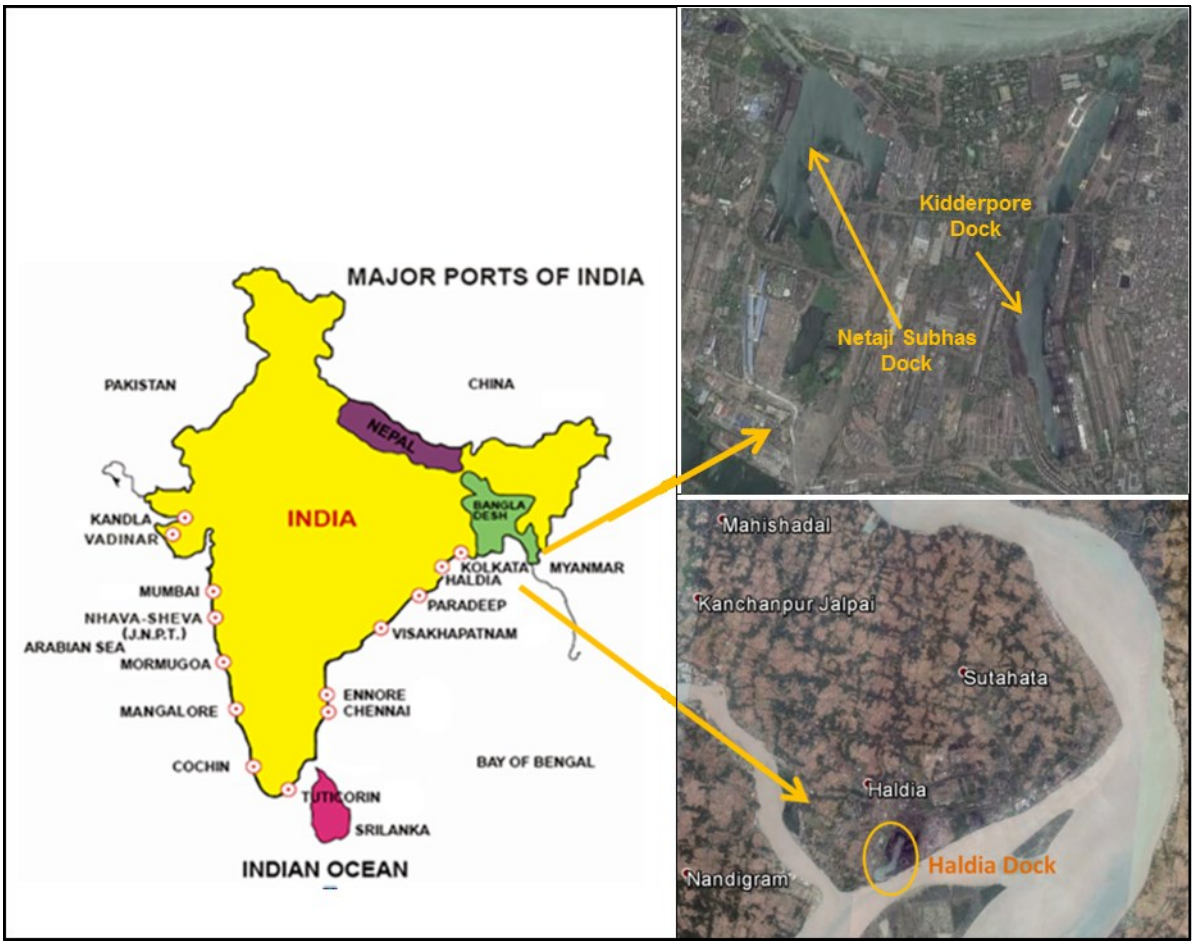

Figure 2.1 Location of Kolkata and Haldia Dock Complexes

Both of the port locations are well connected to nearby places by road, rail and ferry boats. National Highway (NH) 117 is about 1.5 km from KDS dock and connects to NH 6 (Mumbai – Kolkata road). Haldia is also accessible through NH 41, which links Haldia to Kolaghat and meets NH 6.

NH 6 (Mumbai – Kolkata road), make both the locations quite accessible to Maharashtra, Orissa, Jharkhand while passing through Kharagpur, Bankura and Purulia and Durgapur within the state of West Bengal as shown in **Figure 2.2**.

Figure 2.2 Road Connectivity for Kolkata and Haldia Dock Complexes

Both the ports are connected to South-Eastern railway network. Nearest railway stations to KDS and HDC are Majherhat and Panskura, respectively (**Figure 2.3**).

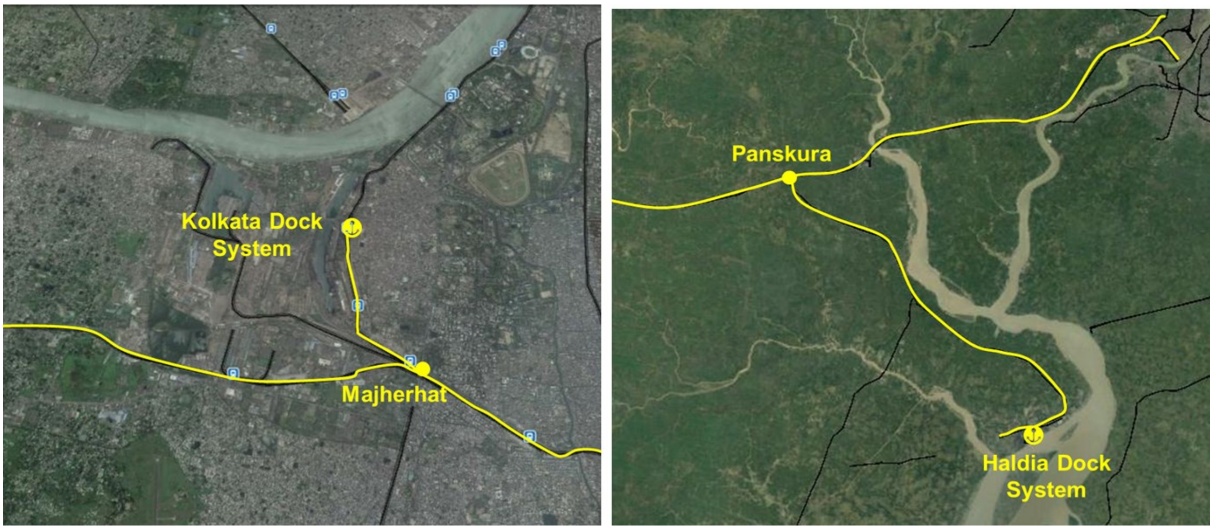

Figure 2.3 Rail Connectivity for Kolkata and Haldia Dock Complexes

2.2 Site Conditions

2.2.1 Climate

The climate of the West Bengal is tropical having four well-marked seasons, i.e., summer (March – May); monsoon (June – September); post monsoon (October – November); winter (December – February).

2.2.2 Temperature

The month of May is the hottest, whereas December and January are colder months for both Haldia and Kolkata. According to the IMD data between 1961 and 1990, the highest temperature recorded in 30 years is 40.6°C at Kolkata while 36.1°C at Sagar Island, which is closer to Haldia. The lowest temperatures were observed to be 9.7°C and 12°C for Kolkata and Haldia, respectively.

2.2.3 Rainfall Data

This region is mainly exposed to Southwest monsoon from June to September and an annual rainfall of more than 1700 mm were reported for the two locations. The IMD data suggests that the months of July and August are the wettest months having monthly rainfall of more than 350 mm. During northwest monsoon from November to March, monthly average rainfall of less than 50 mm is experienced.

2.2.4 Visibility

Visibility at Haldia is better compared to that at Kolkata, as the area is free from industrial smoke. At times due to heavy rainfall poor visibility is reported during the southwest monsoon. On an average, fog is reported on 5-7 days in each month from November to February during morning hours.

2.2.5 Wind

The predominant wind direction reported at Alipur, Kolkata and Sagar Island, is from south and southwest. About 25 % of the time wind was reported to be blowing from north and northeast. The highest wind speed of 16 knots was reported in the month of May. During the months of April to August wind speed was found to be higher than 10 knots.

2.2.6 Tide

The tidal details at Haldia and Kolkata are as follows:

	Haldia	Kolkata
Highest High Water (HHW)	: (+) 7.26 m CD	: (+) 7.70 m CD
Mean High Water Spring (MHWS)	: (+) 5.70 m CD	: (+) 5.62 m CD
Mean High Water (MHW)	: (+) 5.01 m CD	: (+) 5.01 m CD
Mean High Water Neaps (MHWN)	: (+) 4.26 m CD	: (+) 4.10 m CD
Local Mean Water Level (LMWL)	: (+) 3.23 m CD	: (+) 3.19 m CD
Mean Low Water Neaps (MLWN)	: (+) 2.10 m CD	: (+) 2.00 m CD
Mean Low Water (MLW)	: (+) 1.34 m CD	: (+) 1.68 m CD
Mean Low Water Springs (MLWS)	: (+) 0.80 m CD	: (+) 1.41 m CD
Lowest Low Water (LLW)	: (-) 0.07 m CD	: (+) 0.14 m CD

2.2.7 Earthquake

Most of the West Bengal including Haldia and Kolkata are found to lie in Zone III of Indian Map of Seismic zones (IS-1893 Part-1 2002) which is a moderate risk seismic intensity zone (**Figure 2.4**).

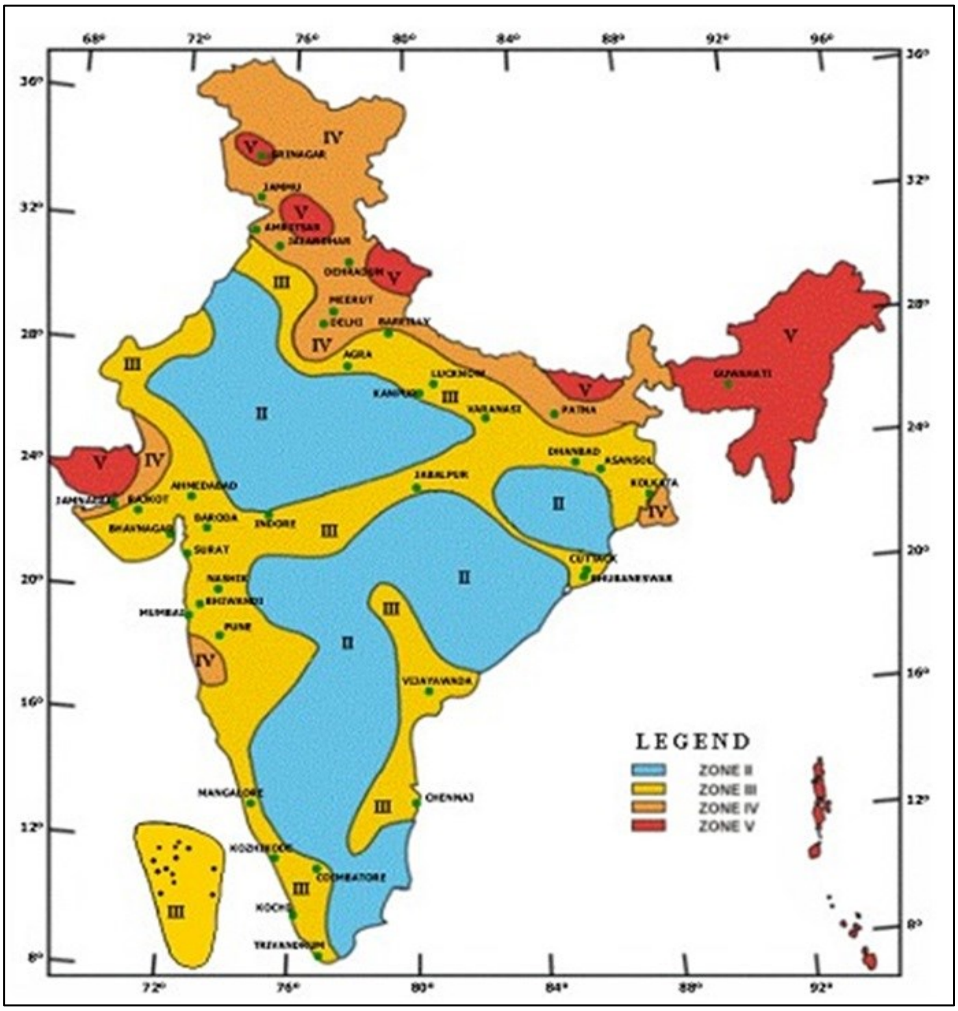

Figure 2.4 Seismic Zoning Map of India as per IS-1893 Part 1 – 2002

3.0 DETAILS OF EXISTING FACILITIES

Kolkata Port comprises of two dock systems one at Kolkata and other at Haldia. This section discusses facilities at both the docks in details.

3.1 Navigational Channel & Navigation

Kolkata Port Trust (KoPT) maintains two approach channels from sea one via Eastern channel for vessels visiting to KDS and the other via Eastern channel / EDEN for vessels visiting to HDC as shown in **Figure 3.1**.

Whereas, the pilotage distance to KDS is 223 km comprising 148 km of river and 75 km of sea pilotage, the pilotage distance to Haldia is 125 km out of which 75 km is sea pilotage. Remote pilotage assistance is provided through VTMS during the sea passage of the vessels in both the channels.

Both the KDS and HDC channels are well marked with nearly 125 light vessels / lighted buoys and 500 shore marks. The Centre Pilot Control Station is located on Sagar Island. In addition to the pilot station, KoPT maintains a pilot vessel at around Sagar in foul weather. The pilot transfer is undertaken for the pilot station / pilot vessel through dedicated pilot launches. While the pilots for KDS vessels board at middle point south of Sagar, for Haldia vessels the pilot launching is undertaken south of Eden in fair weather and north of Eden during foul weather. For the outward passage the same process is used in a reverse order. At Haldia, the pilot bringing the vessel hands over the vessel at the lock entrance to the Berthing Master but all vessels bound for oil jetties are taken alongside by the same Pilot.

Being a riverine port with numerous sand bars (shoals), the advantage of rise of tide is utilized to obtain the maximum draft for shipping. Variation in draft occurs between spring and neap tide and forecast of draft for inward and outward ships are published from Kolkata by the Harbour Master (River) about four/six week in advance. Because of the sharp bends in the river the length of the vessel that can be accommodated is restricted to 172 m at Kolkata and 189 m at Budge Budge. Due to the nature of river and the shifting of sand taking place regularly inside the channels regular hydrographic surveys are done to confirm the depth and width of the channel.

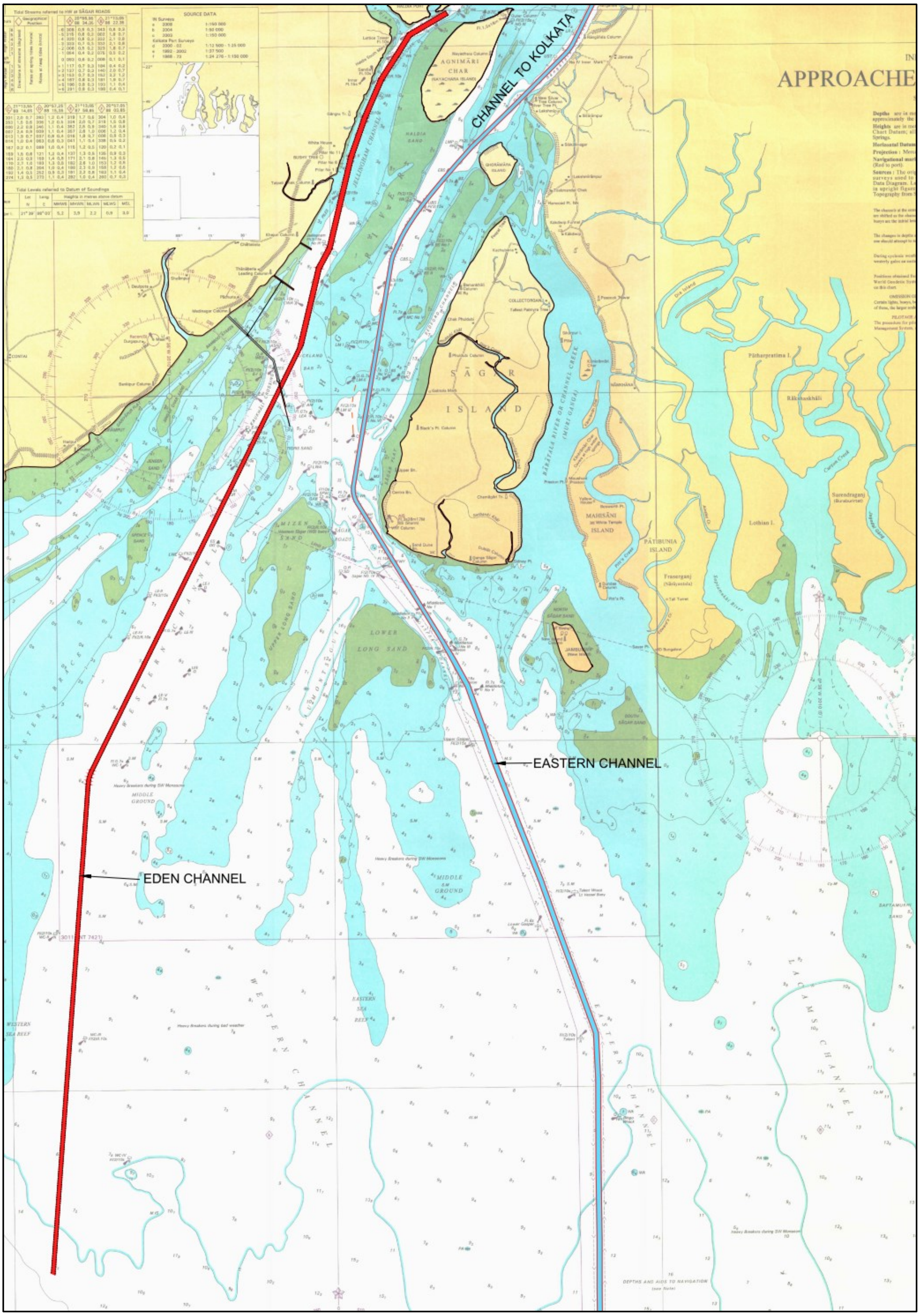

Figure 3.1 Navigational Channel Layout to Kolkata and Haldia

3.2 Port Layout and Facilities at Kolkata Dock System

Kolkata Dock System comprises of three sub components, i.e., Kidderpore Dock (KPD), Netaji Subhash Dock (NSD) and Budge Budge Oil Jetties. The Kolkata port is about 145 km from the Sagar Island and 232 km from sand head.

3.2.1 Existing Berths at Kolkata Dock System

<u>3.2.1.1 Kidderpore Dock</u>

The KPD comprises of two Dock basins – separated by a bascule bridge. KPD – I has 12 berths and KPD – II has 8 berths (**Figure 3.2)**. The total cargo handling capacity of all 20 berths is about 3.24 MTPA. The entrance to basin is through twin locks. The size of berths and the back-up storage facilities in KPD – I and KPD – II are listed in **Table 3.1** and **Table 3.2** respectively. It is important to mention that there are several dilapidated structures at KPD, i.e. KPD 16, 18, 19 and 21 which were earlier utilised for ship breaking activities.

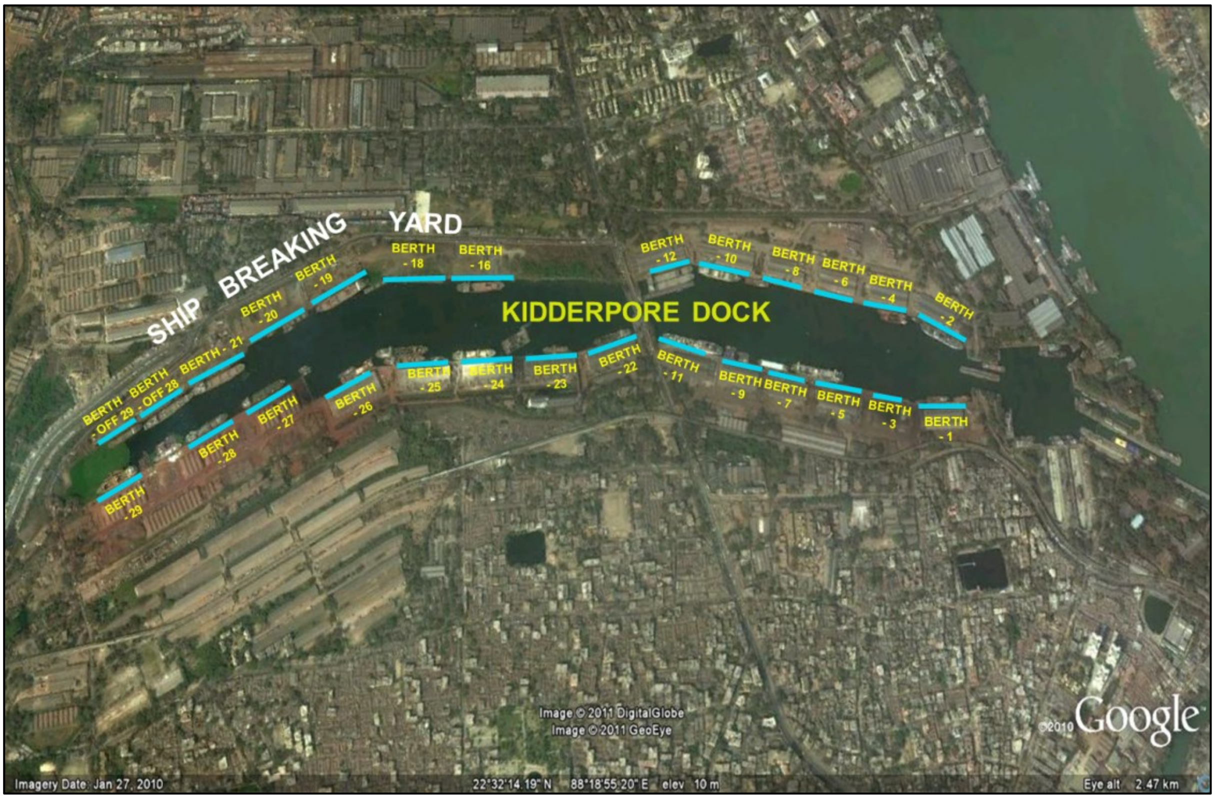

Figure 3.2 Layout Plan of Kidderpore Dock

Table 3.1 Berth Wise Specifications of Storage Area (KPD - I)

Berth			Shed		Major Commodity Handled in 2014-15
No.	Length (m)	Width (m)	Covered (Sqm)	Open (Sqm)	
1	133	18.29	3,345	2,565	G/C
2				2,693	Coastal
3	128	18.29	-	3,887	G/C
4	136	15.24	3,344	9,098	G/C
5	229	18.29	6,689	4,128 +	G/C
				4,374	
6	118	15.24	3,345	11,849	G/C
7					G/C
8	128	15.24	3,344	4,647	G/C
9	108	18.29	3,345	3,812	G/C/
10	161	15.24	3,345	5,683	G/C
11	151	18.29	3,344	1,604	Coastal /Also passenger terminal for A&N islands
12	143	15.24	3,344	5,699	Coastal

[Source: KoPT Website and Admin Reports]

Table 3.2 Berth Wise Specifications of Storage Area (KPD - II)

Berth			Shed		Major Commodity
No.	Length (m)	Width (m)	Covered (Sqm)	Open (Sqm)	
22	151	12.2	8,919	Nil	G/C
23	147	12.2	-	Nil	G/C
24	152	12.2	6,919	Nil	G/C
25	169	12.2	8,919	Nil	G/C
26	185	12.2	9,033	2,616	G/C
27	195	21.3	3,623	3,680	G/C
28	195	21.3	3,523	3,726	G/C
29	183	21.3	3,623	3,440	G/C

[Source: KoPT Website and Admin Reports]

3.2.1.2 Netaji Subhash Dock

The NSD comprises of dock basin with a single lock entrance and has 10 berths and 2 dry docks (**Figure 3.3**). Sizes of berths and the storage space around these are given in **Table 3.3**.

Figure 3.3 Layout Plan of Netaji Subhash Dock

Table 3.3 Berth Sizes and Storage Capacity at NSD

Berth			Shed		Major Commodity
No.	Length (m)	Width (m)	Covered (Sqm)	Open (Sqm)	
1	200	13.7	-	6,000	G/C + H/Lift
2	187	15.2	11,757	3,831	G/C
3	183	15.2	11,758	3,600	Container
4	181	15.2	11,758	3,400	Container
5	182	12.2	-	11,000	Container
7	192	21.3	9,000	50,000	Container
8	225	-	-	-	Container
12	152	-	1,872	-	Liquid
13	174	15.2	10,093	1,278	G/C
14	174	15.2	15,235	2,555	G/C

<u>3.2.1.3 Budge Budge Oil Jetties</u>

Budge Budge is located about 25 km downstream of Kolkata. Amongst the earliest handling facilities that were constructed on the River Hooghly, the Oil Jetties at Budge Budge continue to be operational. There are 6 jetties of different sizes with associated storage facilities which are operational with handling capacity of 3.0 MTPA as shown in **Figure 3.4**. Details of these jetties and the associated storage facilities are given in **Table 3.4** and **Table 3.5**.

Figure 3.4 Layout Plan of Budge Budge Jetties

Table 3.4 Berthing Facilities at Petroleum Wharves at Budge Budge

Berth No.	Length (m)*	Commodity
1	189	POL, Veg. Oil & other liquid
2	102	-do-
3	163	-do-
5	189	-do-
7	189	-do-
8	189	-do-

** Length mentioned in this Table refers to the maximum length of the vessel that can be berthed at these jetties*

Table 3.5 Storage Capacities at Budge Budge

a) POL		
IOCL	26 Tanks	10,3,550 KL
BPCL	39 Tanks	98,748 KL
HPCL	18 Tanks	77,000 KL
IBP	18 Tanks	30,571 KL
Total	**101 Tanks**	**3,09,869 KL**
b) Non POL & Other Liquid		
HSD Co. Ltd.	12 Tanks	81,114 KL
JRE	13 Tanks	25,475 KL
Mundial	5 Tanks	9,822 KL
Surya	12 Tanks	24,445 KL
ARCO	14 Tanks	6,070 KL
S.K. Oil	13 Tanks	74,692 KL
NDDB	5 Tanks	9,822 KL
Others	12 Tanks	27,153 KL
Total	**86 Tanks**	**7,74,781 KL**

3.2.2 Cargo Handling Equipment at Kolkata Dock System

KDS has self-owned as well as hired equipment for cargo handling (**Table 3.6**). In addition to the owned equipment, port has also hired 2 MHC of 40 T each, 6 reach stackers of 45 T each and 20 tractors.

Table 3.6 Cargo Handling Equipment / Facilities

Self-owned Equipment	Quantity / Capacity
Mobile Crane	1 No. – 9T 1 No. – 10 T 2 No. - 13 T 3 No. – 30 T
Wharf Crane	1 No. – 200T
Fork Lift Truck	10 No. – 3T 1 No. – 2 T
Tractor	8 No. – 20 T
Reach Stacker	3 No. – 45T

Self-owned Equipment	Quantity / Capacity
Rubber Tyred Gantry Cranes	3 No. – 35.5 T 1 No. – 40 T
Trailers	24 No. – 10 T 4 No. – 20 T 2 No. – 25 T 2 No. – 35 T 19 No. – 40 T 6 No. – 20 T

3.2.3 Port Railways at Kolkata Dock System

KDS is connected to Eastern Railway (ER) at Majherhat Railway Station. Goods trains are brought upto the EJC (East Dock Junction), by locomotives of ER after which they are taken over by port owned locomotives (**Figure 3.5**).

Presently, the railway system serves berths number 27, 28 and 29 at KPD and CPY for containers at NSD. Though there are railway tracks from 22-26 KPD. These rail lines are unfit due to long disuse. Moreover this portion of the line is no longer connected to the main interchange yard. Similarly, the railway track 1-4 NSD since it is not connected to the main interchange yard.

Apart from these, there are following public/private sidings which have rail linkage with KDS railway and receive rail borne traffic.

- CESC (Southern Generating Station)
- FCI (JJP Depot)
- Balmer Lawrie & Co.
- Pig Iron Supply Syndicate.
- Braithwaite & Co.
- CONCOR EJC Terminal.

Figure 3.5 Existing Rail Network at KDS

The present dock bound rail traffic consists mainly of Containers for Nepal and Amingaon bound cargo. However, sporadic traffic like coal, wheat, tea, peas, coil, fertilizer, rice etc. is loaded/ unloaded at Dock-II as per requirement.

The traffic at private sidings are mainly Thermal Coal (CESC), Food grain/Sugar at FCI(JJP Siding), Iron & Steel from SAIL (handled at B.L. & Co. siding and PISS siding), Aluminium Plates made by NALCO for BL & Co. and materials for manufacturing wagons at B.W.Co. siding.

3.3 Port Layout and Facilities at Haldia Dock Complex

3.3.1 General

Haldia Dock Complex (HDC) consists of 17 berths out of with 14 berths are located inside the dock and three oil jetties are on the bank of the river Hooghly (**Figure 3.6**).

Figure 3.6 Layout Showing Location of the Berths at HDC

Haldia is an all-weather port having a 300.2 m long and 39.6 m wide lock gate and a turning basin of 450 m in diameter. The average draft availability at HDC is 8.0 m.

HDC is having 6,367 acres of land area for port use.

3.3.2 Existing Berths at Haldia Dock Complex

Table 3.7 presents the details of existing berth and cargo handled during 2014-15 at HDC.

Table 3.7 Details of Existing Berths

S. No.	Berth	Length (m)	LOA (m)	Cargo Handled (2014-15) MTPA
1.	HOJ-I	290	238	1.93
2.	HOJ-II	330	270	2.21
3.	HOJ-III	345	275	0.69
4.	Berth No. 2	260	238	1.63
5.	Berth No. 3	337	239	1.03
6.	Berth No. 4	284	230	1.17
7.	Berth No. 4A	245	180	3.14
8.	Berth No. 4B	181	183	4.3
9.	Berth No. 5	195	183	0.98
10.	Berth No. 6	234	212	1.58
11.	Berth No 7	234	212	1.28
12.	Berth No. 8	218	220	1.56
13.	Berth No. 9	218	210	2.42
14.	Berth No. 10	220	210	0.35
15.	Berth No. 11	220	210	1.18
16.	Berth No. 12	220	210	0.87
17.	Berth No. 13	220	210	1.54

[Source: Data Received for HDC for 2014 -15.]

The depth inside the impounded dock system at all the berths on an average is 9.5 m at HOJ I, HOJ II and HOJ III the depths are 9 m, 11 m and 10 m respectively.

While HOJ1, can accommodate upto a maximum length of 238 m having a maximum DWT of 80,000, T, HOJ2 can handle vessels having maximum length of 250 m and maximum DWT of 1,30,000 T.

All the berths inside the impounded dock can accommodate Panamax size vessels having LOA up to 235 m and DWT of 75,000 DWT.

3.3.2.1 Haldia Oil Jetty-I (HOJ-I)

HOJ-I also known as Satish Samanta Oil Jetty is located upstream of the lock gate entrance to the dock and was commissioned during 1968 for handling crude and POL products, Paraxylene, LPG, Naphtha, Benzene, Butadiene, Py Gas, MO Gas, Butane, FO, Bitumen Liquid ammonia. There are direct pipeline connections from this berth to the Indian Oil Refinery, Hindustan Fertilizer, Haldia Petrochemicals, Tata Chemicals and other users.

3.3.2.2 Haldia Oil Jetty-II (HOJ-II)

HOJ-II was commissioned in 1991 and is located adjacent to HOJ-I. It has modern and sophisticated facilities for handling crude and POL products (SKO, HSD, Naphtha, and FO) and has direct pipeline connection to user industries such as Haldia Petrochemical and IOC refinery. Apart from the above, facility of receiving Slop/Ballast water is also available. The jetty can handle tankers up to 150,000 DWT.

3.3.2.3 Haldia Oil Jetty-III (HOJ-III)

HOJ-III is a riverine Oil Jetty was commissioned in April 2000 and is located downstream of the lock gate. It has modern and sophisticated facilities for handling crude oil for refineries at Barauni and Haldia. It is also connected to the storage facility of Reliance Industries Limited at Haldia for marketing purposes. The jetty can handle tankers up-to 150,000 DWT.

3.3.2.4 Berth 2

Berth 2 is currently handling Iron Ore, Thermal Coal, Paraxylene, Coking coal, Non-Coking coal, Met coke, R.P coke, C.P coke, Limestone and Rock Phosphate. The berth can service ships upto 75,000 DWT.

3.3.2.5 Berth 3

Berth 3 has handling capacity of 2.25 MTPA and was originally designed for handling iron ore but at present handles thermal coal and non-dangerous POL products. The berth handles ships up to 90,000 DWT. This berth has open storage of 50,000 m^2.

3.3.2.6 Berth 4

Berth 4 is designed for shipping thermal coal with the help of mechanized loading system and it can handle ships up to 90,000 DWT. The berth has a backup storage area of 50,000 m^2.

3.3.2.7 Berth 4A

Berth 4A is a fully mechanized berth under the license agreement with the International Seaports (Haldia) Pvt Ltd for a period of 30 years with effect from May 2002 to handle ships of maximum DWT of 90,000 DWT. The berth is designed to unload gearless Panamax vessels.

3.3.2.8 Berth 4B

The berth was commissioned in February 2002 to handle coal, coke, iron ore and other dry and break bulk cargo. The berth can handle ships up to 90,000 DWT. The berth is connected to its backup area through a railway line.

3.3.2.9 Berth 5

Berth 5 is designed to handle Iron Ore, Coking Coal, and Fertilizer Raw Material and is equipped with two clam shell unloaders connected to storage area (open and covered). Direct rail connectivity has been provided from berth to the back-up area. Total storage areas available for this berth are 75,000 m^2.

3.3.2.10 Berth 6 & 7

These two berths are located on each side of a Finger Jetty, conventionally handling bulk and break bulk cargos with the help of vessels' own gears. Besides, these berths have facilities for pipeline discharge of different liquid bulk cargo such as Phosphoric Acid, Carbon Black Feed Stock, Edible Oil, Molasses etc. A floating Pipeline Handling Facility for unloading Edible Oil at Berths 5 /off 5/ 6 /off 6 at HDC has also been recently commissioned.

3.3.2.11 Berth 8

The cargo handled at this berth is mainly coking coal, limestone, steel, general and other bulk cargo. The berth is prioritised for TISCO and has dedicated back-up area and rail connectivity. The berth can handle ships up to 90,000 DWT.

3.3.2.12 Berth 9

The berth 9 has a continuous quay face with berth 8 and has a capacity of 1 MTPA where a ship up to 90,000 DWT may be handled. It is a general cargo berth used for handling dry bulk, breakbulk and containerized cargo. This berth has covered storage shed of floor area of 100,000 sqft. This berth has direct rail connectivity to its back up area.

3.3.2.13 Berths 10 & 11

These were general cargo berths and were used for handling containerized cargo along with break bulk, dry bulk. These berths have total combined area of 11,000 m^2. These berths have now been allocated to a BOT operator for development of container terminal. These berths have direct Broad Gauge rail access to Container Parking Yard.

3.3.2.14 Berth 12

The physical construction of berth 12 was completed in September 2000 and was awarded to T.M. International Logistics Ltd in January 2002 for its mechanization, maintenance and management for a period of 30 years. The berth has an open storage area of 14,000 m^2 and a covered storage area of 3000 m^2. The berth mainly handles breakbulk cargo and can handle ships of maximum upto 90,000 DWT.

3.3.2.15 Berth 13

Berth 13 is handling dry bulk and general cargo and it can handle ships of maximum upto 75,000 DWT.

3.3.3 Cargo Handling System at HDC

The HDC has a mix of conventional and mechanised handling at various berths (**Table 3.8**). In addition, the port has other equipment which is used as and when required for its operations (**Table 3.9**).

Table 3.8 Cargo Handling Equipment / Facilities

Berth	Cargo Type	Equipment/ Facilities
4	Thermal Coal	2 - 1500 TPH Wagon Tipplers, 2 - Stacker-cum-Reclaimer, 2 -1500 TPH Shuttle Boom type Ship Loaders, 2 - Wagon Feeding Systems.
4A	Coking Coal	2 - Stacker-cum- Reclaimer, 2 Wagon Loaders, 2 - Mechanized Grab un-loaders
5	liquid Cargo	-
2 & 8	Dry Bulk	2 Mobile harbour crane of capacity 100 MT each. For Shore handling operation: 25 dumpers, 9 pay loaders, 1 bulldozer and 2 excavators
9	Dry Bulk, Break Bulk	Shore handling operation performed by licensed handling agents.
10 &11	Containers	2 – Rail Mounted Quay Cranes (RMQC), 4 - Rubber Tyred Yard Gantry Cranes (RTYGC) [to be introduced shortly], 3 Reach Stackers, 20 Tractor-Trailer combinations, Fork-Lift & Top Lift trucks.
13	Dry Bulk and general Cargo	2 Mobile Harbour Cranes (installation by September, 2016)

Table 3.9 Additional Port Equipment

Number	Type
4	RTYGCs (Each having capacity of 40 T under spreader)
2	RMQCs (Each having capacity of 40 T under spreader)
2	Mobile Crane (one having capacity 15 T and the other 9 T)
12	Locomotives

3.3.4 Storage Area

HDC has adequate storage area for the serviced cargo (**Table 3.10**). Two covered transit sheds are located behind Berth No. 9 and Main Canteen of G.C. Berth respectively. Extensive cargo back-up hardstand area is available behind Berth 4B.

Table 3.10 Details of Storage Area (Sqm)

Location/ Storage Type	Area (m^2)
Inside Custom Bonded Area	
− Transit Shed	17,000
− Hardstand	3,57,000
− Available bare land	8,48,000
Outside Custom Bonded Area	
− Liquid	1,93,500 KL
− Dry Bulk/Container Storage etc.	1,09,950
− Available Storage area	7,32,240

3.3.5 Power Distribution

HDC receives H.T. power supply from 132 KV substation of West Bengal State Electricity Board for Port Operations. HDC also has a standby D.G. sets for operation of Lock Gates of the impounded dock system.

3.3.6 Port Railways

Port Railways at Haldia is equipped with modern signalling and telecommunication facilities **(Figure 3.7)**. It has two wagon interchange yards connected to the South-Eastern Railways. Port Railways has an annual capacity of 18 MT. Port owns a fleet of 11 locomotives. Port Railways serves private as well as common users sidings. Common users' sidings are available inside Dock bounded area as well as outside Dock area for handling General and Bulk cargo. One Liquid cargo siding is also available.

HDC is connected with Durgachak (DZK) station of S E Railway and connects the Howrah-Kharagpur main line through Panskura, thereby providing the link to the all India rail network.

Berth wise details of port railways are as follows:

- Berth No. 2 has two full rake length lines.
- Berth No. 4 has two wagon tipplers connected to the stack yard through conveyors, stacker re-claimer and ship-loader.
- Berth No. 4A (BOT Berth) has one full rake length siding which has facility for mechanized loading of railway wagons.
- Berth No. 12 (BOT Berth) has a railway siding having two full rake length railway siding.
- Two full rake length railway lines in the extended dock boundary area.

3.3.6.1 Connectivity to Berths

- For Berth 4B there are two full length service lines used for loading imported coking coal.
- For Berth 5 there are 2 full length lines for loading imported coking coal.

- For Berth 8, there are 2 short lines which can together hold 59 wagons for loading coking coal to SAIL (10) and also for loading coking coal and limestone to TISCO by using 2 short lines, which can, together load a rake of 59 wagons.
- For Berths 9 to 12, two full length lines are available for loading fertilizers, food grains, oilseeds and containers and steel.

There are 2 Common Users Sidings I and II having 3 full length lines each. In addition, there are a number of private sidings for IOC, BPCL, PCC, SAIL, HMCPCL etc.

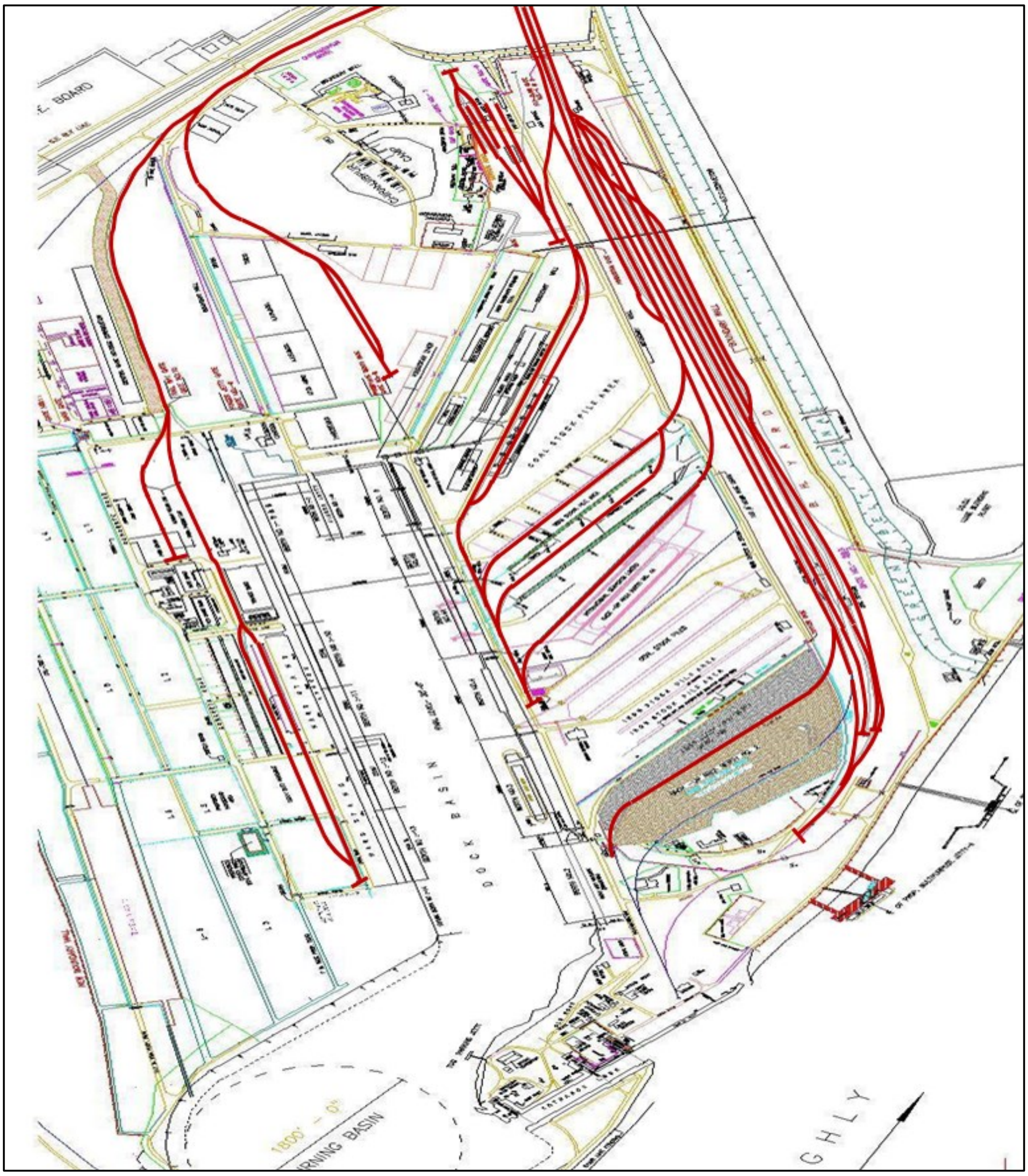

Figure 3.7 Internal Rail Network of Haldia Port

3.3.7 Navigational Aids

3.3.7.1 Lighthouse

Sagar Lighthouse (21°39′N 88°03′E) is situated at Middleton Point on the Sagar Island which is about 1.5 km inshore. It is visible from a distance of 28 km in clear weather.

Dariapur Lighthouse (21°47′N 87°52′E) is situated on the right bank of Hooghly River south of Rasulpur River and is about 2.7 km inshore. It is visible from a distance of 35 km in clear weather.

3.3.7.2 Light Vessels

There are four unmanned light vessels to aid in navigation and these are located at following locations:

- U.G.L.F. at 21°29′57″N 88°06′37.5″E
- L.G.L.F. at 21°21′57″N 88°10′05″E
- Talent WK L.V. at 21°17′21″N 88°11′17″E
- Eastern Channel L.V. at 21°04′19″N 88°11′07″E

3.3.7.3 Port Flotilla and Other Crafts

There are nine tugs of different capacity with the port (**Table 3.11**). Apart from tugs, port has one grab dredger, one anti-pollution vessel and two multi-purpose launches. It was informed that port also engages private dredgers on contract basis for dredging the channel.

Table 3.11 Details of Port Tugs

Number	Type
1	22 T Bollard Pull
1	32 T Bollard Pull
3	30 T Bollard Pull
2	45 T Bollard Pull
2	35 T Bollard Pull

3.3.7.4 River Marks and Buoys

Over 500 (of which 140 are lighted) River Marks and Buoys are maintained by the KoPT. These are extremely useful in facilitating night navigation, pilotage and dredging. There are also 1 boat buoy, 30 lighted buoys and 72 unlit buoys marking the navigational channel from Sand heads to Kolkata.

3.3.7.5 Vessel Traffic Management System (VTMS)

Navigational aid information is provided through VTMS for plying vessels. KoPT is having VTMS console at Haldia with four X band RADAR and AIS stations at Haldia, Frasergaunj, Dadanpatra and Sagar with communication system, metro logical system, microwave communication link etc.

4.0 PERFORMANCE, OPTIONS FOR DEBOTTLENECKING & CAPACITY ASSESSMENT

4.1 General

The total cargo handled through the existing facilities, during the past 5 years for KDS and HDC are presented in the following **Table 4.1** and **Table 4.2**.

Table 4.1 Cargo Handled During Last 5 Years at KDS (in MTPA)

Commodity	2010-11	2011-12	2012-13	2013-14	2014-15
POL+ Crude + Product + other	0.878	0.682	0.708	0.717	1.434
Iron Ore	0.104	-	-	-	0.133
Fertilizer	0.028	0.014	0.042	0.004	0.098
Coal	0.042	0.003	0.009	0.028	1.675
Containers					
− Tonnage	6.220	6.818	6.960	7.063	8.110
− TEUs	0.377	0.412	0.463	0.449	0.528
Others	5.268	4.716	4.125	5.062	3.833
Grand Total	**12.540**	**12.233**	**11.844**	**12.874**	**15.283**

[Source: Major Port of India Profile, IPA and Administrative reports, KoPT]

Table 4.2 Cargo Handled During Last 5 Years at HDC (in MTPA)

Commodity	2010-11	2011-12	2012-13	2013-14	2014-15
POL+ Crude + Product+ other	9.654	7.907	6.195	6.098	9.422
Iron Ore	5.952	3.943	1.715	2.170	2.338
Fertilizer	0.459	0.519	0.386	0.560	0.205
Coal	8.183	7.285	6.479	6.948	11.624
Containers					
− Tonnage	2.835	2.619	2.869	2.230	1.958
− TEUs	0.149	0.140	0.137	0.113	0.102
Others	7.922	8.742	10.440	10.505	5.463
Grand Total	**35.005**	**31.015**	**28.084**	**28.511**	**31.010**

[Source: Major Port of India Profile, IPA and Administrative reports, KoPT]

4.2 BCG Benchmarking Study

BCG, as part of their benchmarking study, has looked into the operation of the berths and has suggested various measures for improving the performance. The report of BCG pertaining to Kolkata Port is given in the **Appendix 1**.

4.2.1 Recommendation for KDS

Regarding NSD, major recommendation is to improve container handling capacity. Out of 5 container handling berths (3, 4, 5, 7, and 8), two berths i.e. 3 and 7 are crane-less and it is posing a constraint. It is further assessed that berth 7 will not be able to support MHC load and hence only berth 3 may be considered for mechanisation. Moreover, it is further recommended that NSD 2, which handles break bulk, may be converted to container handling berth as it is close to container yard.

Extension of railway line at KPD was also recommended to allow complete rake loading in port premises.

4.2.2 Recommendation for HDC

HDC handled 30 MT of cargo in FY 14–15, of which dry bulk constituted ~60% volumes. It has capacity constraints and most of the berths are conventional berths and liquid berths are working at more than 70% occupancy (**Figure 4.1** & **Figure 4.2**).

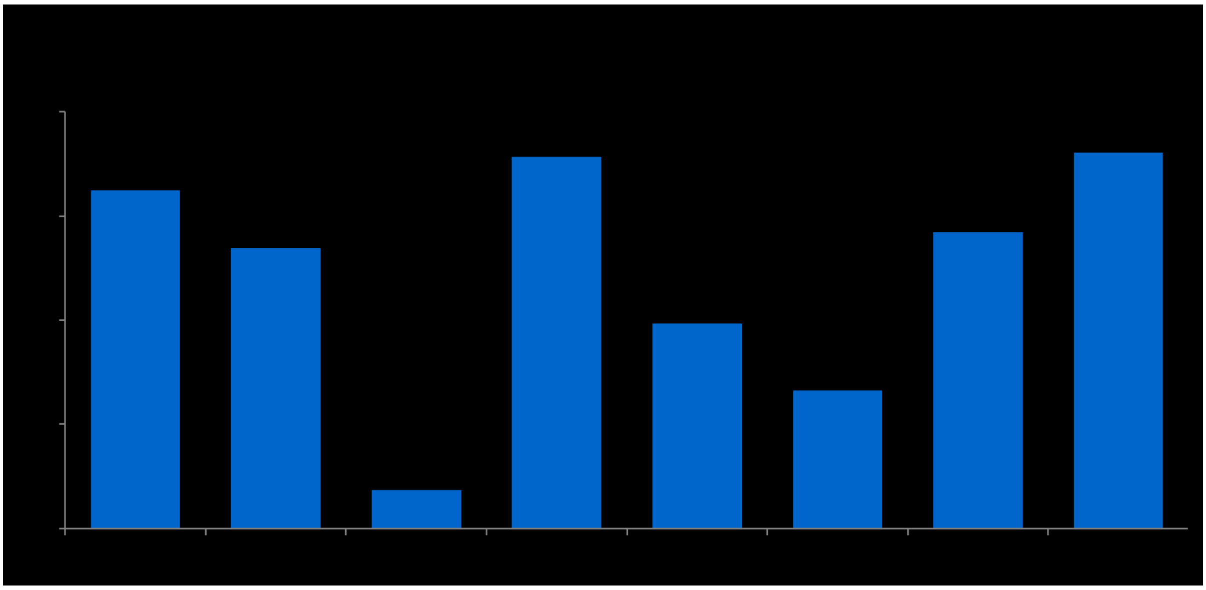

Figure 4.1 Berth Occupancy Details of HOJ 1, HOJ 2, HOJ 3, Berth 2 to 4, Berth 4 A & 4 B

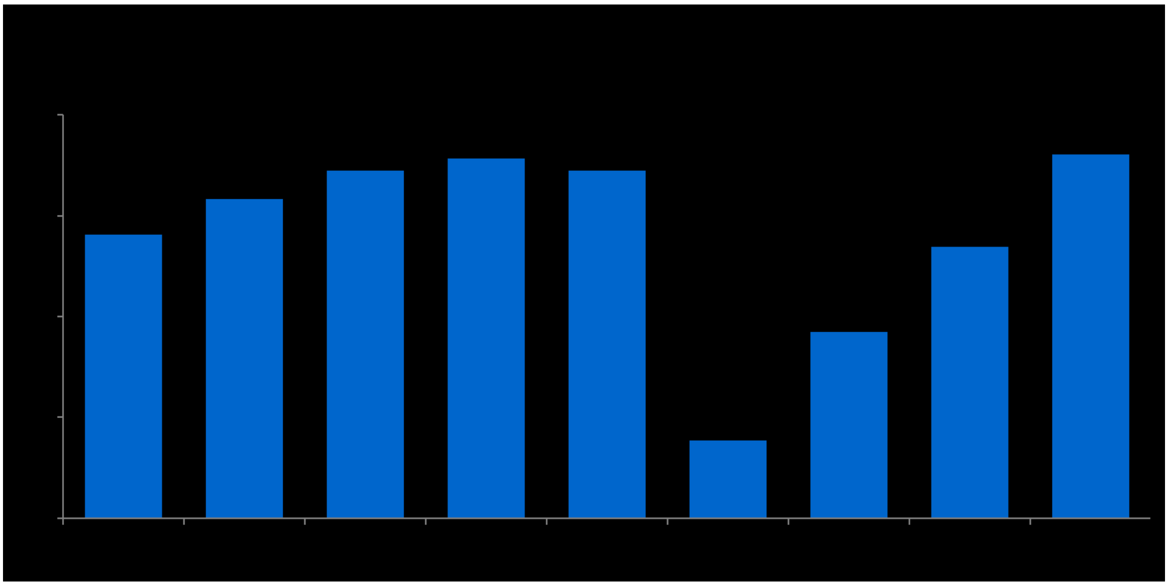

Figure 4.2 Berth Occupancy Details of Berth 5 to Berth 13

The BCG study highlighted that there is a need to add MHCs to berths 2, 8, 9 and 13 to increase berth capacity.

The study also suggested that vessels serviced at HDC generally stay for about 3 days at conventional berths and 2.5 days at Mechanised berths. The time spent at these berths also includes non-working time of 21-24 hr on account of shift breaks (14 hr) and waiting time for tide to sail out of lock gate (6 hr). To deal with these delays the report suggests bringing vessels in anticipation, creating additional waiting space inside the Dock and also providing for 2 additional tugs for timely shifting of the vessels.

The major bottleneck at HDC is the capacity of the lock gate which can allow entry and exit of limited number of ships per day. As the liquid bulk handled at berths 3, 5, 6 and 7 comes in low parcel sizes and higher number of ships results in wastage of lock gate capacity. Thus, it is advisable to shift these vessels outside the lock gate probably to HOJ II and HOJ III, which are operating at low occupancy.

4.3 Performance of Berths at KDS

4.3.1 Berths inside KPD

Out of total 20 berths in KPD, only 13 berths were utilised to handle 0.5 MTPA of cargo during 2014 - 15. A total of 203 ships were handled with average parcel size ranging from 58 T to 5,928 T. All the berths were found to work at very low occupancy rate except berth KPD 8, which is handling container and is servicing 1.2 lakh T of cargo as shown in **Table 4.3**.

Table 4.3 Analysis of Berths inside KPD

Berth No.	Cargo	Volume (T)	No. of Ships	Average Output '000 (TPD)	Berth Occupancy	Pre-Berthing Detention in Ship Days	Average Parcel Size, T
KPD 1	Coal Tar Pitch, General	24,405	6	1,317	10.9%	1.6	4,068
KPD 3	Pet Coke, General	80,579	15	1,753	16.5%	12.6	5,372
KPD 4	General, Wooden logs	65,906	18	1,433	20.9%	9.6	3,661
KPD 5	Container, General, Sand, Salt, Steel, Wooden Log	46,156	12	2,194	9.3%	7.4	3,846
KPD 6	General	11,695	3	1,794	2.9%	0.9	3,898
KPD 7	General	58	1	2,900	0.8%	0.4	58
KPD 8	Container, General	119,306	81	616	73.2%	15.3	795
KPD 9	General	2,899	2	950	1.2%	3.0	1,450
KPD 10	General, Wooden logs	11,169	4	1,249	3.3%	0.9	2,792
KPD 11	Container, General	11,880	29	532	29.6%	3.6	410
KPD 12	General, Peas	2,320	2	527	3.2%	0.3	1,160
KPD 27	Coke, General, Iron Ore, Limestone, Sand, Wooden Logs	130,422	22	2,860	16.5%	10.4	5,928
KPD 28	Coke, Iron Ore, Sand, Wooden Logs	79,113	8	3,748	9.0%	2.7	9,889
Total		**505,938**	**203**				

However, on detailed examination it was noted that although the berth occupancy on account of vessels servicing cargo is low but these berth also handle many non-cargo vessels, i.e. barges, passenger vessels, repair vessels, Navy vessels etc. Therefore the actual berth occupancy at these berths is much higher as presented in **Table 4.4.**

Table 4.4 Berth Occupancy at KPD Accounting All Vessel Types in 2014 - 15

Berth	No. of days							Percentage of Occupancy
	Available	Occupied						
		By Vessels			By Barges Working	Others	Total	
		Working	Non-Wkg.	Repair				
1	365	51.0	0.0	0.0	47.0	74.0	172.0	47.1
3	365	70.8	0.0	0.0	8.5	97.0	176.3	48.3
4	365	101.4	0.0	0.0	65.7	65.0	232.1	63.6
5/7	365	46.0	1.2	0.0	172.0	23.0	242.2	66.4
6	365	10.4	3.8	0.0	95.3	3.0	112.5	30.8
8	365	273.4	0.0	0.0	20.3	12.0	305.7	83.8
9	365	10.1	5.1	0.0	91.5	0.0	106.7	29.2
10	365	24.1	0.0	0.0	70.2	78.0	172.3	47.2
11	365	127.7	34.2	178.8	0.0	24.0	364.7	99.9
12	365	11.6	0.0	234.9	31.1	70.1	347.7	95.3
22	365	0.0	0.0	114.2	13.6	150.0	277.8	76.1
23	365	0.0	0.0	0.0	74.7	289.3	364.0	99.7
24	365	0.0	0.0	12.0	63.6	221.5	297.0	81.4
25	365	0.0	0.0	0.0	173.8	133.0	306.8	84.1
26	365	0.0	0.0	17.2	118.8	0.0	136.0	37.3
27	365	60.4	0.0	0.0	122.1	0.0	182.5	50.0
28	365	33.0	45.6	0.0	155.1	66.0	299.7	82.1
29	365	0.0	0.0	0.0	78.9	285.2	364.0	99.7

[Source: KoPT]

4.3.2 Berths at NSD

The actual cargo handled in the impounded dock system of KDS, excluding traffic handled at Budge Budge Jetties and anchorages / IWT Jetties / IV Wharves, etc. for 2014-15 is **10.32 MT**. Berths NSD 4, 5 and 8 together service 70% of the cargo. These berths are found to have acceptable berth occupancy rates. Most of the other berths have very low occupancy rates and average parcel sizes were also found to be smaller. Bharat Kolkata Container Terminals Pvt. Ltd. (a wholly owned unit of PSA International) has been given a contract for integrated ship-to-shore services including back-up operations at berth no. 3, 4, 5, 7 & 8 NSD of KDS as shown in **Table 4.5**.

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Table 4.5 Analyses of Berths Inside NSD

Berth No.	Cargo	Volume (T)	No. of Ships	Average Output '000 (TPD)	Berth Occupancy	Pre-Berthing Detention in Ship Days	Average Parcel Size (T)
NSD 1	Container, General, Project Cargo, Rock Phosphate, Steel, Wagon	54,430	34	1,535	17.1%	14.1	1,601
NSD 2	Container, General, Mach, Rock Phosphate, Steel, Wagon	378,998	56	5,720	26.2%	13.7	6,768
NSD 3	BMO, Container, Furnace Oil, HSD, LDO, Benzene, Palm Oil, Sulphuric Acid	970,461	129	6,271	59.7%	48.7	7,523
NSD 4	Container	2,381,500	197	10,488	78.5%	115.4	12,089
NSD 5	Container, General	1,354,421	123	9,123	54.6%	60.4	11,012
NSD 7	Container	891,470	93	6,548	50.5%	44.6	9,586
NSD 8	Container, General	2,016,114	170	9,243	74.8%	70.5	11,859
NSD 12	BMO, Container, Lube Oil, Palm Fatty acid	51,671	14	2,811	8.4%	8.7	3,691
NSD 13	Coke, Container, General, Peas, Sand, Sulphur	58,308	30	1,306	19.4%	9.8	1,944
NSD 14	Coal, Coke, Container, General, Salt, Steel, Wooden Log	81,372	28	2,069	16.8%	20.6	2,906
Total		**8,238,745**	**874**				

As explained earlier for KPD, at NSD also there are many other vessels which occupy berth in addition to cargo vessels (**Table 4.6**).

Table 4.6 Berth Occupancy at NSD Accounting All Vessel Types in 2014 - 15

Berth	Available	No. of Days						Percentage of Occupancy
		Occupied						
		By Vessels			By Barges Working	Others	Total	
		Working	Non-Wkg	Repair				
1	365	142.88	0	0	7.82	11	161.7	44.30
2	365	158.64	0	0	16.35	0	174.99	47.94
3	365	200.77	0	0	38.82	0	239.59	65.64
4	365	292.38	0	0	0	0	292.38	80.10
5	365	206.29	0	0	0	0	206.29	56.52
7	365	196.81	0	0	0	0	196.81	53.92
8	365	281.71	0	0	0	0	281.71	77.18
13	365	142.37	0	0	48.79	2	193.16	52.92
14	365	141.07	0	0	31.31	0	172.38	47.23

[Source: KoPT]

4.3.3 Budge Budge Jetties

A total of 1.1 MTPA of cargo was handled at 6 budge budge jetties. The main cargo handled is POL and three berths (BB1, B7 and BB8) together handle 76% of the total cargo. The berth occupancy was recorded to be low for all the berths. The pre berthing time at BB 7 and 8 is quite high (**Table 4.7**).

Table 4.7 Analyses of Jetties at Budge Budge

Berth No.	Cargo	Volume (T)	No. of Ships	Average Output '000 (TPD)	Berth Occupancy (%)	Pre-Berthing Detention in Ship Days	Average Parcel Size (T)
BB 1	HSD, LDO, Benzene, Lube Oil, Motor Sprit, Palm Oil	238,851	47	6,558	19.5	23.8	5,082
BB2	Benzene, Lube Oil, Palm Oil	3,771	3	3,697	0.5	2.0	1,257
BB 3	Lube Oil, LDO	13,010	5	7,837	1.0	1.7	2,602
BB 5	HSD, LDO, Benzene, Lube Oil, Motor Sprit, Palm Oil, MTBE, Phenol	134,428	29	4,253	12.7	20.6	4,635
BB 7	ATF, BMO, Lube Oil, MTBE, Palm Oil, Paraffin, Phenol, Kerosene	326,794	74	4,183	34.7	87.7	4,416
BB 8	ATF, BMO, Motor Sprit, MTBE, Paraffin, Palm Oil, Phenol, Sulphuric Acid	388,633	75	4,894	34.5	66.4	5,182
Total		**1,105,487**	**233**				

Berth Occupancy at Budge Budge considering both cargo and non-cargo vessels are presented in **Table 4.8**.

Table 4.8 Berth Occupancy at Budge Budge Accounting All Vessel Types in 2014 - 15

Berth	No. of days							Percentage of Occupancy
	Available	Occupied						
		By Vessels			By Barges Working	Others	Total	
		Working	Non-Wkg	Repair				
1	365	142.88	0	0	7.82	11	161.7	44.30
2	365	158.64	0	0	16.35	0	174.99	47.94
3	365	200.77	0	0	38.82	0	239.59	65.64
4	365	292.38	0	0	0	0	292.38	80.10
5	365	206.29	0	0	0	0	206.29	56.52
7	365	196.81	0	0	0	0	196.81	53.92
8	365	281.71	0	0	0	0	281.71	77.18
13	365	142.37	0	0	48.79	2	193.16	52.92
14	365	141.07	0	0	31.31	0	172.38	47.23

4.4 Performance of Berths at HDC

4.4.1 Oil Jetties outside Dock

There are 3 oil jetties outside the dock, handling more than 4.3 MT of cargo annually. HOJ I and II have very high pre-berthing detention. HOJ I handle small vessels with average size of 7,000 T and hence have very limited handling capacity of only 8,500 TPD (**Table 4.9**).

Table 4.9 Analysis Oil Jetties Outside the Dock

Berth No.	Volume, (MT)	No. of Ships	Average Output '000 (TPD)	Berth Occupancy (%)	Pre-Berthing Detention in Ship Days	Average PBD in Ship Day	Average Parcel Size (T)
HOJ I	1.93	270	8.5	81%	412	0.66	7133
HOJ II	2.21	181	26.7	67%	265	0.68	12208
HOJ III	0.69	32	40.0	9%	29	1.12	21584

At HOJ III facilities have been created for handling edible oil so that more number of dry bulk cargo vessels can be handled inside the impounded dock basin.

4.5 Berths inside Dock

AECOM has also evaluated the performance of these dock basin berths for a sample year of 2014-15. For this purpose, these berths are set in three groups:

- Berths on the eastern side of the basin;
- Berths on the western side of the basin and
- The finger jetty.

4.5.1 Berths on the Eastern Side of the Basin

As per KoPT, the berth wise details are as follows. The annual capacity of berths mentioned is based on the equipment provided and cargo proposed to be handled.

Berth no. 2: The berth is primarily utilised for handling dry bulk cargo operated through to MHC's having capacity of 20,000 T per day. The berth has an annual capacity of 3.5 MT.

Berth no. 3: After dismantling of the mechanised loading system the same is primarily utilised for handling liquid bulk cargo like Para xylene, SKO, furnace oil, HSD and edible oil. Dry bulk and breakbulk cargo is also handled at this berth in conventional method using ship's gears. At the moment this berth has an annual capacity of 1.5 MT.

Berth no. 4: This berth has fully mechanised handling facility for handling coastal thermal coal at 20,000 T per day. This berth has an annual capacity of 3.5 MT.

Berth no. 4A: This berth has fully mechanised facility for handling primarily coal as well as other dry bulk cargo. This berth has an annual capacity of 3.5 MT.

Berth no. 4B: This berth is equipped with 2 MHC's for handling primarily dry bulk cargo at 20,000 T per day. The berth has an annual capacity of 3.5 MT.

Berth no. 5: The berth is utilised for handling liquid bulk cargo through pipelines. This berth has an annual capacity of 1.0 MT.

Berths on eastern side of dock are shown in **Figure 4.3**.

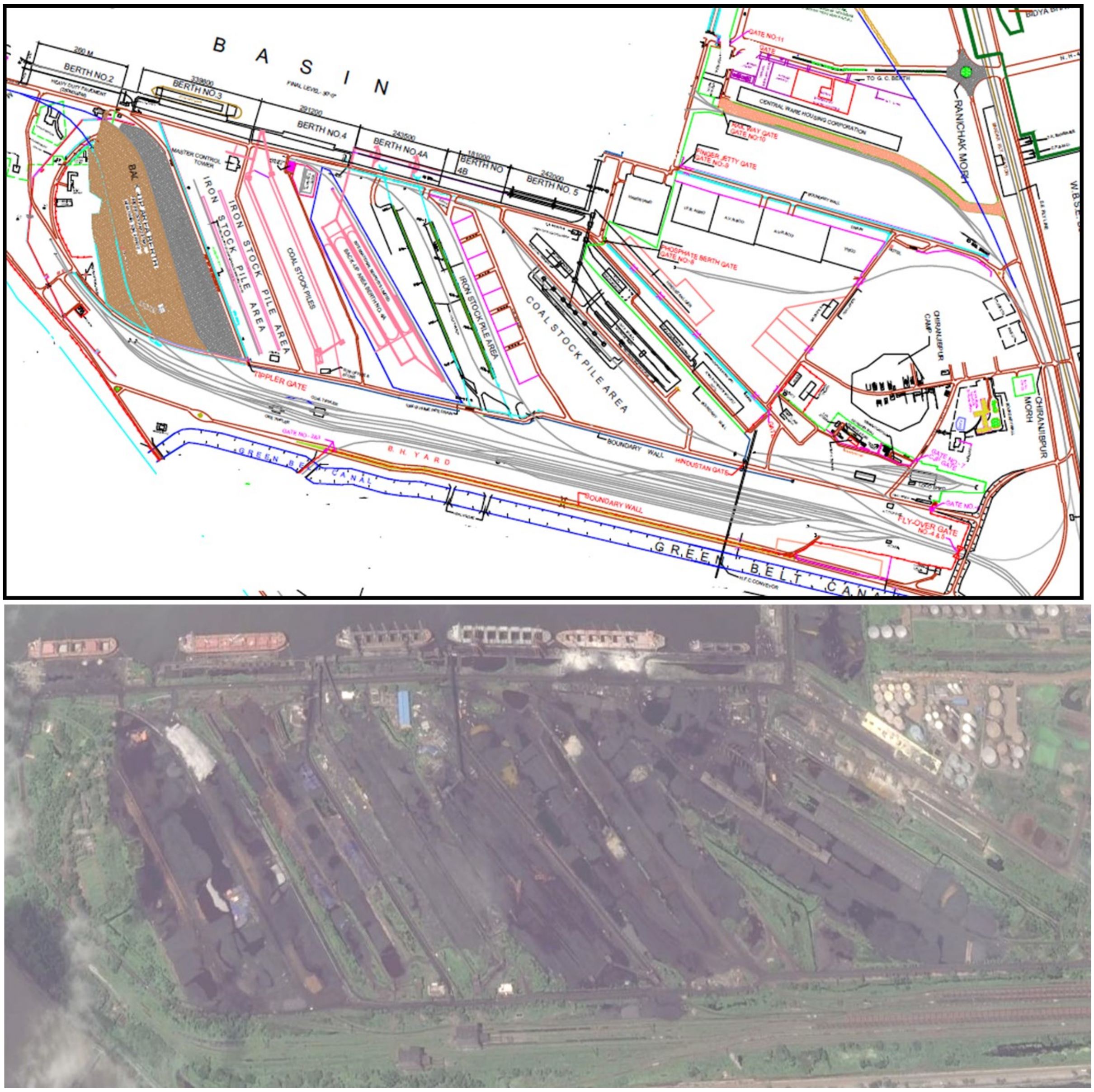


Figure 4.3 **Berths on the Eastern Side of Dock Basin (Map- Top; Satellite Image – Bottom)**

4.5.2 Berths on the Western Side of the Basin

As per KoPT, the berth wise details are as follows. The annual capacity of berths mentioned is based on the equipment provided and cargo proposed to be handled.

Berth no. 8: The berth is equipped with 2 MHC's for handling primarily dry bulk cargo at 20,000 T per day. The berth has an annual capacity of 3.5 MT.

Berth no. 9: The berth I s primarily utilised for handling dry bulk cargo and breakbulk cargo in conventional methods using ship's gears. The annual capacity of this berth is 2.0 MT.

Berth no. 10 & 11: These berths are utilised for handling container vessels in an integrated manner and is equipped with 2 RMQC's. The annual capacity of these berths is 2.0 MT. With the increase in container traffic additional equipment at these berths could be deployed to achieve the capacity upto 6 MTPA.

Berth no. 12: This BOT berth is utilised for handling clean dry bulk as well as breakbulk cargo using ship's cranes and also one MHC. The annual capacity of this berth is 2.0 MT.

Berth no. 13: At this moment, this berth is utilised for handling clean dry bulk cargo as well as breakbulk cargo through conventional methods using ship's own gears and its annual capacity is about 2.0 MT. However, after installation of 2 MHC's by September 2016, the capacity will be 3.0 MT.

Berths on western side of dock are shown in **Figure 4.4**.

Figure 4.4 Berths on the Western Side of Dock Basin (Map-Top; Satellite Image – Bottom)

4.6 Berths on the Finger Jetty

There are two berths on the Finger Jetty namely berth no. 6 & 7 (**Figure 4.5**). The said berths are primarily utilized for handling various liquid bulk cargo like phosphoric acid, CBFS, Sulphur Acid, MEG, edible oil etc.

There is also provision of handling edible oil through floating pipeline from vessels in double banking position at the Finger Jetty.

After procurement/deployment of additional tugs, Berth no. 7 will be declared as waiting jetty. The annual capacity of Finger Jetty is estimated to be 2.0 MT.

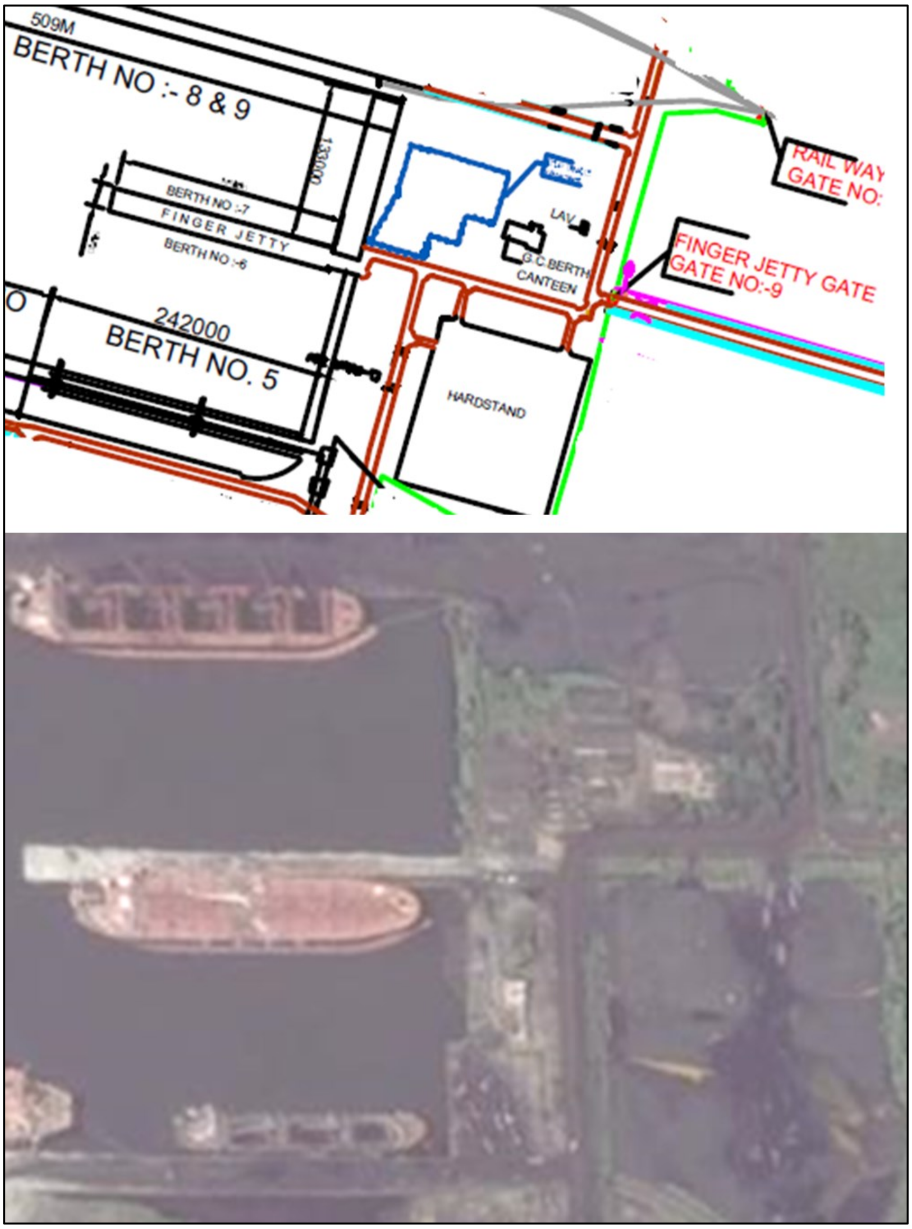


Figure 4.5 Berths on the Finger Jetty (Map- Top; Satellite Image – Bottom)

4.7 Performance of the Navigation Channel and Lock Gates

4.7.1 Approach Channel

HDC has depth limitation on account of high siltation, which results in high annual maintenance dredging. Most of the vessels sail taking advantage of tide. Vessels start navigation just before the high tide level of the day through Eden and proceed towards Haldia port in a convoy. A separation time of about 15 minutes is kept between vessels so as to allow some response time in case of any emergency. About 2 hours is taken by these vessels to reach the Lock Gate. Thus, only 7 to 8 vessels having draft close to about 8 m navigate the channel to Haldia port during each high tide.

4.7.2 Lock Operation

HDC lock is sized to handle a Panamax size ship having 301 m in length, 36.9 m in width and floor level of 10.99 m w.r.t. CD. The lock is aligned west – southwest to facilitate entry during flood time. Three caisson gates have been provided at the lock, each with a recess area to allow ship passage. The central one has capability to be utilised as dry dock for repair of gate.

Currently, ship can enter the dock basin through the lock gate in about 80 to 90 minutes. Similarly departure of the ship from turning circle to outside lock takes about 90 to 100 minutes. The original design allowed for passage of 10 ships (5 in + 5 out) per high tide but with the passage of time the operating system of the lock has slowed down and currently on an average of 5 to 6 ships per tide could be taken in / out, which limits the number of ships that could be handled at the dock annually.

5.0 DETAILS OF ONGOING DEVELOPMENTS

5.1 General

Kolkata Dock seems to have lots of capacity lying un-utilised and the cargo potential is also low. Considering these aspects no new development is planned at Kolkata Dock.

On the other hand, HDC has good prospects to handle import coal (coking, non-coking coal, coke) for the steel plants (SAIL at Durgapur, Bokaro and Rourkela; IISCO at Burnpur; TATA Steel at Jamshedpur) and power plants (NTPC at Farakka and Kahalgaon; CESC at Budge Budge). Besides, HDC is suitably located to handle iron ore originating from states of Jharkhand and Orissa. Thus, to meet the demand of anticipated traffic growth, HDC has envisaged a number of projects outside the dock basin and these are shown in the **Figure 5.1**.

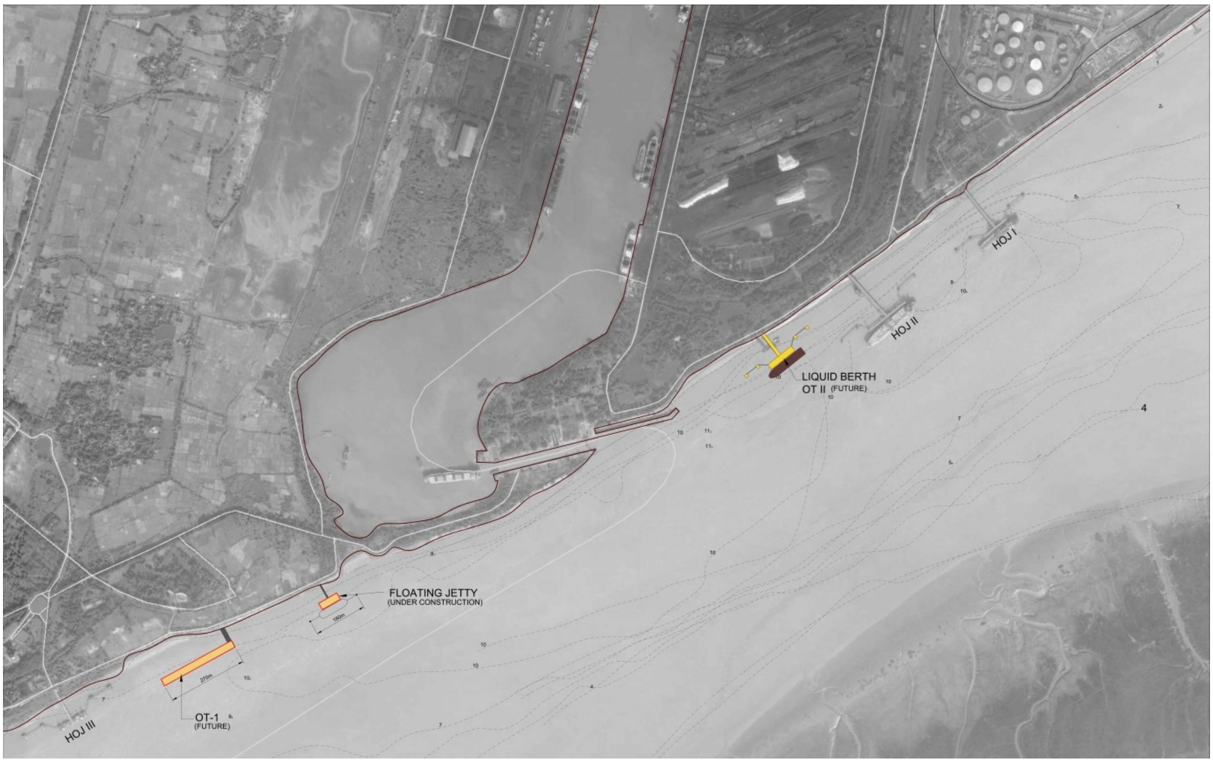


Figure 5.1 Location of Ongoing Developments near Haldia Dock

While Outer Terminal 1 (OT1) and Outer Terminal 2 (OT2) are at a planning stage, the contract for the floating jetty has already been awarded. The fly ash jetty is already commissioned.

In addition, the port had earlier planned total four berths at Shalukhali, which is about 15 km north of the existing Dock Complex. It was proposed to develop two fully mechanized berths for handling imported coal and two multi-purpose berths with MHC for handling other bulk cargoes like imported coal and iron ore. The location plan for the proposed port facilities are shown in **Figure 5.2**.

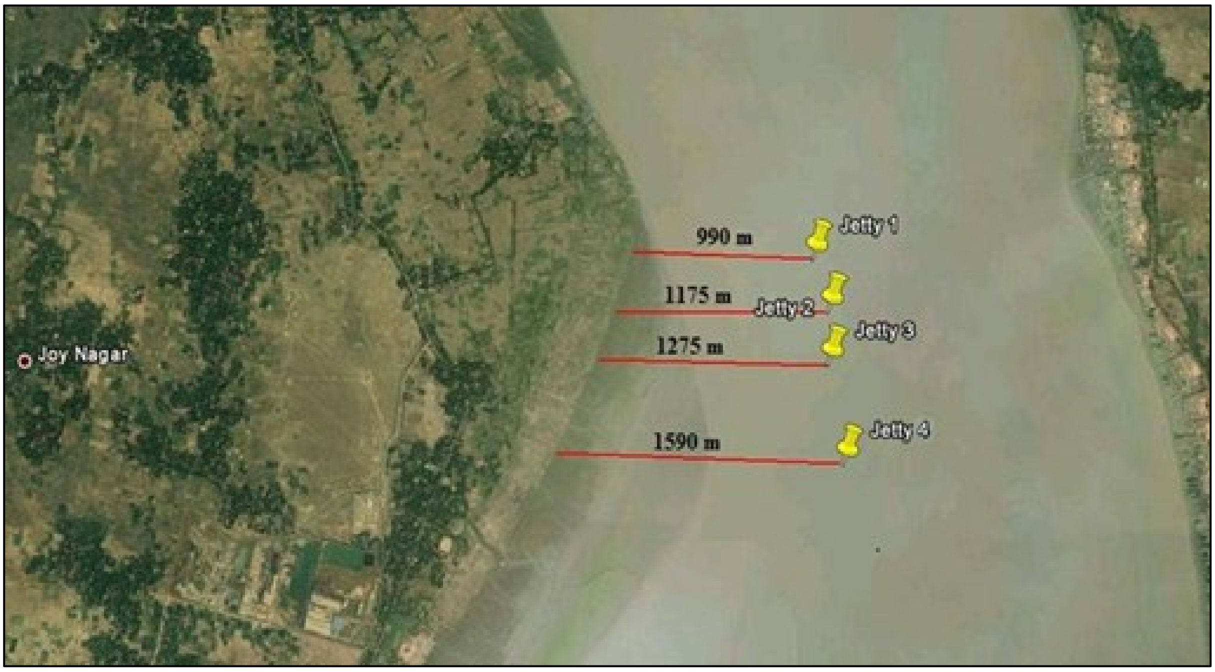


Figure 5.2 Location of Jetties at Shalukhali alongwith Approaches

5.1.1 Multipurpose Jetty (OT-I)

Due to depth limitations at the HDC, it was planned to ramp up transloading operations at the Sand heads during dry season and at Kanika Sands, an island off the Orissa coast, during monsoon. For this, a 270 m multipurpose jetty is planned to be constructed upstream of Oil Jetty III to be known as Outer Terminal 1 (OT1). The planned capacity for the jetty is about 5 MTPA and it will require a capital investment of INR 413 crores.

5.1.2 Multipurpose Jetty (OT-II)

The space available between the 2nd Oil Jetty and lead-in Jetty has been proposed to develop a jetty for handling vessels of maximum 185 m LOA. The new riverine jetty shall be designed to handle vessels/barges up to 22,500 DWT/10,000 GT with parcel load of 15,000 T. It is estimated that this jetty will handle about 2.0 MTPA of cargo.

The jetty is mainly planned to support import of coal and also export of iron ore. The operation at the jetty shall be mechanised having a grab unloader with conveyor system to unload a vessel and thereafter a stacker cum reclaimer will be used for aggregation of cargo at back up area. Mechanized wagon loader of 1,500 TPH capacity will be utilised to transfer cargo from back up area to wagons.

5.1.3 Floating Riverine Barge Jetty

Upstream of 3rd oil jetty, a floating barge jetty is proposed to handle Mini Bulk Carriers (MBC) of about 10,000-12,000 DWT to handle cargo like coal etc. The proposed jetty will be capable to handle barges of 106 m LOA and 26 m beam. It is proposed that cargo from the vessels will be unloaded by means of a crane fitted over a floating pontoon and from there it will be transferred to shore hardstand through a conveyor. The proposed barge jetty will have an annual handling capacity of 2.55 MTPA. The projected cost for the facility is INR 73.7 crore.

5.1.4 Oil Terminal at Haldia Dock – II / Shalukhali

The bulk and breakbulk terminal planned at Shalukhali could not be taken up due to weak response from the bidders. Now KoPT plans to set up a liquid jetty at that location. As regards chemicals, Paraxylene is likely to be shifted to the new jetty at Shalukhali along with the proposed LPG imports of Aegis Logistics as the capacity of the three existing oil jetties is exhausted.

All the above mentioned projects are to create new facilities but HDC has also foreseen many capacity augmentation projects at the already existing berths to enhance the cargo handling capacity. Some of the projects are as follows:

- Integrated Container Handling at Berths 10 & 11
- Supply, Operation & Maintenance of different cargo handling equipment (MHC) at berths 2 & 8
- Procurement of 1 Stacker-cum-Reclaimer for Coal Export Plant at HDC

It is important to note that the above mentioned enhancement projects will overcome some of the constraints highlighted in previous sections of the report.

6.0 TRAFFIC PROJECTIONS

6.1 Projections Based on OD Study at National Level

The origin-destination of key cargo (accounting for greater than 85% of the total traffic) for all Indian ports and development of traffic scenarios for a period of 20 years has been carried out by **McKinsey & Co.** as mandated for this project. Accordingly, based on a macro-level analysis the future traffic for Kolkata Dock System & Haldia Dock Complex up to 2035 is presented in this chapter (**Table 6.1** and **Table 6.2**).

6.2 Kolkata Dock System (KDS)

Kolkata handles containers, coking coal, iron ore and fertilizers in dry and break bulk cargo and POL in liquid bulk. Out of these commodities, Containers alone constitute ~53% of the cargo. Kolkata currently has West Bengal as its primary hinterland for containers with other hinterlands including Bihar, Jharkhand, North East and Orissa.

6.2.1 Major Commodities and their Projections

Assessment of traffic has been done based on analysis of past traffic at Kolkata, interviews with Port authorities, West Bengal Industrial Development Corporation (WBIDC) as well as several stakeholders in the shipping and user industries.

Hinterland for container traffic at Kolkata is expected to remain the same going forward. Tidal draft, limited plans for capacity expansion and no mainline vessel call for containers in India limit growth in hinterland for Kolkata.

Kolkata port currently handles ~0.5 MTEUs of containers, catering primarily to West Bengal hinterland. Kolkata, Durgapur, Haldia are the key container generating hinterlands for HDC and KDS generating ~60% of the overall traffic and small volume move to/from Bihar, Jharkhand and other parts of West Bengal. Kolkata's GDP is expected to grow at 9-11% while most other hinterlands are expected to grow at 8-10% CAGR.

Based on above, Kolkata is expected to handle 0.7-0.8 MTEUs by FY25 and further increase in traffic is limited by the port's planned capacity of 0.8 MTEUs. **Figure 6.1** to **Figure 6.3** show the current and projected container traffic for both Kolkata and Haldia which is shared between the two.

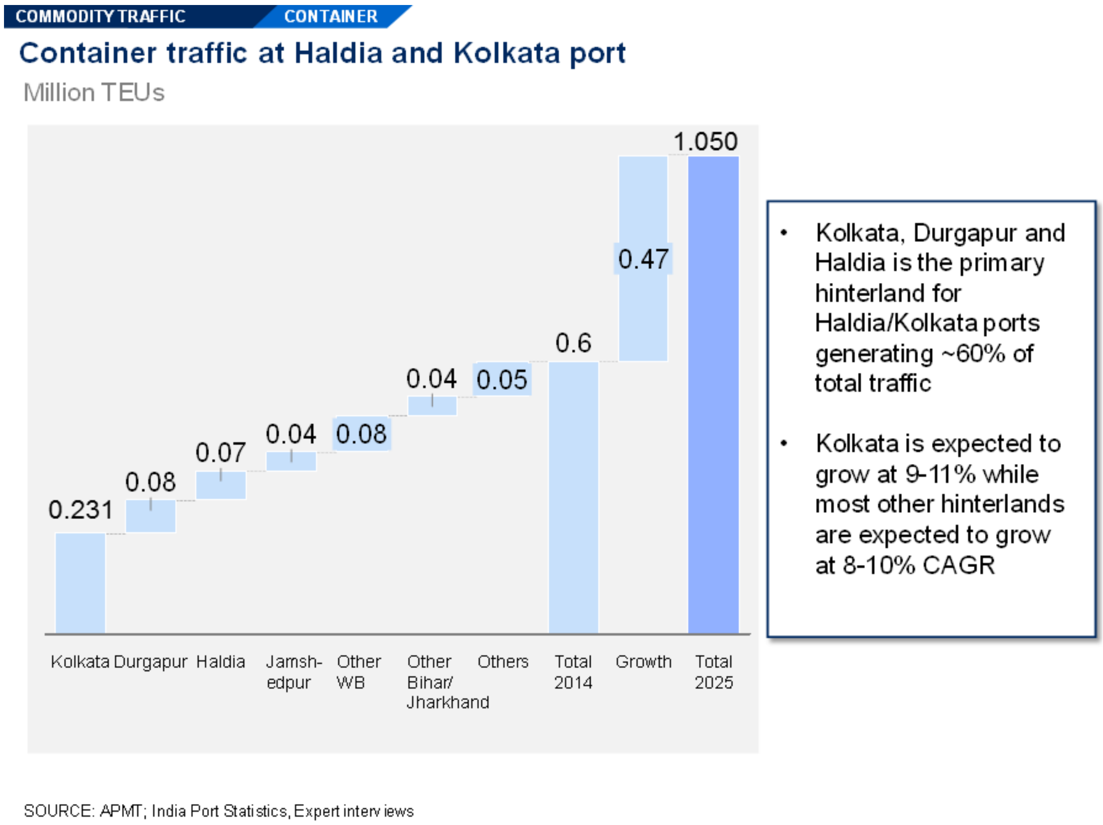


Figure 6.1 Container Traffic Projection of KoPT

COMMODITY TRAFFIC CONTAINER

West Bengal is the primary hinterland of Kolkata and Haldia port with small traffic from Bihar and Jharkhand

Primary hinterland of port

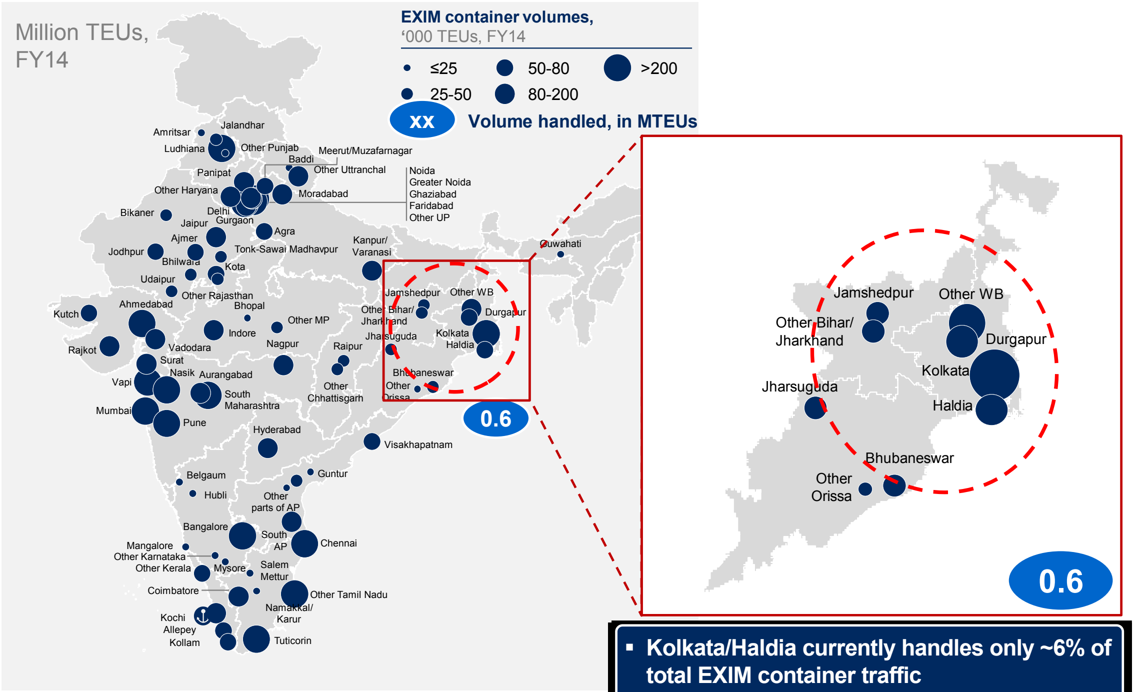
EXIM container volumes, '000 TEUs, FY14	JNPT	Mundra	Chennai	Pipavav	Tuticorin	Kolkata/ Haldia	Cochin	Visakha-patnam	Mangalore
NCR+Punjab	936	1,264	0	329	0	0	0	0	0
Maharashtra	2,121	54	0	0	0	0	0	0	0
Tamil Nadu	0	0	1,240	0	484	0	0	0	0
Gujarat	552	262	0	169	0	0	0	0	0
Uttar Pradesh	228	274	0	107	0	0	0	0	0
West Bengal	0	0	0	0	0	458	0	0	0
Rajasthan	43	448	0	60	0	0	0	0	0
Karnataka	94	0	163	0	66	0	0	0	50
Kerala	0	0	0	0	0	0	351	0	0
Andhra Pradesh	75	0	65	0	0	0	0	110	0
Madhya Pradesh	43	70	0	14	0	0	0	29	0
Bihar/Jharkhand	0	0	0	0	0	85	0	8	0
Uttaranchal	95	0	0	0	0	0	0	0	0
Orissa	0	0	0	0	0	12	0	69	0
Chhatisgarh	15	18	0	14	0	0	0	15	0
North East	0	0	0	0	0	7	0	0	0
Port total	4,202	2,390	1,468	693	551	562	351	263	50

SOURCE: APMT

Figure 6.2 Hinterland of Container Traffic

COMMODITY TRAFFIC CONTAINER

EXIM container generating hinterlands for Kolkata and Haldia port



- Kolkata/Haldia currently handles only ~6% of total EXIM container traffic
- Almost all of the traffic gets transshipped

SOURCE: APMT; IPA statistics; Stakeholder interviews

Figure 6.3 EXIM Container Generating Hinterland

Table 6.1 Traffic Forecast for Kolkata Dock System (MTPA)

Kolkata Port - Traffic Projections

Units: MMTPA (except Containers)

xx Base Scenario xx Optimistic Scenario

Commodity	2014-15	2020	2025 (Base)	2025 (Optimistic)	2035 (Base)	2035 (Optimistic)	Remarks
Liquid Cargo							
POL	0.6	0.9	1.1	1.5	1.8	2.2	
Dry and Break Bulk Cargo							
Thermal Coal (Loading)	0.0	0.0	0.0	0.0	0.0	0.0	
Thermal Coal (Unloading)	0.0	0.5	0.5	0.5	0.5	0.5	
Coking Coal	0.12	0.17	0.2	0.3	0.4	0.5	
Iron Ore	0.13	0.0	0.0	0.0	0.0	0.0	
Fertilizers	0.20	1.0	1.0	1.0	1.3	1.3	
Containers and other Cargo							
Containers (MnTEU)	0.53	0.65	0.7	0.8	0.8	0.8	▪ If any capacity constraints, some traffic may move to Dharma/ Haldia
Others	6.1	7.7	10.3	10.8	13.2	19.4	▪ Highly fragmented
Total (MMTPA)*	**15.3**	**20.3**	**23.9**	**26.4**	**29.5**	**36.2**	

Conversion Factor Used for Containers Projections: 1 TEU = 15.4 Tons

* Currently, the port is limited by its capacity of ~20 MTPA. It has limited scope of expansion and will not be able to capture all of its traffic potential post 2025.

6.3 Haldia Dock Complex (HDC)

HDC is a major port in West Bengal handling ~31 MTPA of cargo. It handles containers, coking coal, iron ore, fertilizers and POL. Out of these commodities, liquid bulk and coking coal constitute ~50% of the cargo. Haldia currently has West Bengal as its primary hinterland with other hinterlands including Bihar, Jharkhand, North East and Orissa. Going into the future we expect to see this traffic to go up to 54-65 MTPA by 2025.

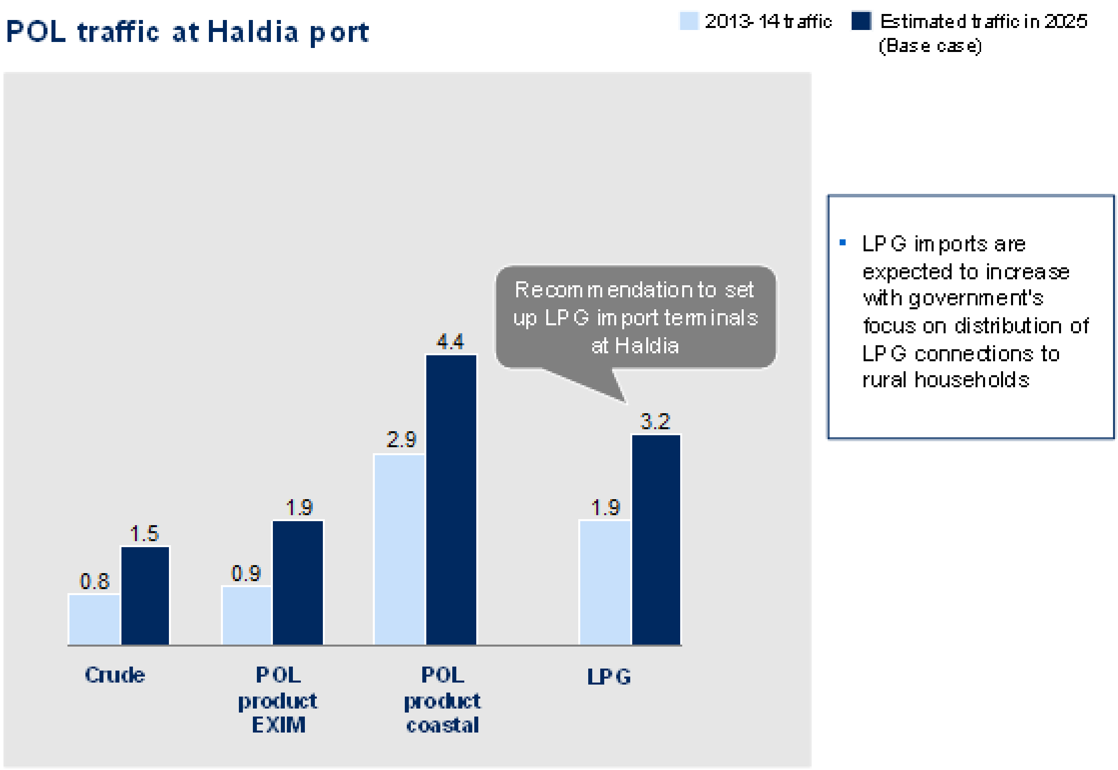
The traffic projections suggest that significant additional capacity is required to be created at HDC in order to cater to increasing traffic that may be serviced at HDC (**Table 6.2**).

6.3.1 Major Commodities and their Projections

6.3.1.1 POL

POL crude and product constitute 18% of traffic handled. The current traffic of 5.5 MTPA is split between crude, POL product-EXIM and coastal movement and LPG. IOCL Haldia is the key player for the crude oil imports. The current and the estimated traffic of POL in 2025 are shown below.

With no significant capacity expansion expected at Haldia and no new facility planned, POL crude traffic is increasing minimally. However, LPG imports are expected to increase with government's focus on distribution of LPG connections to rural households. It has also been proposed to setup LPG import terminal at Haldia.



SOURCE: Indian Petroleum and Natural Gas Statistics 2013-14; Basic Port Statistics of India 2013-14, Team analysis

Figure 6.4 POL Traffic Projections (HDC)

6.3.1.2 Thermal Coal

Currently Haldia imports 3.5 MTPA of thermal coal to meet the blending requirement of the power plants in the hinterland (NTPC Farakka). In addition, it also exports 1.2 MTPA of thermal coal, which is coastally shipped to TNEB power plants. Going forward, with the output of ECL increasing, overseas coal imports is unlikely to increase. By 2025, thermal coal imports is likely to range around 3-4 MTPA while the coastal coal exports will be around 2 MTPA.

6.3.1.3 Coking Coal

Currently Haldia imports 6 MTPA of coking coal primarily to meet the energy requirement of the steel plants in the hinterland. Haldia is the nearest logical port for 4 major steel plants – Durgapur, IISCO, Bokaro and Rourkela. But due to low draft, only a part of these plants' requirement is met by Haldia, the remaining is catered by Dhamra and Paradip port which have a much higher draft, allowing for bigger vessels to call at the port. Going forward, coking coal import is expected to increase and touch 8 MTPA by 2020 and 11-12 MTPA by 2025.

COMMODITY TRAFFIC COKING COAL

Haldia the nearest port (in rail kms) for 4 SAIL plants which contribute ~30% of total imports…

Short distance

Shortest distance rail route (siding to siding) kms

	Durgapur	IISCO	Bokaro	Rourkela	Bhilai
Vizag	984	656	940	665	550
Dhamra	485	453	499	531	808
Paradip	617	585	630	504	735
Haldia	308	~308	366	401	852

SOURCE: Indian railways, SAIL

Figure 6.5 Comparative Rail Route Distance

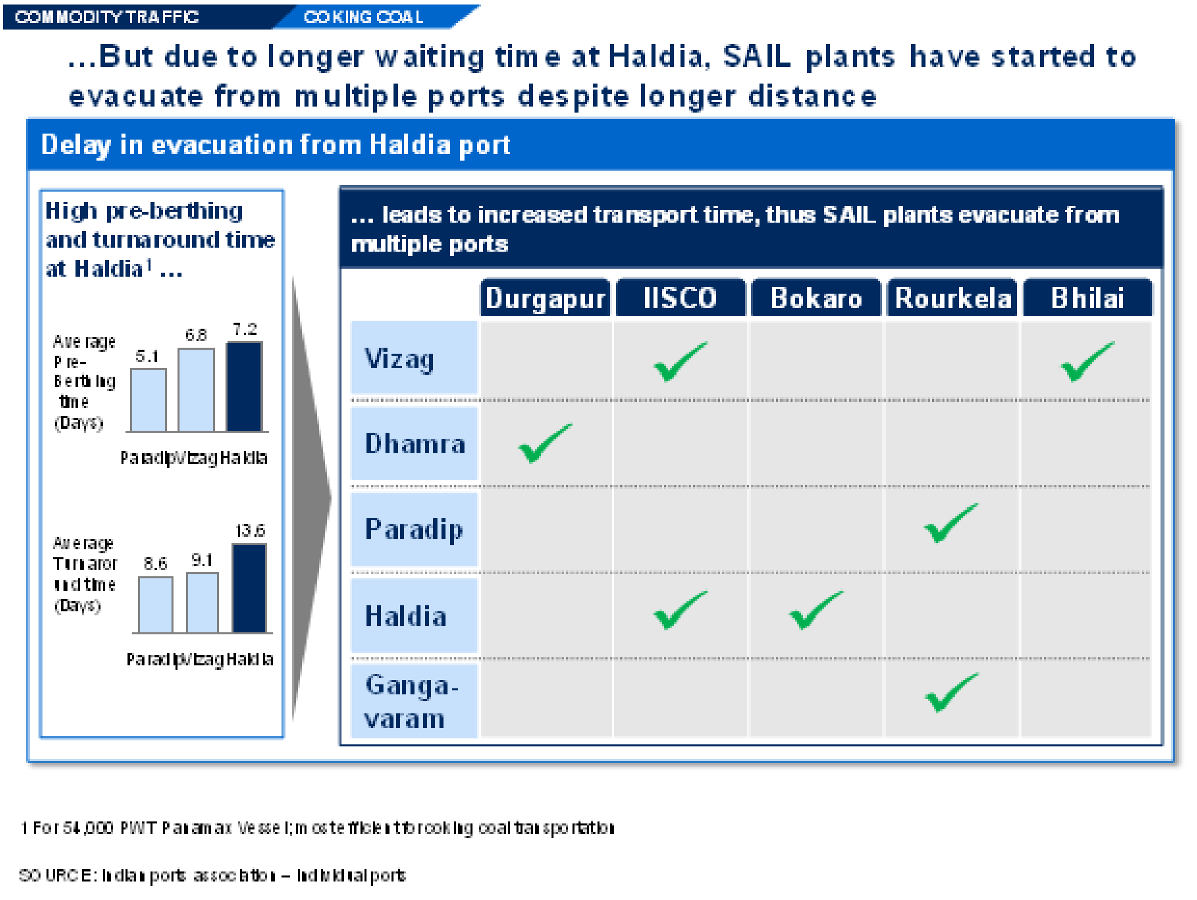


Figure 6.6 Comparative Analysis of SAIL Plants Coal Evacuation

6.3.1.4 Containers

Haldia port currently handles 0.1 MTEUs of containers, catering primarily to West Bengal hinterland. Kolkata, Durgapur, Haldia are the key container generating hinterlands for HDC and KDS generating ~60% of the overall traffic and small volume move to/from Bihar, Jharkhand and other parts of West Bengal. Kolkata's GDP is expected to grow at 9-11% while most other hinterlands are expected to grow at 8-10% CAGR.

With the capacity at KDS getting saturated, spill over traffic is expected to come to Haldia port. Going forward, container volumes are expected to touch 0.15 MTEUs by 2020 and 0.2-0.3 MTEUs by 2025. The exhibits below show the current and projected container traffic for both Kolkata and Haldia which is shared between the two. In case of capacity constraints, part of this traffic will move to Dhamra and Sagar.

6.3.1.5 Other Localized Commodities

Other commodities include iron ore, manganese, vegetable oil, chemicals, limestone etc. With the mining ban on iron ore, exports are expected to remain low, while chemicals and vegetable oil will grow at a healthy rate.

Table 6.2 summaries the traffic potential for key commodities for Haldia port.

Table 6.2 Traffic Forecast for Haldia Dock Complex

Units: MMTPA (except Containers)

Haldia Port - Traffic Projections

xx Base Scenario xx Optimistic Scenario

Commodity	Current	2020	2025 (Base)	2025 (Optimistic)	2035 (Base)	2035 (Optimistic)	Remarks
Liquid Cargo							
POL	5.5	9.9	11.0	12.1	13.6	15.3	▪ Growth coming from LPG import terminals proposed to set up in east coast ports
Vegetable Oil	1.6	3.5	4.5	5.5	5.5	6.5	
Chemicals	2.9	3.0	4.5	5.5	6.5	7.5	
Dry and Break Bulk Cargo							
Thermal Coal (Loading)	1.2	1.6	2.1	2.3	3.4	4.1	
Thermal Coal (Unloading)	3.5	3.3	3.3	4.0	4.0	5.0	▪ Overseas coal imports likely to decline as CIL production rises
Coking Coal	6.0	8.0	11.2	11.9	19.9	23.1	
Iron Ore	2.3	1.0	1.3	4.6	2.3	8.7	▪ Mostly exports; likely to remain low. Optimistic case is related to the volumes handled before ban
Limestone	1.4	2.0	2.8	3.2	4.8	5.5	
M.Ore	1.4	2.0	2.5	2.6	4.1	4.7	
Other Ore	0.9	1.5	1.8	2.2	2.8	3.2	
Fertilizers	0.8	1.0	1.5	1.6	1.8	2.2	
Containers and other Cargo							
Containers (MnTEU)	0.10	0.15	0.2	0.3	0.4	0.6	
Others	1.4	2.5	3.4	3.6	4.6	6.7	▪ Highly fragmented
Total (MMTPA)	**30.8**	**42.2**	**53.7**	**64.9**	**81.0**	**104.0**	

Conversion Factor Used for Containers Projections: 1 TEU = 19.2 Tons

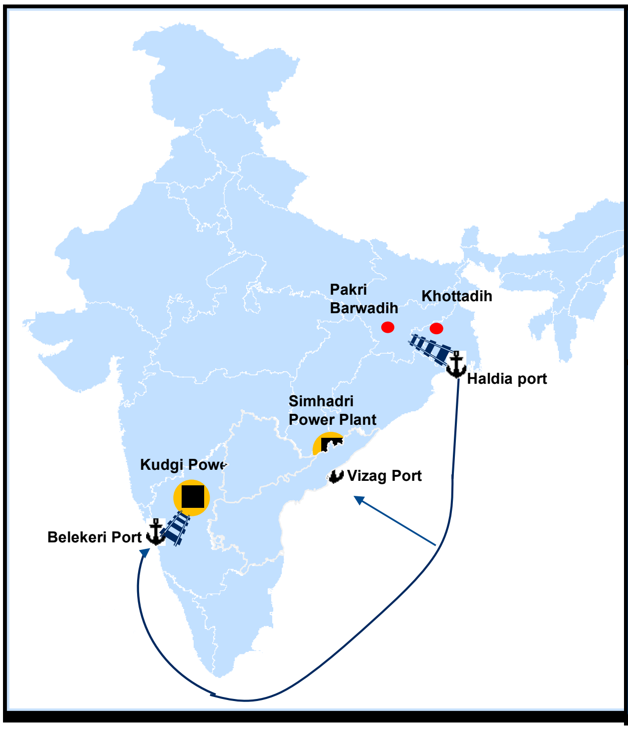
6.3.2 Coastal Shipping Potential

Apart from the above mentioned traffic, there is additional opportunity of coastal shipping that can be potentially tapped:

- **Thermal Coal:** 12.4 MTPA of thermal coal can be coastally shipped to NTPC Kudgi (Karnataka) and NTPC Simhadri from Pakri Barwadih and Khottadih OC mines respectively.

COMMODITY TRAFFIC COAL

~11 MTPA Coal can be moved from Pakri Barwadih to Kudgi1 and ~1.4 MTPA from Khottadih to Simhadri via coastal shipping through Haldia port



Pakri Barwadih to Kudgi (Optimimum route: dashed box)

S. No.	Route (Modal combination)	Distance Kms	Cost Rs/tonne
1	Road-Rail-Port-Road-Rail	3,833	2,883
2	Road-Rail	2,035	3,300

Khottadih to Simhadri (Optimimum route: dashed box)

S. No.	Route (Modal combination)	Distance Kms	Cost Rs/tonne
1	Rail-Port-Rail	1,074	1,318
2	Rail	1,024	1,783

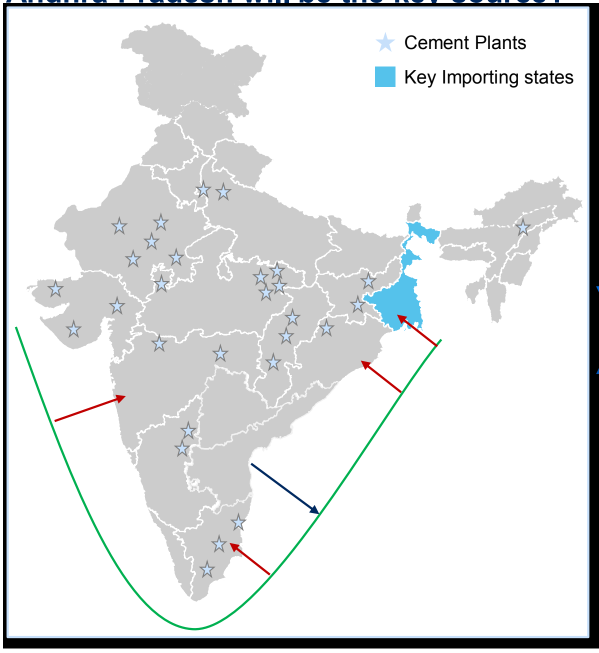
1 Considering linkage rationalization from Pakri Barwadih to Talcher does not happen

Figure 6.7 Coastal Shipping Potential for Coal

- **Cement:** ~2.5 MTPA of cement can be coastally shipped to Haldia port from Andhra Pradesh by 2025. This would primarily be consumed in West Bengal, Bihar and Jharkhand. Additional ~5 MTPA of cement can be coastally shipped to West Bengal via Haldia port from central Andhra Pradesh by 2025 is the central AP port comes up.

COASTAL SHIPPING | CEMENT

~ 2.5 MTPA of cement can be coastally shipped to Haldia Port by 2025; Andhra Pradesh will be the key source1



Key ODs with coastal shipping potential to Haldia Port

Route	Volume, TPA
Andhra Pradesh to West Bengal	1,804
Andhra Pradesh to Bihar	369
Andhra Pradesh to Jharkhand	194

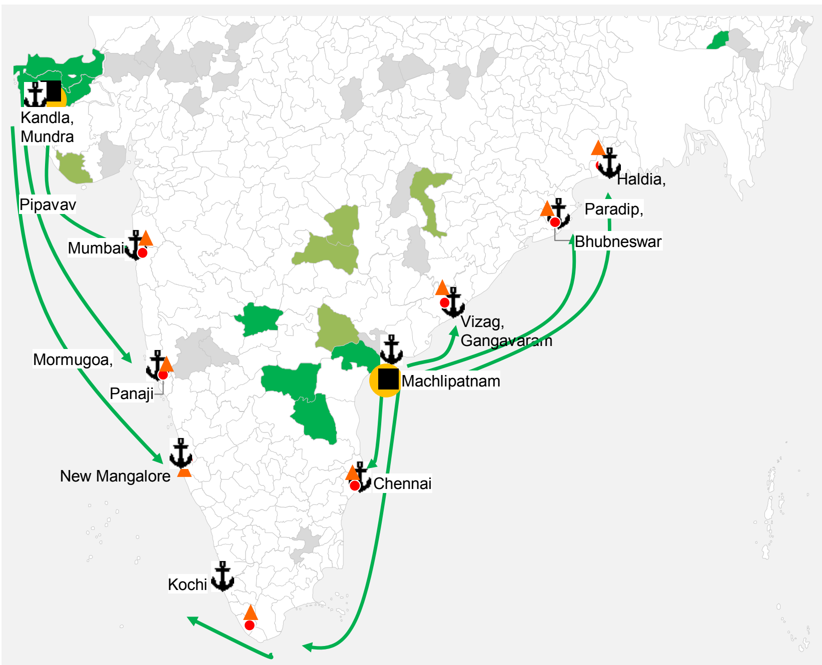
1 Small quantities can come from a number of other ODs via Haldia Port

SOURCE: DGCIS data 2013-14

Figure 6.8 Coastal Shipping Potential for Cement

COMMODITY TRAFFIC | CEMENT

Additional ~5 MTPA can be coastally shipped to Haldia Port from the proposed cement cluster in AP by 2025



Limestone reserves (MnTn)

- ≤250
- 250-1,000
- 1,000-2,500
- >2,500

Port

Demand centers

Clinkerisation unit

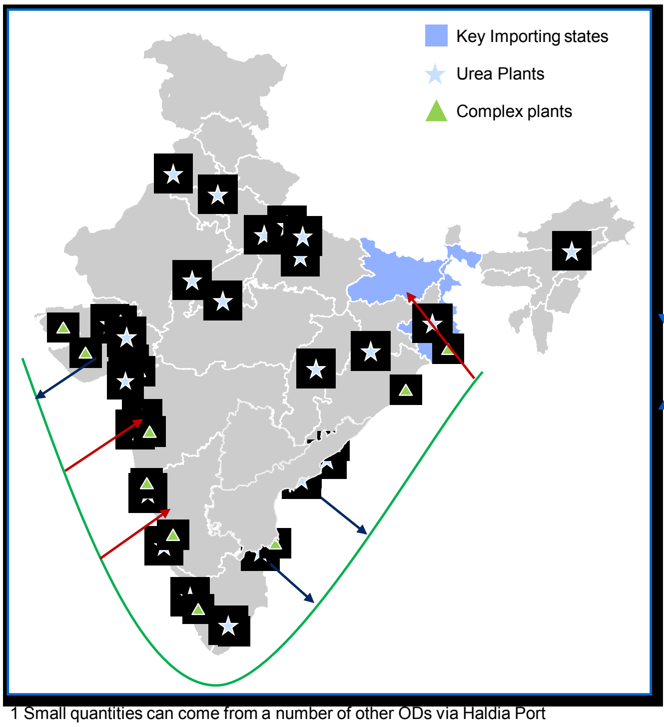
Grinding unit

Figure 6.9 Additional Coastal Shipping Potential for Cement Via Andhra Pradesh

- **Fertilizers:** ~2-2.5 MTPA of fertilizers can be coastally shipped to Bihar and West Bengal via Haldia port by 2025. Andhra Pradesh would account for most of this supply.

COASTAL SHIPPING FERTILISERS

~2-2.5 MTPA of fertilizer can be coastally shipped to Haldia Port by 2025[1]; Andhra Pradesh will be the key source



Key ODs with coastal shipping potential to Haldia Port

Route	Volume, TPA
Andhra Pradesh to Bihar	643
Andhra Pradesh to West Bengal	919
Gujarat to West Bengal	150
Andhra Pradesh to Assam	137

1 Small quantities can come from a number of other ODs via Haldia Port

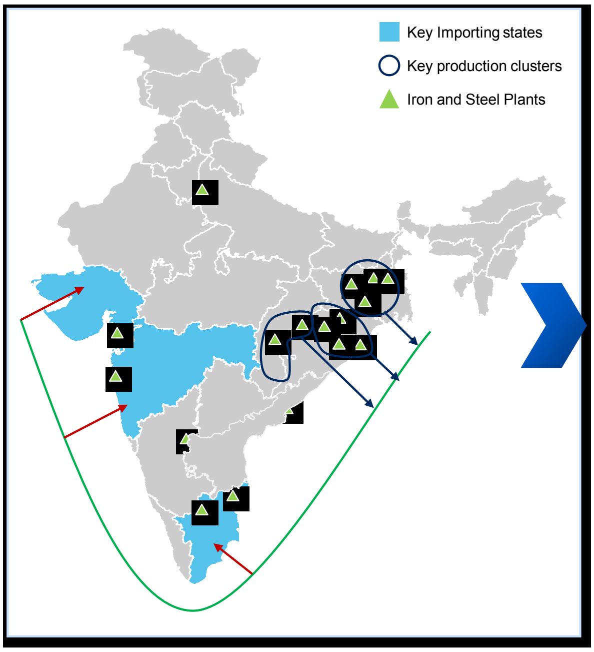
SOURCE: DGCIS data 2013-14

Figure 6.10 Coastal Shipping Potential for Fertilizer

- **Steel:** ~3-4 MTPA of steel can be coastally shipped by 2025 from Haldia port to demand states of Maharashtra, Andhra Pradesh, Tamil Nadu and Gujarat. Tata steel plant in Jamshedpur and SAIL plants in Durgapur, Bokaro and Burnpur has the maximum potential for coastal movement.

COASTAL SHIPPING | IRON AND STEEL

~3-4 MTPA of steel can be coastally shipped from Haldia Port to demand states of Maharashtra, AP, TN and Gujarat by 2025



Key plants with coastal shipping potential from Haldia Port

Plant	Location	Volume Potential to shift to coastal (in MTPA)
Tata Steel	Jamshedpur	1.5-1.6
SAIL	Durgapur	0.2-0.3
SAIL	Bokaro	0.7-0.8
SAIL ISSCO	Burnpur	0.3-0.4

SOURCE: DGCIS data 2013-14

Figure 6.11 Coastal Shipping Potential for Steel

The **Table 6.3** summarizes the potential of coastal movement for key commodities.

Table 6.3 Coastal Shipping Potential

Units: MMTPA (except Containers)

Commodity	2020	2025	2035
Thermal Coal (Loading)	12.4	12.4	12.4
Steel (Loading)	2.74	3.66	6.56
Steel (Unloading)	0.39	0.52	0.94
Cement (Loading)	0.00	0.00	0.00
Cement (Unloading)	1.88	7.5	9.49
Fertilizer (Loading)	0.00	0.00	0.01
Fertilizer (Unloading)	1.92	2.34	3.46
Food Grains (Loading)	0.11	0.13	0.20
Food Grains (Unloading)	0.00	0.01	0.01

- Additional Coastal shipping from Pakri Barwadih in Jharkhand to Kudgi I in Bijapur; and Khottadih OC to NTPC Simhadri

- 5MMTPA can be shipped from Central AP cement cluster (If Central AP port comes up)

* The coastal opportunity identified is contingent on a number of enablers like last mile connectivity, availability of handling infrastructure at the ports, rationalization of port charges, availability of aggregators for different commodities wherever individual parcel sizes are small. The handling charges and sea freights assumed for the analysis is INR 150 per tonne per handling and INR 0.2 per tonner per km respectively

7.0 CAPACITY AUGMENTATION PROPOSALS

7.1 Requirement for Capacity Expansion

HDC has 17 berths in total and most of the berths are having very high pre-berthing detention. Out of these 10 berths are already working at high berth occupancy and remaining 7 berths (HOJ II, HOJ III, 3, 4, 4A, 10 and 11) are found to be working at lower occupancy. A number of inefficiencies are noticed in the port operations on the following accounts:

- High detention time due to limitation of lock operation
- Conventional way of cargo handling
- Mix of cargo handled at many of the berths
- Lack of mechanisation
- Low parcel size of cargo

The improvements to the operations and augmentation of the existing port facilities at Haldia Dock Complex (HDC) have already been taken up. In additional new port facilities will be required to be built to cater to the traffic projections over the master plan horizon. The need for capacity augmentation is given in **Table 7.1**.

Table 7.1 Capacity Augmentation Required at HDC (MTPA)

Cargo Handled	Current Capacity (MTPA)	2020		2025		2035	
		Projected Traffic (MTPA)	Capacity Augmentation Required (MTPA)	Projected Traffic (MTPA)	Capacity Augmentation Required Over Current (MTPA)	Projected Traffic (MTPA)	Capacity Augmentation Required Over Current (MTPA)
Liquid Cargo	11.7	16.4	4.7	20.0	8.3	25.6	13.9
Coal	12.0	12.9	0.9	16.6	4.6	27.3	15.3
Breakbulk and Other Dry Bulk (Limestone, M. Ore, Other ore, Fertiliser, etc)	15.0	10.0	0.0	13.3	0.0	20.4	5.4
Containers	2.0	2.9	0.9	3.8	1.8	7.7	5.7
TOTAL	**40.7**	**42.2**	**6.5**	**53.7**	**14.7**	**81.0**	**40.3**

As far as Kolkata Dock System (KDS) is concerned, it has unutilised berth capacity mainly operational improvements are required at KDS.

7.2 Suggested Measures for KDS

7.2.1 An Exclusive Berth for Bulk Cargo

During one of the discussions, it was understood that there is a demand to handle coal for Nepal with estimated annual throughput of 0.5 MTPA. The evacuation of this cargo would require rail connectivity which is possible only at KPD II. Earlier this coal was handled on the eastern side berths of KPD II but due to the recent allocation of nearby sheds for agro products, coal cannot be handled at that location.

Thus, it is suggested to provide an exclusive berth as replacement to erstwhile berth 17 for about 120 m length, on the western side of KPD II for handling coal on confirmation of the assessed coal traffic. The berth shall be provided with barge handlers for unloading coal to berth from whether it shall be shifted to stacking area behind by means of pay loader-dumper combination. As the cargo needs to be evacuated through rail, therefore a rail siding from Marshalling yard shall be built up to the western side of KPD II. The indicative details are shown in **Figure 7.1**.

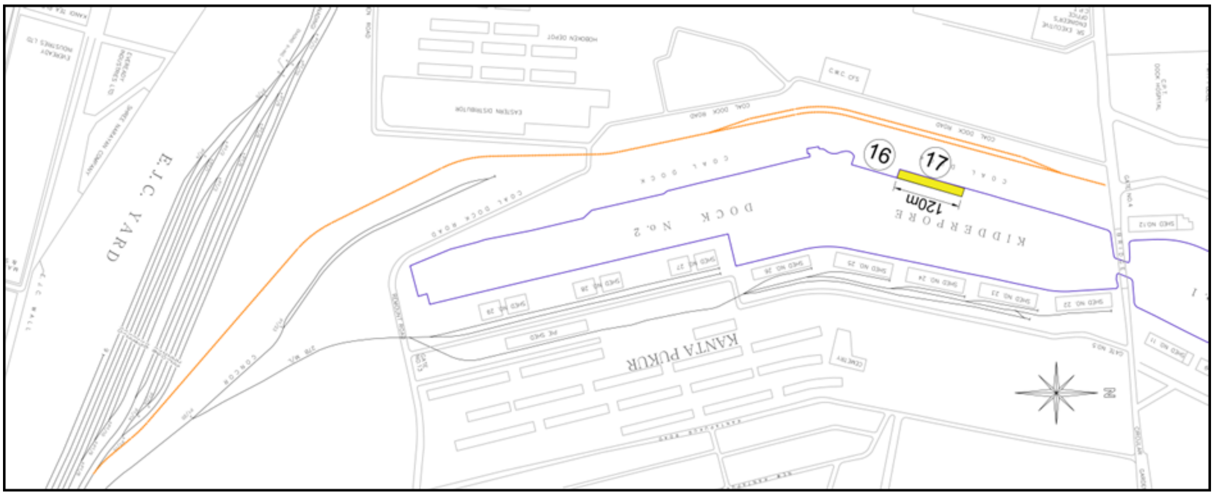


Figure 7.1 Proposed Barge Jetty in KPD II and Rail Connectivity

7.2.2 Traffic Management

Gate no. 07 (as shown in **Figure 7.2**) is the bottle neck inside the port, for movement of trucks and this area needs to be widened. This would in turn reduce the queue of the trucks inside the NSD dock and allow faster movement of containers ship to yard.

It was observed that most of the empty as well as loaded trucks are parked on the roads leading to port area. During discussions with port officials, two to three locations were identified as parking lots for the vehicles, i.e. area in front of Gates 4 and 5; area behind berth 8 at NSD and some area in Alif Nagar.

Figure 7.2 Location Near Gate 7 for Road Widening

The options are to be analysed for development as a parking bay for the container trucks this in turn will minimizes the traffic congestion within and outside port premises.

7.3 Suggested Measures for HDC

7.3.1 Improvement in Berthing Pattern

One of the shortfalls noticed in the HDC operations is handling mix cargo at most of the berths. Thus it is suggested that berths on the Eastern side shall be dedicated for Bulk Cargo, while Containers may be handled on the Western side of the dock.

This will enable to segregate cleaner cargo towards Town side while cargo having dust potential will be handled towards river, reducing impacts on humans.

7.3.2 Reallocation of Cargo between Berths

As explained in **Section 4.7.2** only limited number of vessels can enter the dock basin due to constraints in lock capacity. Therefore vessels with higher parcel size should be preferred inside the dock to enable handling of higher cargo throughput. It is therefore important the oil tankers of edible oil and chemicals are shifted outside the dock basin. This would improve the dock capacity by way of handling higher parcels of dry bulk.

Similarly, the cargo like iron and steel, machinery and spare parts and some project cargo are handled in small parcels and therefore could also be shifted to a multipurpose berth outside to create additional capacity.

7.3.3 Development Possible within the Existing Haldia Dock

7.3.3.1 Capacity Assessment of Dock Basin

An analysis of data for the ships visiting the Haldia dock for the last year reveals the following:

1. About 520 ships of liquid cargo ships carrying about 3.7 MT visited lock with average parcel size of about 6,000 T
2. Similarly about 70 ships of breakbulk carrying about 0.5 MT visited the lock with average parcel size less than 6,000 T.
3. If the riverine jetties are developed to handle vessels of smaller parcel size the dock facilities could be utilized for handling bigger ship with average parcel size of about 20,000 T.
4. Considering that about 10 ships can enter/exit a dock per day, the total dock capacity would work out to 35 MTPA, considering 350 working days in a year.
5. However, the concession for the container terminal at berths 10 and 11 has already been awarded and therefore there is no possibility to shift the container vessels, which bring cargo in smaller parcels, to the riverine jetty. Based on the profile of the container ships visiting KoPT it is observed that the average parcel size is about 500 TEUs only.
6. Considering that the container vessel calls in the dock would be about 400 for the planned capacity of 0.2 MTEUs. This would result in loss of dock capacity by about 5 MTPA (i.e. 400*(20,000-7,500)/10,00,000) i.e. the capacity of dock shall be 30 MTPA.
7. In case the traffic throughput of container increases to 0.3 MTPA, the capacity of the dock shall further reduce to about 27.5 MTPA.

The productivity of the berths within the dock basin needs to be improved and as part of that following projects are recommended:

1. Providing mobile harbour cranes at berths 2 and 8 and associated backup area development
2. Mechanisation of berths 2 and 3

7.3.3.2 Mechanisation of Eastern Berths 2 and 3

The eastern berths 2 and 3 could be taken up for upgradation and these berths shall be developed only for handling dry bulk cargo and all the liquid cargo shall be taken away to berths outside the basin (**Figure 7.3**).

However, it is proposed that the initial mechanisation be taken up at berth 3, which was earlier being used for handling iron ore exports. The berth 2 could continue to handle the cargo using MHC, dumper and front end loader combination and a suitable decision of its full mechanisation shall be taken later.

Figure 7.3 Suggested Backup Area for Berths 2 and 3

The overall layout of the proposed scheme is shown in **Figure 7.4**. The salient features of the mechanisation of berth 3 are:

1. It is proposed that two mobile harbour cranes with integrated hoppers be provided for unloading the cargo from ships.
2. The hoppers shall discharge the material to underneath connected conveyor which shall transfer the bulk material to the stackyard, where it shall be handled using stacker cum reclaimer.

3. Two rows of stockpiles with total storage capacity of 0.37 MT shall be built. Assuming the dwell time of import cargo as 30 days, the stackyard can support the terminal capacity of about 3.0 MTPA.
4. The wagon loading shall be undertaken by rapid loading system with a silo provided over a rail line. The cargo shall be reclaimed by stacker cum reclaimer and transferred to silo through conveyor system.
5. It is understood that the foundation of berth 3 are on Monoliths of size 6.55 m wide and 13.7 m long. The centre to centre distance of monoliths is about 13.7 m and the gap is bridged by superstructure comprising of longitudinal beams and slab. Based on the berth details provided above by HDC, it can be inferred that the berth is structurally suitable to support mobile harbour cranes. It has however to be ensured that during operations the cranes are placed within the extents of monolith.
6. The berth structure is however old and damaged at several locations and requires thorough rehabilitation, the cost of which would me marginal as compared to building a new berth.
7. However an approach trestle of about 20 m width needs to be newly built connecting the berth 3 to shore to allow passage of mobile harbour cranes and the conveyor system. In addition conveyor trestles would need to be built in the rear of the berth.
8. Most of the old structures, conveyor system have been cleared from site. Existing two bunkers at site which would need to be demolished before installation of the new bulk import system.

As yard space is limited the cargo has to be evacuated faster and if the dwell time could be reduced to about 20 days, the berth 3 will be able to handle about 4.0 to 4.5 MTPA of dry bulk import.

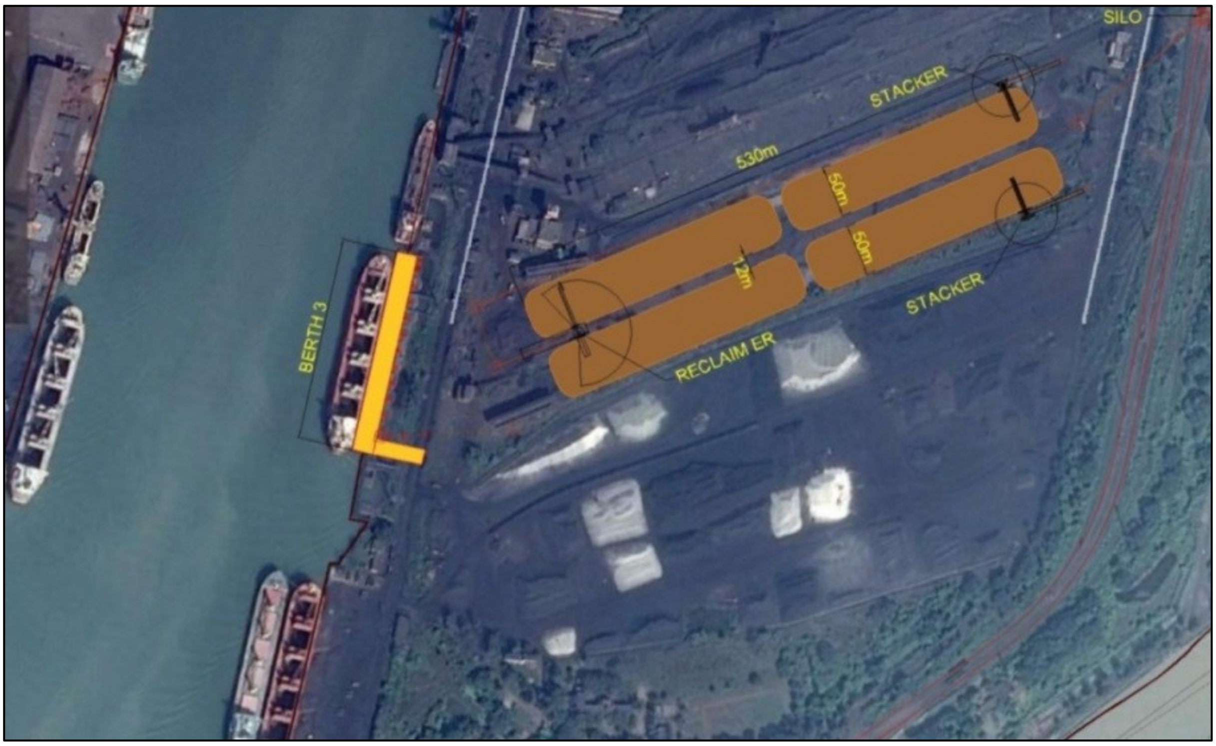


Figure 7.4 Proposed Mechanisation of Berth 3

7.3.4 Development Possible Outside the Existing Haldia Dock

There is a very limited waterfront with deeper draft outside the dock basin as shown in **Figure 7.5**.

Figure 7.5 Location of Waterfront with Deeper Draft

As part of the planned projects already OT1, OT2 and floating jetty are planned and there is just space to provide a mechanised barge jetty upstream of HOJ1. This project can be taken up once the transloading operations get stabilised.

7.3.4.1 New Exclusive Berth Outside Dock for Edible Oil & Chemicals

The liquid bulk traffic other than crude & POL products during the past 5 years is presented in the following **Table 7.2**.

Table 7.2 Oil Traffic Handled at HDC in Last 5 Years (MTPA)

Commodity	2014 - 15	2013-14	2012-13	2011-12	2010-11
LPG	1.91	1.53	1.40	1.32	1.11
Chemicals	1.94	1.83	1.59	1.48	1.61
Edible oil	1.96	1.55	1.54	1.19	1.02
Total	**5.81**	**4.91**	**4.53**	**3.99**	**3.74**

It could be seen that the growth of the chemical traffic has been nominal while the growth of LPG and Edible oil are significant. Edible oil traffic is growing at the rate of almost 15% per annum which is confirmed by the trade. Interaction with the trade indicated that the growth is on account of demand for this cargo in the north eastern states and Haldia being the nearest feeder port, this traffic is bound to maintain the same rate of growth. However due to of the congestion, pre-berthing detention and the consequent demurrage (US$ 10,000 to US$ 20,000 per day) HDC is not one of the preferred destination. It was reported that the edible oil tankers are given the last priority and thus the pre-berthing detention sometimes extends even up to 15 days.

Considering the demand and also the limitation liquid cargo presents in terms of inefficiencies due to small parcel size, it is advisable to shift the edible oil and chemical traffic to berths outside the basin, where the tankers can directly berth so as avoid pre berthing detention and consequent demurrage. This move will also ease the congestion at the lock gates and the bulk carriers will not suffer any appreciable pre-berthing detention.

Presently, four agencies, viz. Adani Wilmer Ltd., Ruchi Soya Industries Ltd., Emami Biotech Ltd., and Gokul Refoils and Solvent Ltd., are having their edible oil refineries at Haldia and are importing the edible oil. There are dedicated 12" pipelines having the discharge rate of 250 to 300 TPH only. These pipelines originate from Berths 5, 6 and 7 of dock basin and are 4.2 km, 4.5 km, 2.7 km and 4.2 km away from the tankfarms of Adani Wilmer Ltd., Ruchi Soya Industries Ltd., Emami Biotech Ltd., and Gokul Refoils and Solvent Ltd respectively (**Figure 7.6**).

Figure 7.6 Location of Various Oil Refineries with Respect to HDC

Considering the relative locations of the industries and their terminals, there are following options for locating the new facility:

Location 1: Upstream of HOJ 3 where the port is planning its OT1.
Location 2: Downstream of HOJ 2 where port is planning OT2.

Table 7.3 presents relative merits and demerits of the considered locations.

Table 7.3 Relative Merits and Demerits of the Two Locations

S. No.	Parameter	Location 1	Location 2
1.	Relative distance between the users and jetty	About 6 to 8 km	About 1 km less as compared to option 1
2.	Cost of Laying pipeline	About 4 km of new pipelines are to be laid	Only about 1 km of pipelines need to be laid as pipelines already exist up to berth no. 3
3.	Due to increased distance of unloading point as compared to berths 6 and 7, the flow rate of unloading tankers would reduce. The measures to improve the flow rate	The new pipeline laid could be of higher diameter to reduce the head loss. Additional tank farms could be built by users to unload the tankers very fast	As the existing pipeline is proposed to be used, the cargo to be unloaded with reduced flow rate.
4.	Space for additional tank farms for users on account of their increased handling requirements	Adequate area is available where users can built their tank farms for transit storage. This would result in faster turnaround of ships	Not possible due to the presence of bulk stack yard

As could be observed from the above that while location 2 offers advantage in terms of reduced initial investment, location 1 could be better as it can allow transit storage tanks to ensure that the tankers discharge at their optimum capacity and turn round faster.

Based on the analysis of data on the oil tankers for edible oil and chemicals it is noticed that average parcel size is only about 7,500 T and the handling rate low at about 6,500 TPD only. As mentioned above the handling rate would further reduce at either of the location OT1 or OT2. Even considering the same handling rate it is assessed that the capacity of the one oil jetty for products would only be limited to about 1.3 MTPA at 70% berth occupancy and that about 1.7 MTPA at 90% berth occupancy. Considering the current throughput of oil tankers as over 3.0 MTPA (out of which palm oil, handled in small parcels itself constitutes about 1.2 MTPA), only one oil jetty would not be adequate. Therefore following is suggested:

1. Though the port has planned OT1 to handle bulk vessels using fully mechanised system, provision for handling oil tankers to be kept (by way of flexible hoses and pipeline manifold and accordingly the length of OT1 be increased to 330 m to enable handling two small oil/bulk tankers simultaneously.
2. Providing an additional jetty in between OJ1 and OJ2 may be examined for handling small tankers with LOA limited to 120 m (as shown in **Figure 7.7**) through navigational simulation study. However, this could be taken up at a later date once the proposed OT2 gets saturated.
3. In the event this additional jetty in between OJ1 and OJ2 is not found feasible, developing oil jetty at Shalukhali should be taken up by port.

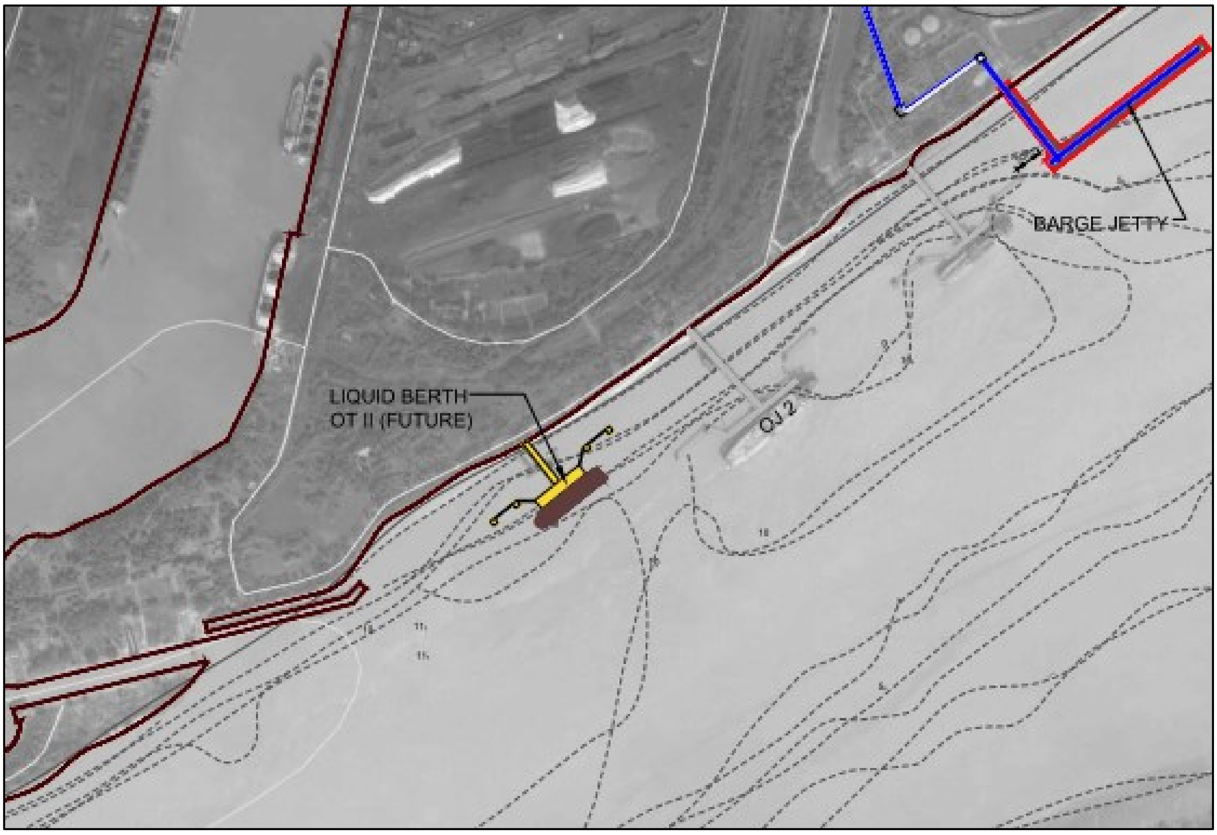


Figure 7.7 Proposed OT 2

7.3.4.2 Building a Multipurpose Berth Outside the Dock Basin to Handle Breakbulk and Other Dry Bulk Cargo

The proposed bulk and breakbulk terminals at Shalukhali are not being pursued further due to lukewarm response of the bidders. However considering the increasing volume of bulk import cargo at HDC and the requirement to reduce the waiting time for entry/exit to the dock there is a requirement to create bulk import facility outside the lock gate. Such bulk import facility shall also support the transloading and lighterage operations and thus would reduce the turnaround of the ships.

The proposed facility (already planned at OT1 by HDC) shall comprise of a berthing jetty of 270 m length and width of 25 m. The system for bulk unloading shall be fully mechanised comprising of mobile harbour cranes at berth with mobile hoppers and conveyor system underneath. The conveyor shall be located about 20 m behind the berthing line and shall carry the bulk cargo to the mechanised stackyard. The schematic layout of the proposed terminal is shown in **Figure 7.8**.

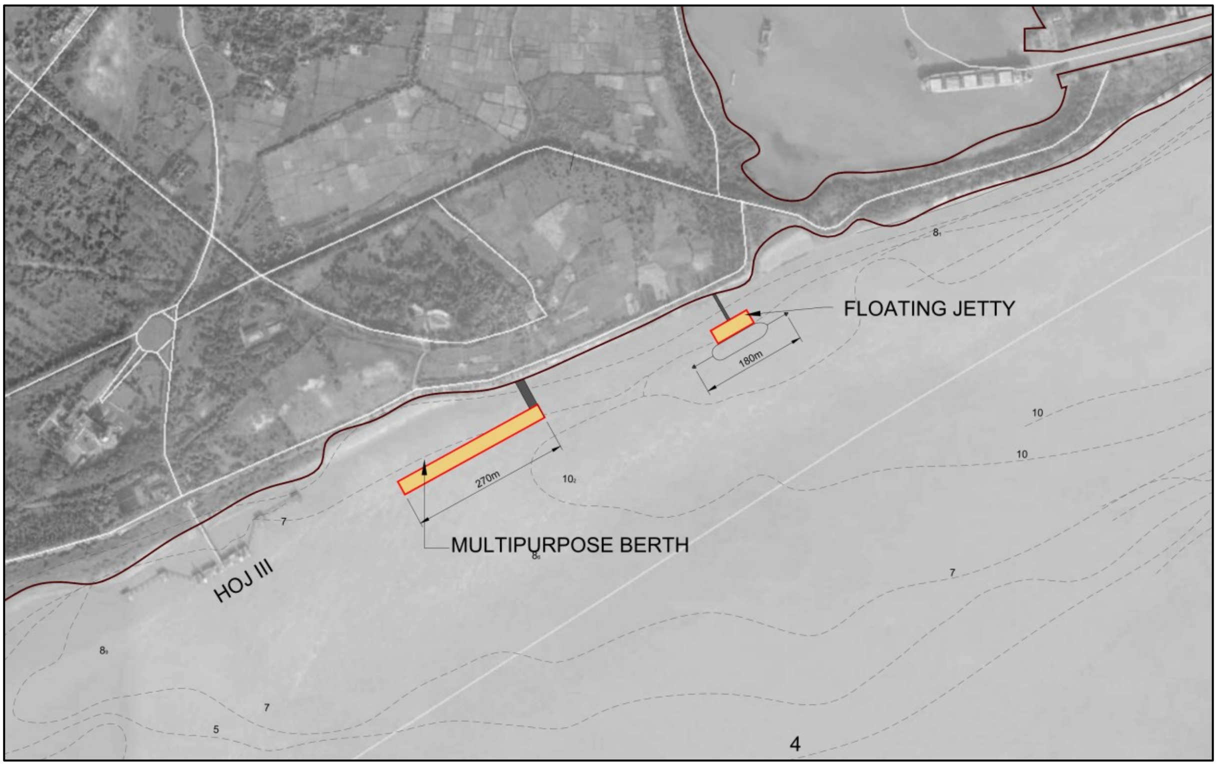


Figure 7.8 Proposed OT 1 and Floating Jetty

7.3.4.3 Building Barge Jetties to Support the Anchorage Operations

In order to compete with ports like Dhamra, Gangavaram, Vizag etc. which are capable of handling the Capesize ships, KoPT should also be plan similar facilities. Handling of cape size ships is only possible in the outer anchorages as per the details as shown in **Figure 7.9**. While it is not yet established that round the year operations would be possible at anchorage, the facility is expected to be operational for about 225 to 250 days in a year.

OT1 is already planned to handle the handy to Panamax size ships of direct call or as daughter vessels of the cape ships at anchorage. However the capacity of this berth would also be limited to only about 5.0 MTPA which matches with the capacity of one transloading station for handling cape size ships.

Currently, barges are deployed at Sagar roads for lightering of the ships and it is also feasible to deploy barges for supporting the transloading operations at anchorage. It is therefore required that additional berths are needed to support the barges utilised for transloading/ anchorage operations. The barges could be easily hired from different suppliers and could also support the IWT movement in NW1. The following options exist for building barge berths outside the dock basin.

1. Floating jetty upstream of HOJ3 as already awarded
2. Mechanised barge unloading jetty be built upstream of the HOJ1.

A barge jetty with mechanised cargo handling system has a capacity of only about 2.2 MTPA at 70% berth occupancy. The floating jetty has been planned for handling only one barge at a time and therefore there is still a need to add one more jetty for barge unloading to support the lighterage operations. Further there is a need to have additional jetty to support the anchorage operations. The layout plan is shown in **Figure 7.9**.

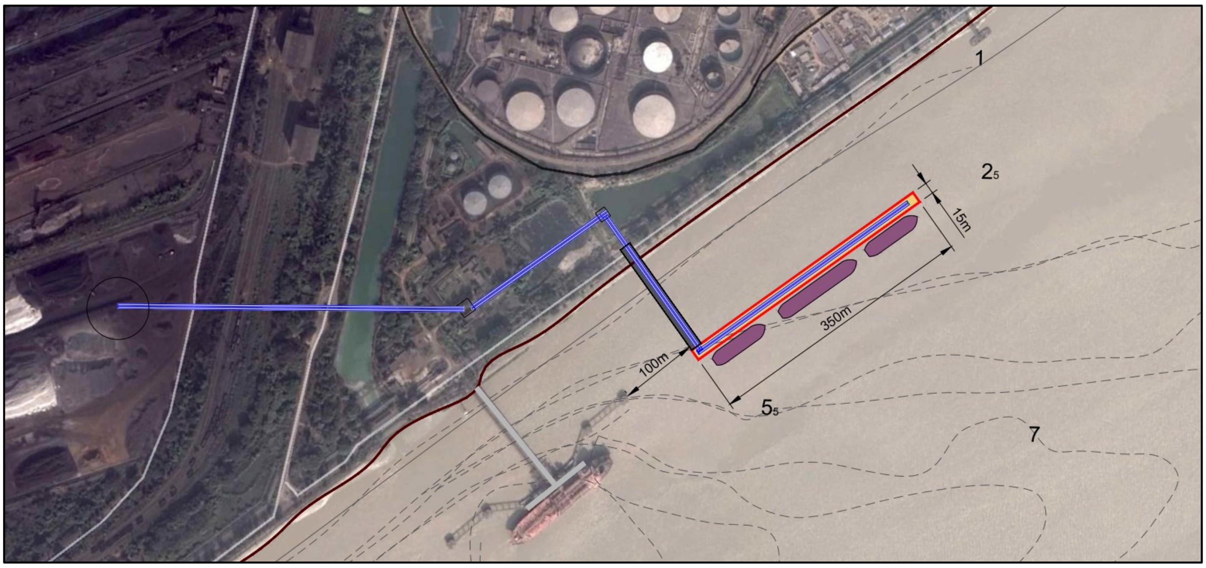


Figure 7.9 Layout Plan of Barge Jetty

This jetty shall be designed to simultaneously handle two barges of size upto 3,000 DWT drawing a draft of about 2.5 to 3.0 m. The minimum water depth needed at the berth would be about 3.5 m below CD. The berth would be sized 300 m long and 20 m wide. The bulk material shall be unloaded using barge handlers and put on to mobile hoppers with a conveyor system. The conveyor shall transport the material to the stackyard already available behind the dock-basin eastern berths.

7.3.5 Transloading Operations

In order to be competitive with the nearby deep draft ports, KoPT should have a provision for handling cape size ships in the long term. Though unloading the cape size ship at anchorage to daughter vessels/ barges, transfer to the HDC and then unloading it there would be a costlier operation as compared to the direct unloading of cape size vessels at the competing port, but the overall logistics cost could still be comparable due to better rail and road connectivity from Haldia to the cargo destination centres.

The cargo unloaded may be unloaded using transloaders or floating cranes at the anchorage and shall be taken by daughter vessels of handy size or Panamax size or by barges to the HDC and gets unloaded again. The handy or Panamax size vessels have draft restrictions and they have to be light loaded to the permissible draft only. For the cargo that has to go upstream using inland waterways the cargo can be transferred to riverine barges at the Sagar roads. Alternatively the riverine barges could also be loaded at the HDC.

During fair weather the Capesize ship can be unloaded at the anchorage. However, during foul weather location near Kanika Sands has to be used but it is likely to have significant weather downtime as shown in **Figure 7.10**.

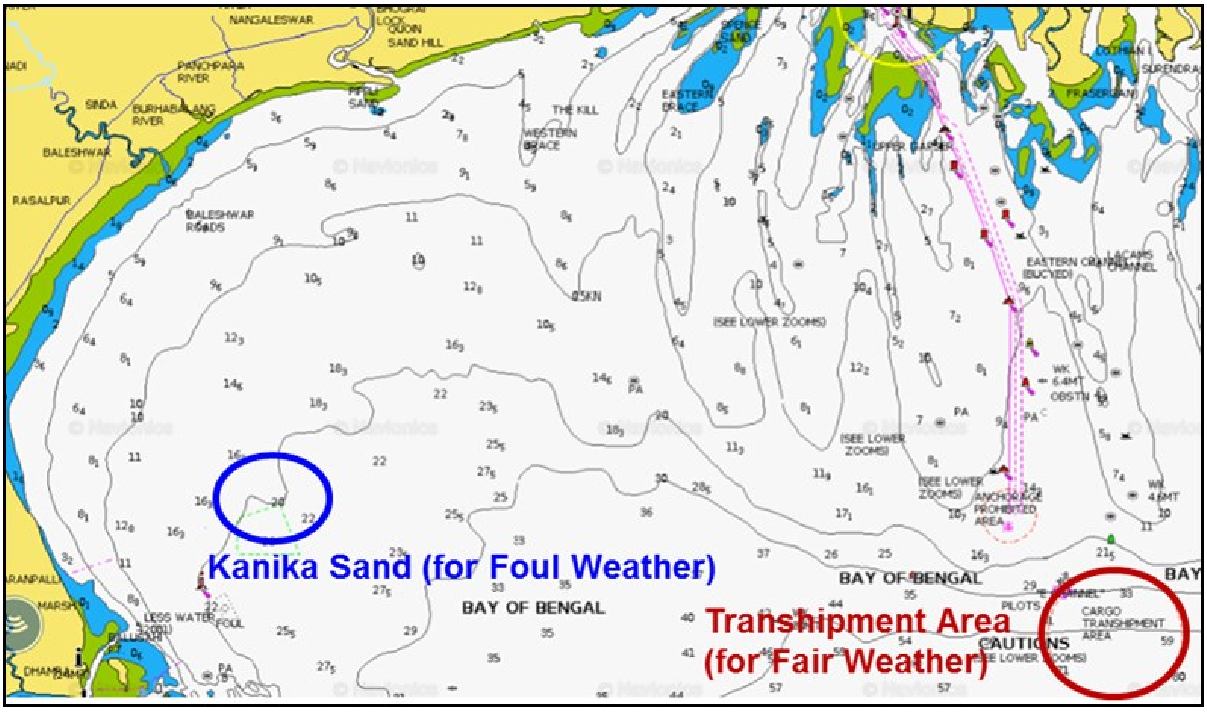


Figure 7.10 Transloading Points of KoPT

7.3.6 Creation of New Dock Basin at Haldia

7.3.6.1 Need for New Dock Basin

Even with the mechanisation and improvements of operations within dock the overall capacity would be limited to about 27.5 MTPA due to the constraints in the lock gate capacity. Similarly fully building up the riverine jetties would add additional capacity of about 19 MTPA. Therefore the overall capacity of HDC can reach upto 46.5 MTPA as shown in **Table 7.4**:

Table 7.4 Estimated Capacity of HDC

S. No.	Cargo Handling Area	Estimated Capacity (MTPA)
1.	Dock Complex	27.50*
2.	HOJ1, 2 and 3	9.70**
3.	OT1	4.00
4.	Floating Jetty	2.50
5.	OT2	2.00
6.	Barge Jetties to support transloading	4.00
7.	Fly ash jetty	1.00
Total Capacity (MTPA)		**50.70**

** Assuming that the container traffic within dock shall increase to 0.3 MTEUs*
*** Based on the type and proportion of products being handled currently*

As the projected traffic for HDC beyond year 2025 are higher, there is a need to expand the berthing facilities and creation of second dock basin could meet this requirement.

7.3.6.2 Alternative Options

The following three alternatives are available for creation of the additional dock:

Figure 7.11 Alternative 1

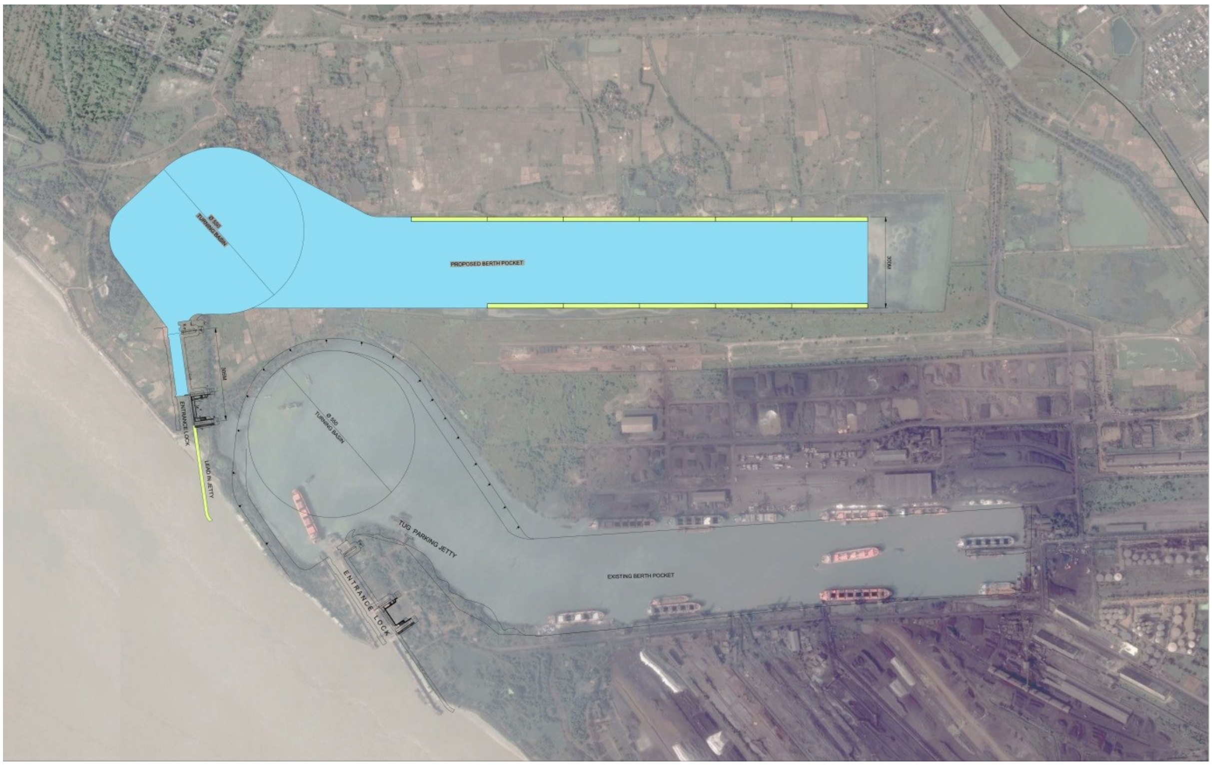


Figure 7.12 Alternative 2

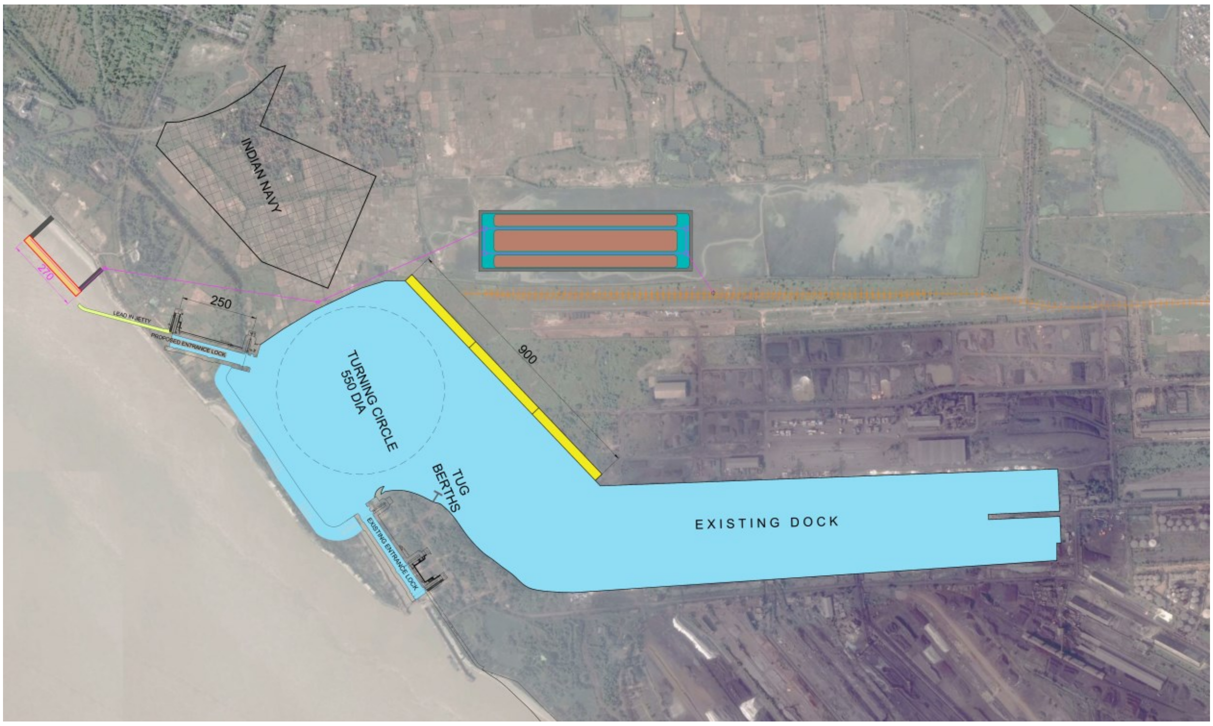


Figure 7.13 Alternative 3

Alternative 1 (Figure 7.11)

1. This alternative makes use of the existing turning circle with minor increase in the size.
2. The movement of vessels need to be staggered to utilise the common turning circle.
3. Dredging in the dock basin is minimised thus offering economy.
4. The lock entry is oriented for ebb entrance making navigation relatively difficult. Waterfront adjacent to HOJ3 would be required for lock entrance, where two riverine jetties could be located

Alternative 2 (Figure 7.12)

1 In this alternative a totally independent dock basin is proposed.
2 The movement of vessels in the lock is independent and thus offers larger number of entry / exit of vessels (about 20 % additional) as compared to alternative 1.
3 Dredging in the dock basin is significantly high and therefore initial investment is higher by about INR 120 crores as compared to Alternative 1.
4 The navigation to in and out of dock is relatively easier.
5 Waterfront adjacent to HOJ3 could be used for locating two riverine jetties.
6 This option would involve utilising land near the existing HDC installations.

Alternative 3 (Figure 7.13)

1. This alternative is similar to alternative 1 except that no additional dock basin would be developed.
2. Initially the existing berths would be fully mechanised to achieve the maximum possible berth capacity
3. Subsequently additional berths would be developed in the existing dock basin.
4. This scheme involves least capital expenditure but the achievable capacity would also be limited.

7.3.6.3 Preferred Option

The proposed OT1 stockyard is located in the space shown for the second dock basin in alternatives 1 and 2. Therefore alternative 3 seems to be the only feasible option but this would involve dismantling of the floating jetty (being built for handling bulk cargo through barges) if and when this project is taken up.

7.3.6.4 Capacity

The additional lock gate can provide overall capacity addition of about **20 MT** per annum, which could be developed in a phased manner.

7.3.7 Development of Cargo Handling Facilities at Shalukhali

Additional berthing facilities along with the associated infrastructure could be created at Shalukhali located towards north east at a distance of about 15 km from the Haldia dock:

1. Initially it was planned as two separate projects with each project comprising of one mechanised berth and one multipurpose berth for handling dry bulk and breakbulk cargo.
2. The advantage of this site is availability of at least 9 m natural water depth currently. Therefore berths with same draft as at main Haldia port could be planned.
3. Railway connectivity to Shalukhali is possible -- land to be given by State Government (about 40 acres)

The access to this site is through Rangafala channel leading to Kolkata Port. HDC has proposed to provide a liquid jetty of capacity 2.0 MTPA. Additional jetties could be provided in case of any capacity addition requirements.

Further the port would need to create additional support infrastructure to manage the terminals at Shalukhali, the cost of which, if apportioned to a small standalone terminal, may not be financially viable.

7.4 Rail and Road Infrastructure Augmentation at HDC

As discussed in the previous sections, it is proposed to develop additional facilities outside the HDC particularly for bulk cargo. Thus it is required that new road and rail connectivity is provided to these facilities for effective evacuation of cargo.

Figure 7.14 and **Figure 7.15** provide the rail and road augmentation respectively that is required to be carried out as part of capacity enhancement of the port.

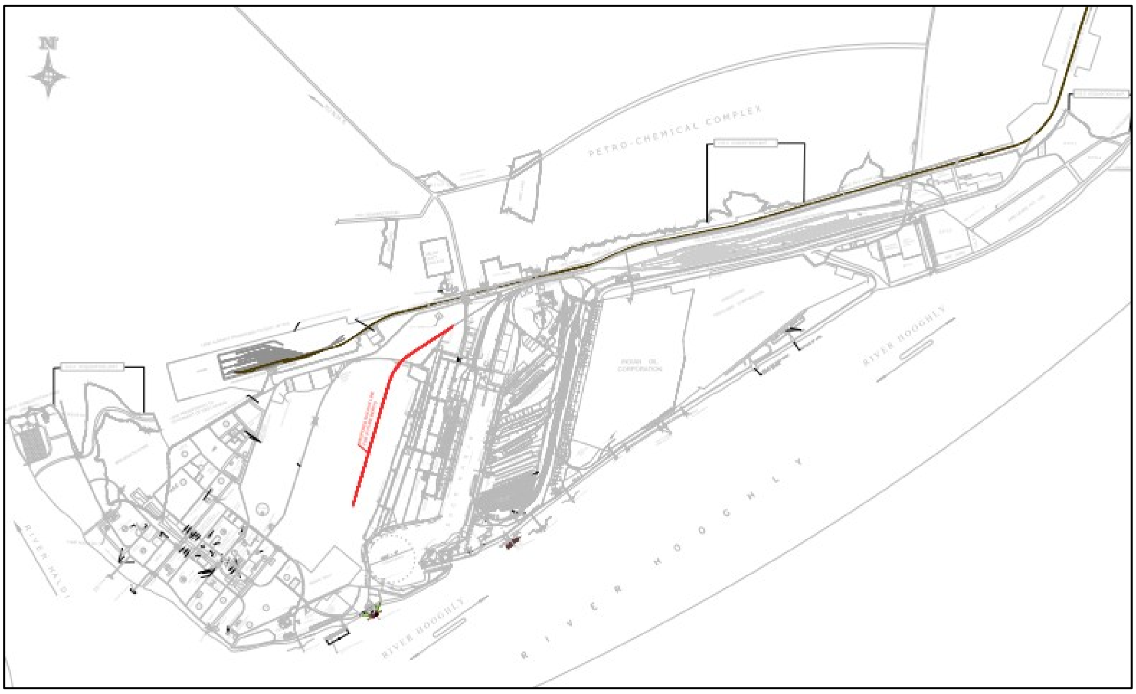


Figure 7.14 Proposed Rail Connectivity at HDC

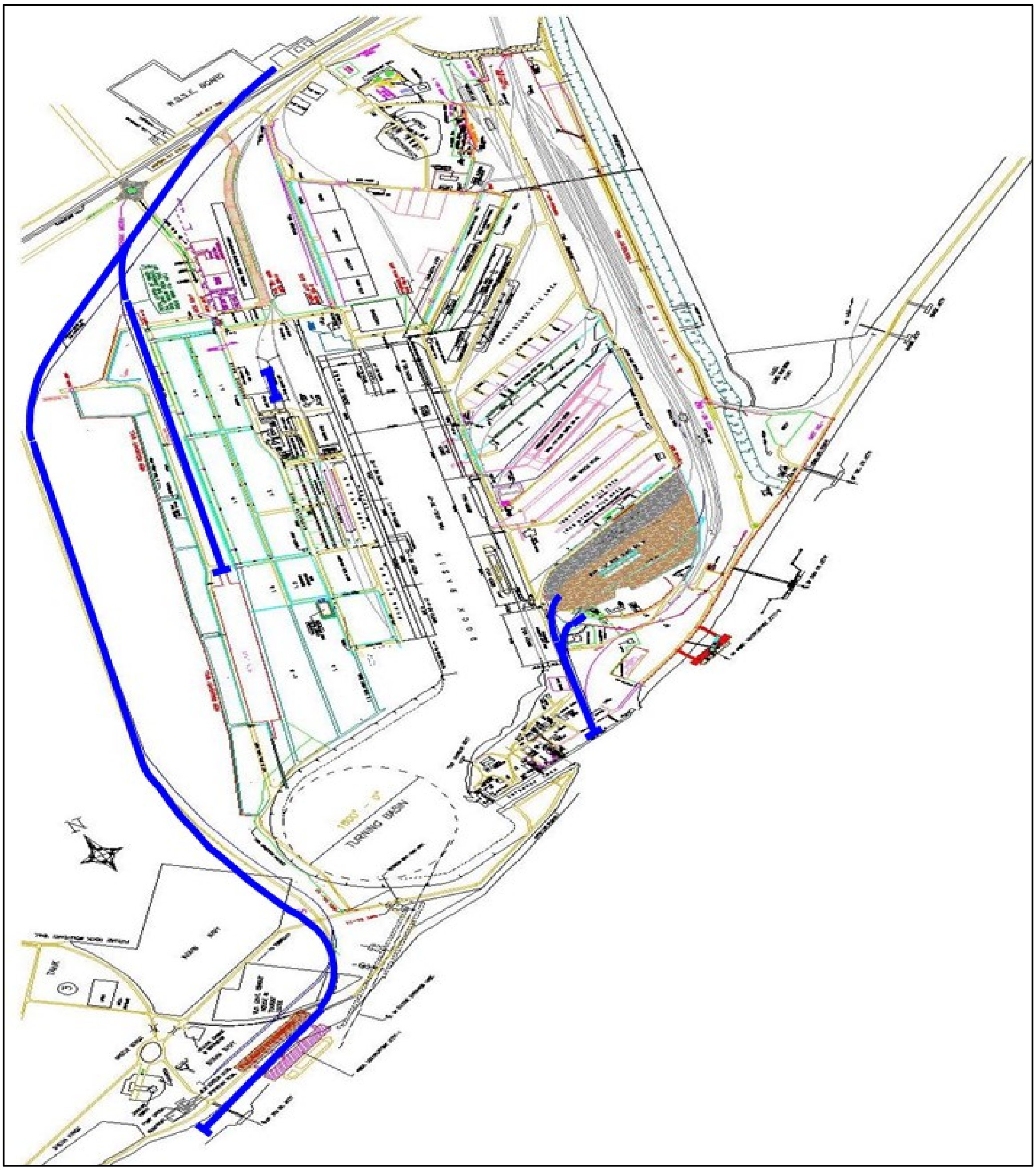


Figure 7.15 Proposed Road Connectivity at HDC

7.5 Development of Anchorage Berths at Sagar

7.5.1 Current Anchorage Operations at Sagar

The fully loaded Handy size to Panamax size ships visit KoPT after partly discharging their cargo at other ports such as Paradip, Vizag etc. Panamax ships light loaded to about 24,000 T are taken to Haldia/Kolkata docks directly. As draft at Sagar Roads is about 2.0 m higher than Haldia port, Panamax ships light loaded to 30,000 T can be brought to Sagar Roads. Their draft is reduced after lightering by about 9,000 T, and then they can proceed to Haldia/Kolkata docks. Barges of about 3,000 DWT are used for lightering operations.

At present there are 5 anchorages available at Sagar as shown in **Figure 7.16**.

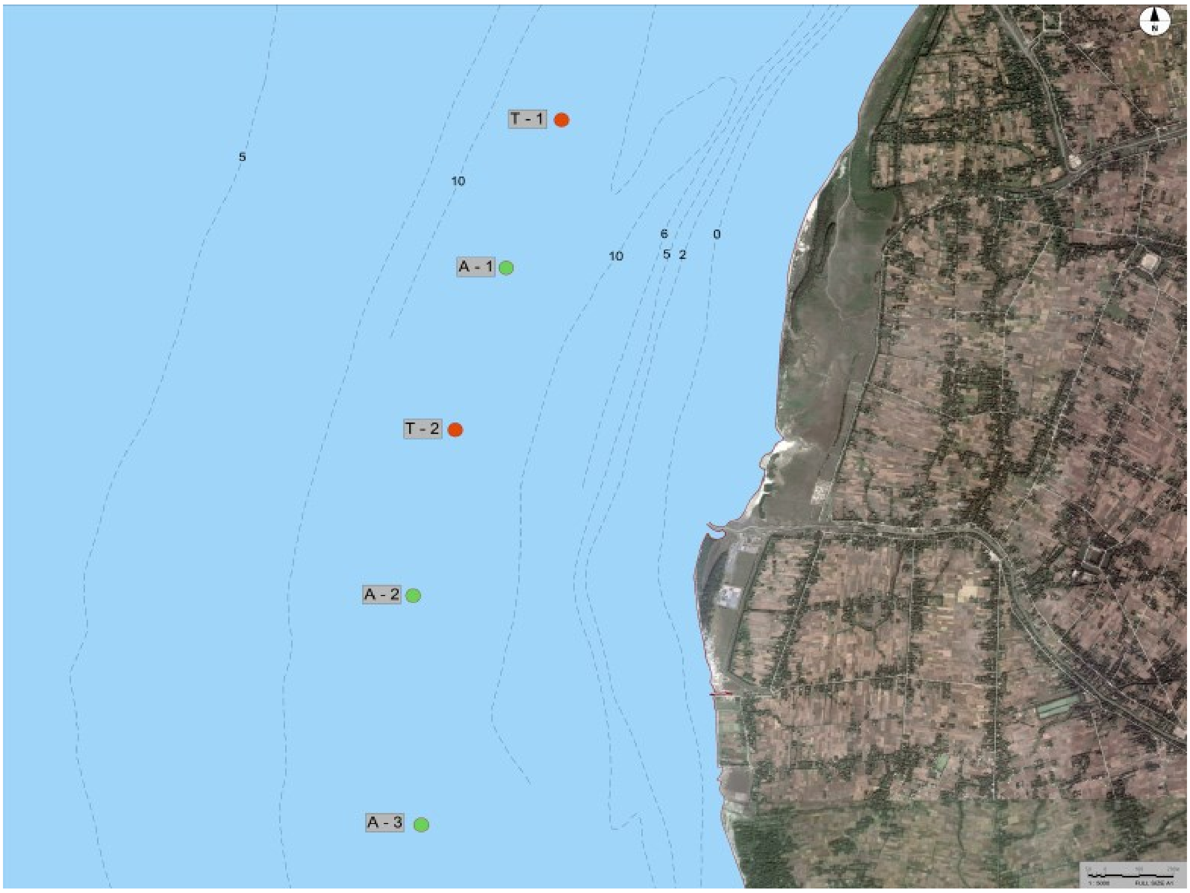


Figure 7.16 Location of Existing Anchorages at Sagar

Two of these anchorages i.e. T1 and T2 are for holding the transit ships whereas at A1 to A3 lighterage operations are carried out to reduce the draft of the ships to the level enabling them to proceed to Haldia/Kolkata ports.

7.5.2 Additional Anchorages

There is demand for additional anchorages which would enable handling more ships of higher parcel size within KoPT. However, due to availability of limited deep water there is no further space to provide the additional conventional anchorages.

It is therefore proposed to provide fixed anchorage comprising of mooring dolphins as shown in **Figure 7.17**.

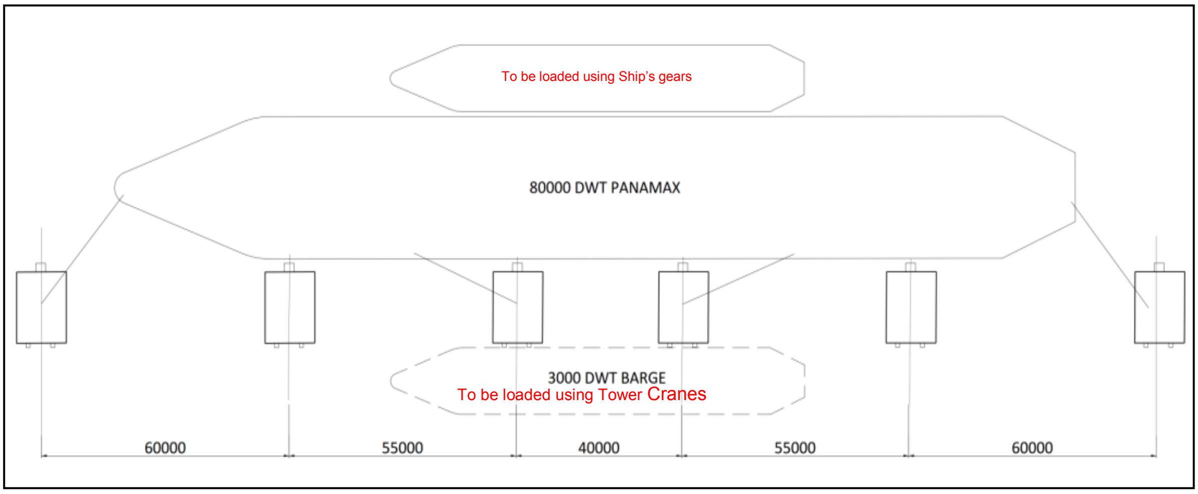


Figure 7.17 Fixed Anchorage with Mooring Dolphin Arrangement

As could be seen above the mother vessel is berthed against the dolphins and it is held in position using mooring ropes to the dolphins. The self-geared vessels shall unload the material to the barge placed alongside.

It shall also be possible to unload the gearless vessels for which tower mounted cranes could be provided on the dolphins. In such case the barge is berthed on the other side of the dolphins to receive the cargo unloaded by the cranes. This option shall obviate the need of providing costlier floating cranes at the anchorage. However if placing the crane option is not to be exercised a relatively less costlier multiple buoy mooring could also be considered, which can also meet the objective of holding the mothership which can unload the material to barges using self gears.

The proposed scheme would need the following:

- Locating the jetty in deep water just clear off the proposed Sagar Channel. The jetty shall be aligned along the current direction
- Provision of two tugs for berthing assistance
- One mooring boat

This scheme could be implemented in case there is significant delay in building of the proposed port at Sagar Island.

The location plan showing two fixed anchorages at Sagar is shown in **Figure 7.18**.

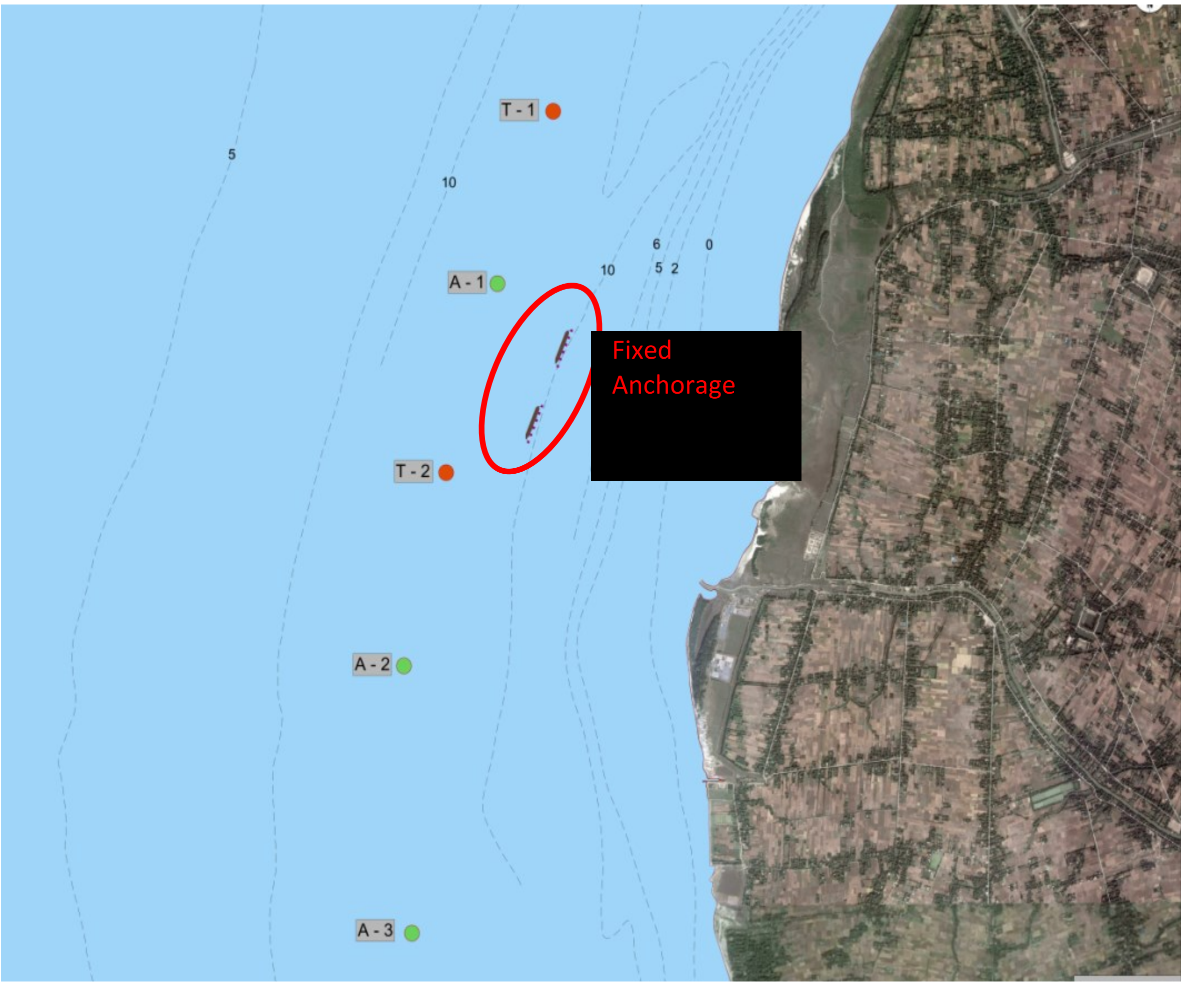


Figure 7.18 Location Plan of Two Fixed Anchorage at Sagar

7.6 Development of Satellite Port at Sagar

Due to the challenges being faced by KoPT in terms of draft limitations, limited headroom for expansion and efficiency, there is a need to look for a new port nearer to the sea, avoiding long river navigation with limitations in draft due to high dredging costs.

After a detailed study the location at Sagar Island has been selected for locating a Satellite port of KoPT. The Sagar Island is the southernmost Island of the Hooghly Estuary and forms one of the biggest deltas in Sunderban group. It is located 100 km downstream of Kolkata and separated by Muriganga River from mainland. The island is 30 km in length and has a maximum width of 12 km. Presently, there is no rail-road connectivity to Sagar Island with the mainland and rail-cum-road bridge across the Muriganga River has been proposed to provide connectivity.

At Sagar anchorage an additional draft of about 2.0 m is available as compared to HDC and KDS respectively. Accordingly it is proposed to initially develop the Sagar port to handle vessels with draft of 9.0 m with tidal advantage and subsequently the draft could be increased to suit the trade requirements.

The vessel size for Phase 1 is carefully chosen so that no capital dredging is needed in the long eastern approach channel. This would still enable carrying about 30,000 T of parcel size of bulk in Panamax ships round the year with minimum waiting time. The recommended Phase 1 port layout is as shown in **Figure 7.19**.

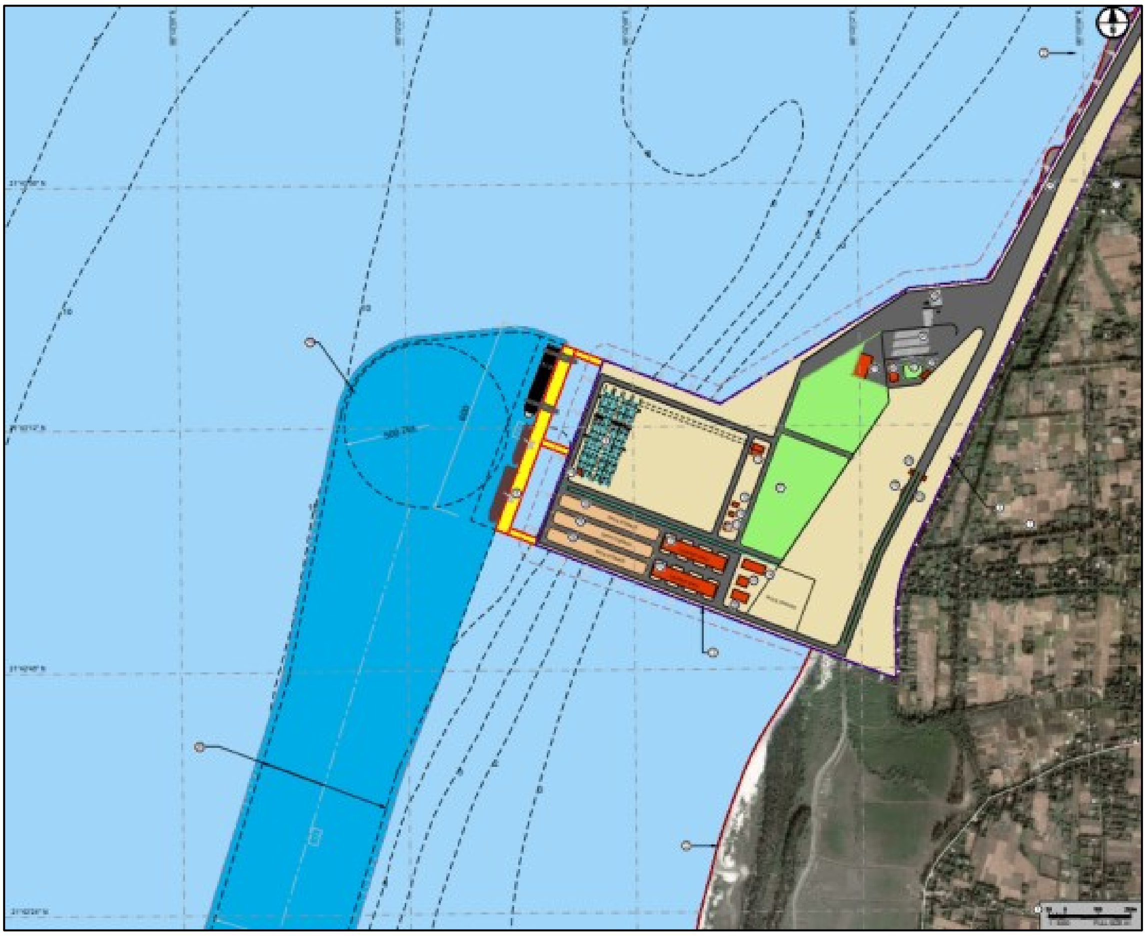


Figure 7.19 Layout of the Satellite Port – Phase 1

State of the art material handling system shall be provided to ensure faster turnaround of ships. In the Phase 1 a 600 m quay length is provided which shall go upto 2,000 m in the master plan phase.

The recommended master plan layout of port is shown in **Figure 7.20** and it shall be developed in various phases as per the built up of traffic. The entire area for port operations and storage shall be created by way of reclamation. It is proposed to reclaim an area of 96 ha. in Phase 1 and that 197 ha. in master plan stage of the port.

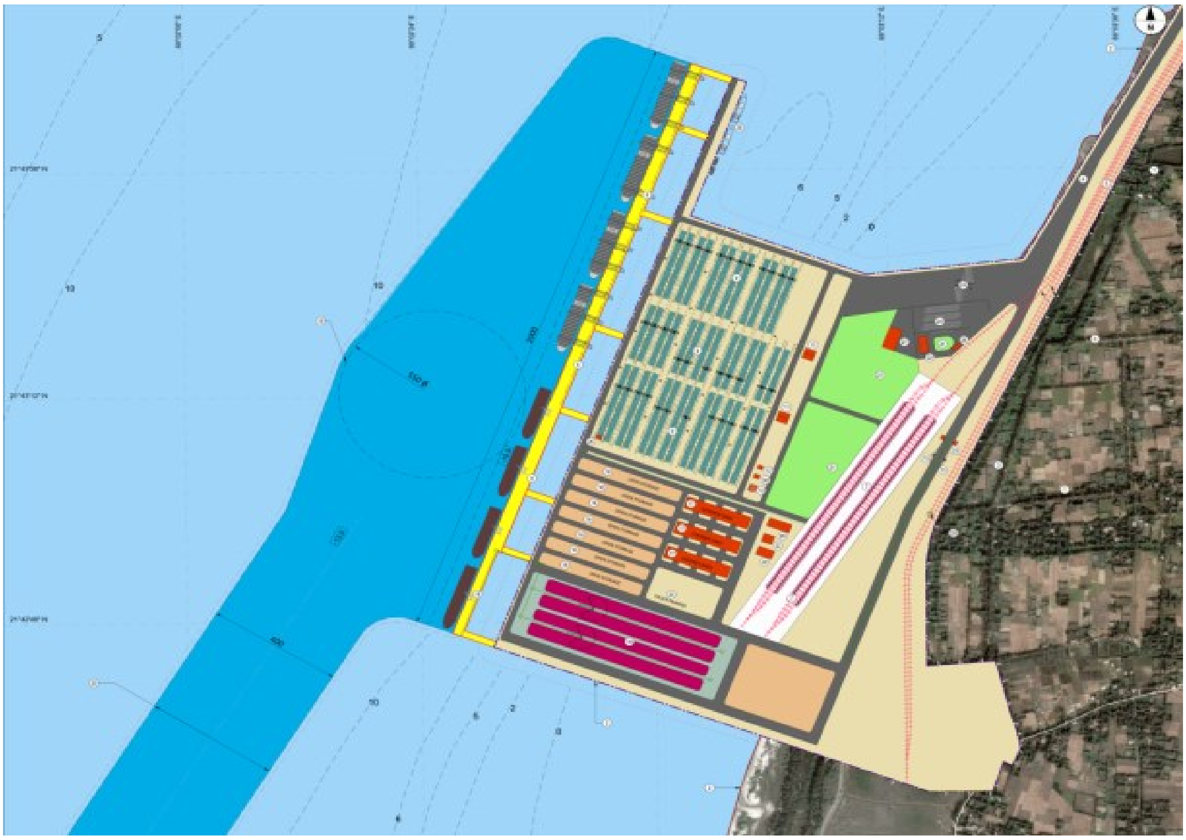


Figure 7.20 Layout of the Satellite Port – Master Plan

8.0 SHELF OF NEW PROJECTS AND PHASING

As part of the KoPT Master Plan several projects have been identified which need to be taken up in phased manner with the built up in traffic. The proposed phasing, capacity addition and the likely investments are discussed in paragraphs below. Many of these projects are subject to outcome of detailed techno economic studies, which shall be conducted as part of the project development.

It may be noted that apart from these projects there could be several other projects which port would be implementing as part of the routine operations and maintenance of the port facilities. Further the phasing proposed is not cast in stone but could be reviewed periodically and revised based on the economic scenario and demand for port at that particular point of time.

8.1 Ongoing Projects

The details of the projects which have already been awarded and development is ongoing are given in **Table 8.1**.

Table 8.1 Ongoing Projects

S. No.	Project Name	Capacity Addition (MTPA)	Investment Required (INR in Crores)	Mode of Implementation
1.	Floating Barge Jetty	2.5	73	Port's Funds
2.	Setting up of 2nd Railway Line from Durgachak take off point to 'A' cabin at Durgachak at HDC, Haldia	_	100	Port's Fund
3.	Deployment of 2 floating cranes near Sagar	2	75	PPP

8.2 Projects to be completed by Year 2020

The details of the projects which are envisaged to be completed by year 2020 are given in **Table 8.2**.

Table 8.2 Projects to be completed by Year 2020

S. No.	Project Name	Capacity Addition (MTPA)	Investment Required (INR in Crores)	Mode of Implementation
1.	New Exclusive Berth (OT2) outside Dock for Edible Oil and Chemicals at Haldia	2.0	75	Port's funds
2.	Development of Multipurpose Berth (OT1) outside the Dock Basin at Haldia	4.0	450	PPP

8.3 Projects to be completed by Year 2025

The details of the projects which are envisaged to be completed by year 2025 are given in **Table 8.3**.

Table 8.3 Projects to be completed by Year 2025

S. No.	Project Name	Capacity Addition (MTPA)	Investment Required (INR in Crores)	Mode of Implementation
1.	Building Barge Jetty for Coal in KPD II and associated rail siding	0.5	25	PPP
2.	Mechanisation of Berth 3 at HDC	4.5	150	PPP
3.	Development of Barge Jetties outside the Dock Basin at Haldia	4.0	120	PPP
4.	Oil Terminal at Shalukhali (LPG and Chemicals at Haldia)	2.5	150	PPP

8.4 Projects to be completed by Year 2030

The details of the projects which are envisaged to be completed by year 2030 are given in **Table 8.4.**

Table 8.4 Projects to be completed by Year 2030

S. No.	Project Name	Capacity Addition (MTPA)	Investment Required (INR in Crores)	Mode of Implementation
1.	Creation of Second Lock at HDC - Phase 1	10	1,600	PPP

8.5 Projects to be completed by Year 2035

The details of the projects which are envisaged to be completed by year 2035 are given in **Table 8.5**.

Table 8.5 Projects to be completed by Year 2035

S. No.	Project Name	Capacity Addition (MTPA)	Investment Required (In Crores)	Mode of Implementation
1.	Creation of Second Lock at HDC - Phase 2	10	800	PPP

Appendix-1: BCG Benchmarking Study for Kolkata Port Trust

9 Kolkata Port Deep-dive

9.1 Port overview

Kolkata Port Trust (KoPT) is one of the oldest city ports in India and is called the gateway to Eastern India. Kolkata port not only serves Eastern India, it also serves the landlocked Himalayan kingdoms of Nepal and Bhutan. KoPT has two dock systems—Kolkata Dock System (KDS) and Haldia Dock Complex (HDC), which is ~122Kms from each other—with 47 berths that handle ~41 MMT cargo. HDC is the newer and larger dock system handling 30 MMT of cargo, while KDS is located at the heart of the city of Kolkata and handles 11 MMT cargo.

Both HDC and KDS is a draught constraint port with average draught of ~7 to 8 mtrs. Lock gate system is used for vessels to enter the impounded dock area where only 3 to 4 vessels can enter at a time during high tide.

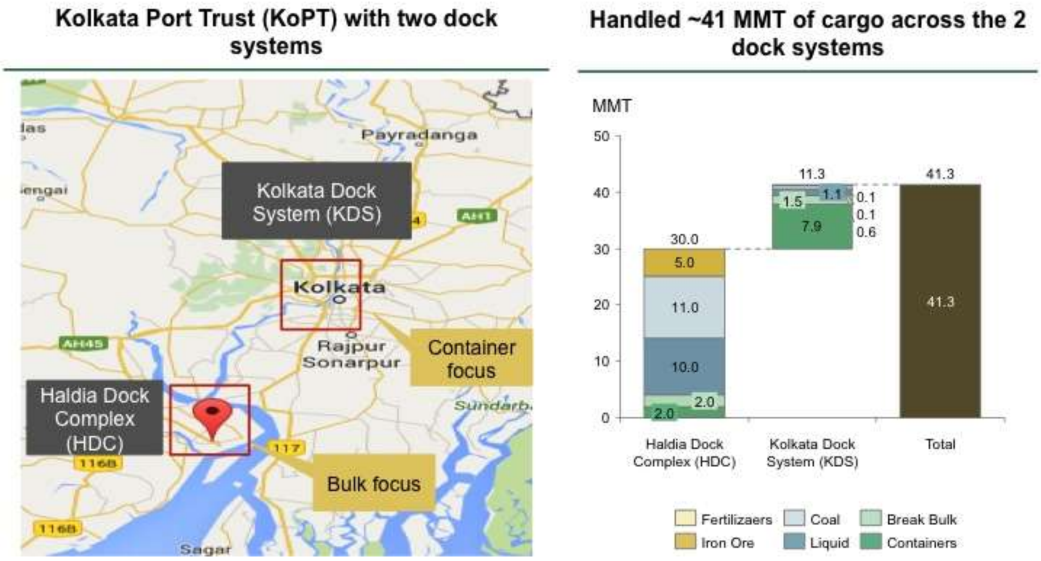


Figure 254: Kolkata and Haldia docks, cargo handling at KoPT

The Haldia Dock Complex (HDC) has 17 berths, of which 14 berths are within the impounded dock and 3 berths are outside the lock. The berths comprise mechanized export and import berths for coal, craned berths, container berths, liquid berths and conventional berths.

Figure 255: Haldia Dock Complex and its berths

Kolkata Dock System (KDS) comprises 33 berths across 3 docks. The berths comprise general cargo berths, break bulk berths, craneless container berths, HMC container berths and liquid berths.

Figure 256: Kolkata Dock System and its berths

9.2 Key findings and initiatives from deep-dive

- Haldia Dock Complex is a capacity constraint port. HDC handled 30 MMT of cargo in FY14–15, of which dry bulk constituted ~60% volumes. All conventional dry bulk berths, and most of the other berths inside the impounded dock, have more than 70% occupancy. There are three liquid berths outside, out of which 2 have more than 60% occupancy.

- Key efforts will be focused on improving productivity to increase capacity at HDC.

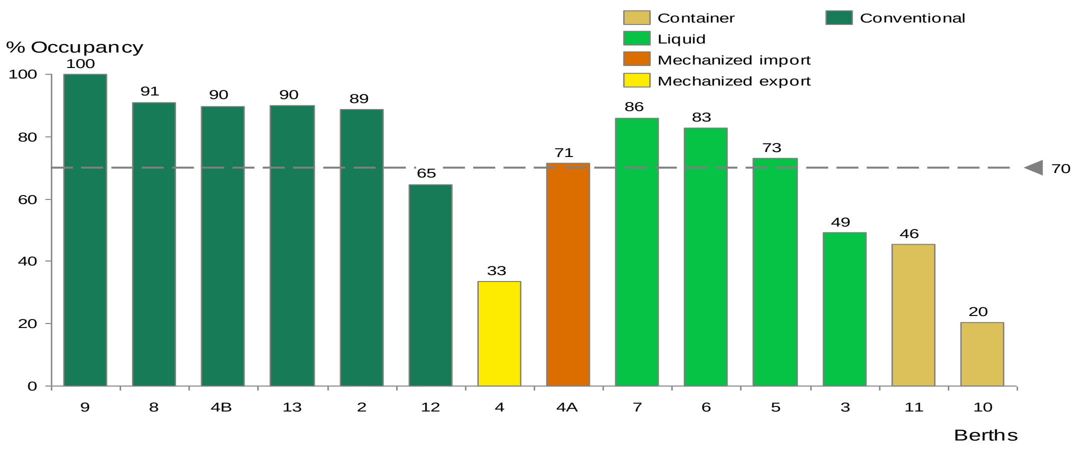


Figure 257: Occupancy at HDC

Kolkata Dock System (KDS) currently handles ~0.5 million TEUs of container cargo. The demand growth will continue to sustain due to its rich hinterland:

- KDS is a gateway to Eastern India, Nepal, Bhutan and Bangladesh
- Key industries: Leather, textiles, plastics, iron and steel, electronics, timber, food grains
- There is large export potential in hinterland:
    - Assam and WB are the largest producers of rice and tea
    - WB is a large producer of Jute and leather
- Major Indian exports to Bangladesh include cotton, sugar, cereals, vehicles and accessories (expected to double by 2018)
- At existing growth rate (~14%) or even lesser of ~ 12%, KDS will reach its container capacity within 2-3 years and will not be able to cater to the projected demand

Key efforts will be focused on enabling the port to increase container handling capacity

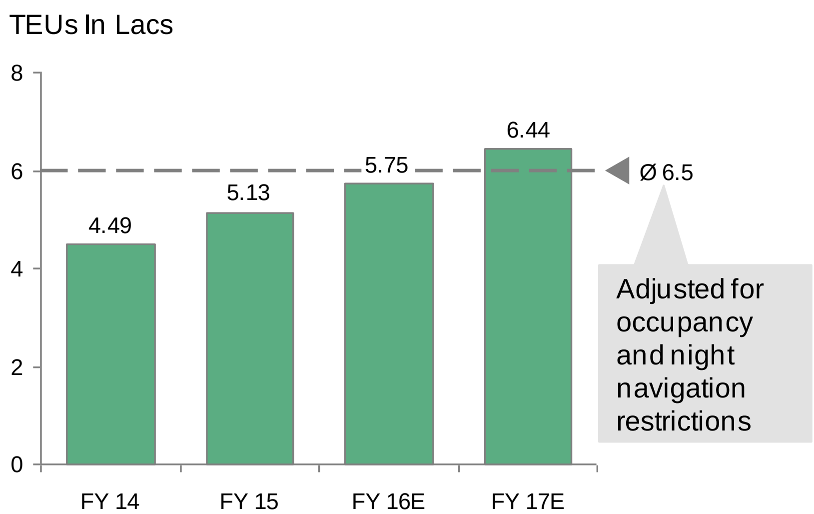
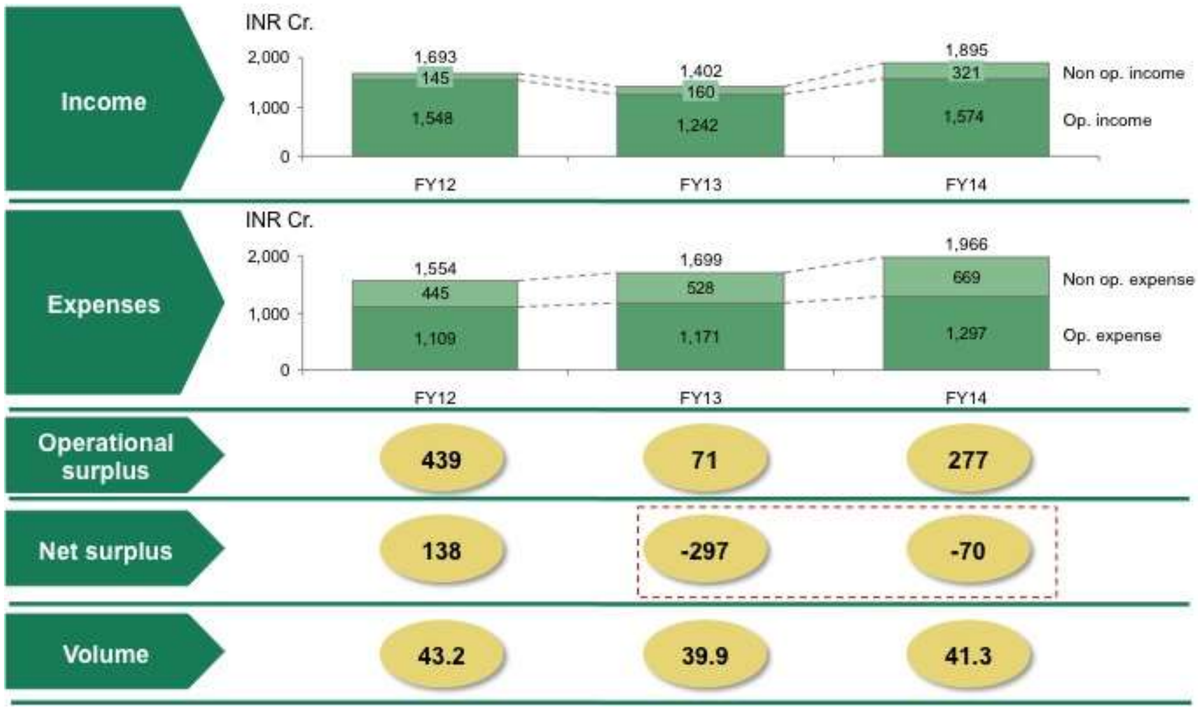


Figure 258: Container growth at KDS and maximum container capacity

KoPT has faced increasing expenses over the years, resulting in net deficit. There is a net deficit of ~ Rs. 70 Cr despite a dredging subsidy of Rs. 350 Cr. Key efforts will be focused on reducing various cost heads.



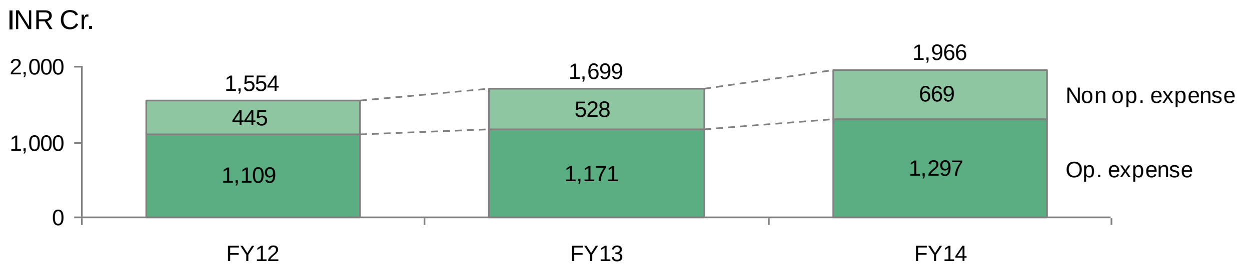


Figure 259: Year-wise income and expense trends

9.2.1 Bulk cargo

9.2.1.1 Initiative: KoPT 1.1 & 1.2 HMC for berths 2, 8, 9 and 13

Initiative Overview

Currently, only berths 4A, 4B and 12 have mobile harbor cranes. The volume within the impounded dock can be increased to 34MMT till the gate capacity is hit, and further by 3MMT by moving edible oil ships outside the gate.

Currently, berth productivity is limiting the volume at Haldia and, therefore, it is proposed to add MHCs to berths 2, 8, 9 and 13.

Key Findings

HDC is restricted is terms of berth handling capacity. Currently, only 3 berths—4A, 4B and 12—have mobile harbor cranes. In order to increase the berth handling capacity at HDC, it is proposed to add MHCs in a phased manned to the identified berths:

- Phase I
    a. Add 2 HMCs of 100MT each to berths 2, 8
    b. Hardstand ~56K sqm behind berths 8, 9
- Phase II
    a. Add 2 HMCs of 100MT each to berths 9, 13
    b. Hardstand ~100K sqm behind berth 9
-

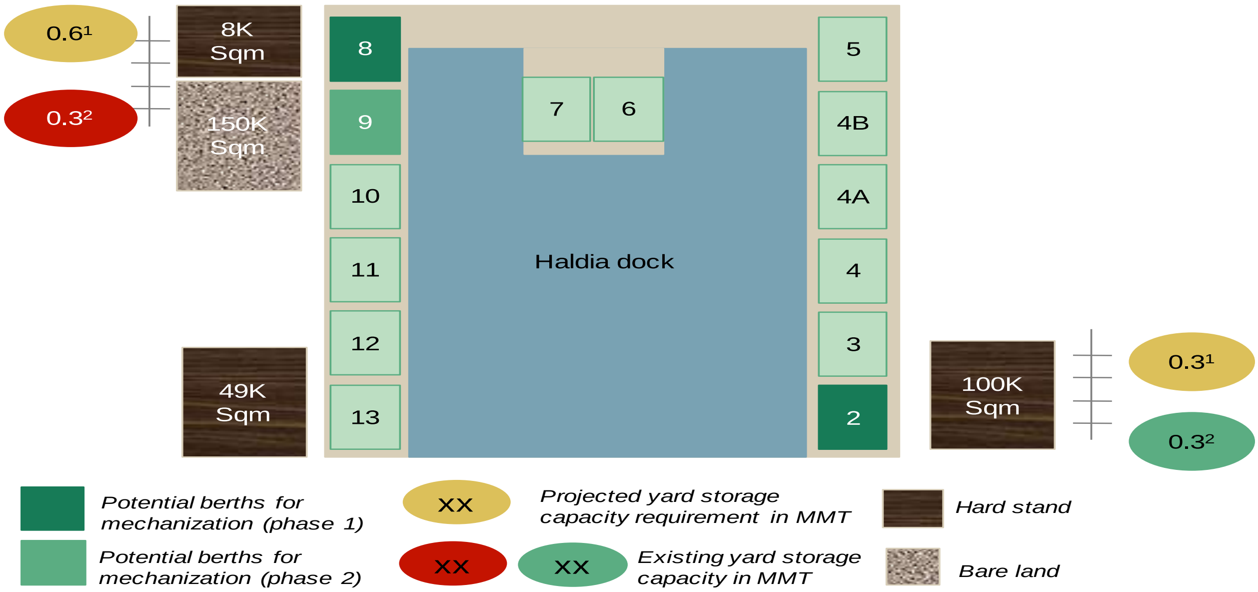


Figure 260: HMC berths and area for hardstand

Recommendations

Issue tender to add cranes to berths 9, 13,and to hardstand 1L sqm behind berth 13; establish berth norm of 13000 TPD once the cranes are commissioned.

Expected Impact

There will be a capacity release of ~4-5 million tons and incremental operating surplus of ~Rs. 60 Crs.

9.2.1.2 Initiative: KoPT 1.3 Reduce non-working time by reducing shift change time, marine wait time

Initiative Overview

Currently, the non-working time is as high as ~21-24 hrs of berth stay, of which ~50% is on account of time lost due to shift breaks, with the second biggest component being waiting for tide to sail the vessel out of HDC. Reducing these delays will help improve berth productivity.

Key Findings

A vessel has an average berth stay of 3 days at the conventional berths, and 2.5 days for mechanical berth. Of this berth stay, almost ~21-24 hours is non-working time. Non-working time is on account of various reasons, however, shift breaks constitutes more than50% of the non-working time (i.e., 14 hrs) and waiting for tide is the second biggest component (i.e., 6 hrs). Vessels have to wait for high tide in order to sail out of the lock gate.

Conventional berths: Avg. berth stay – 3 days	Mechanized export berth: Avg. berth stay – 2.5 days

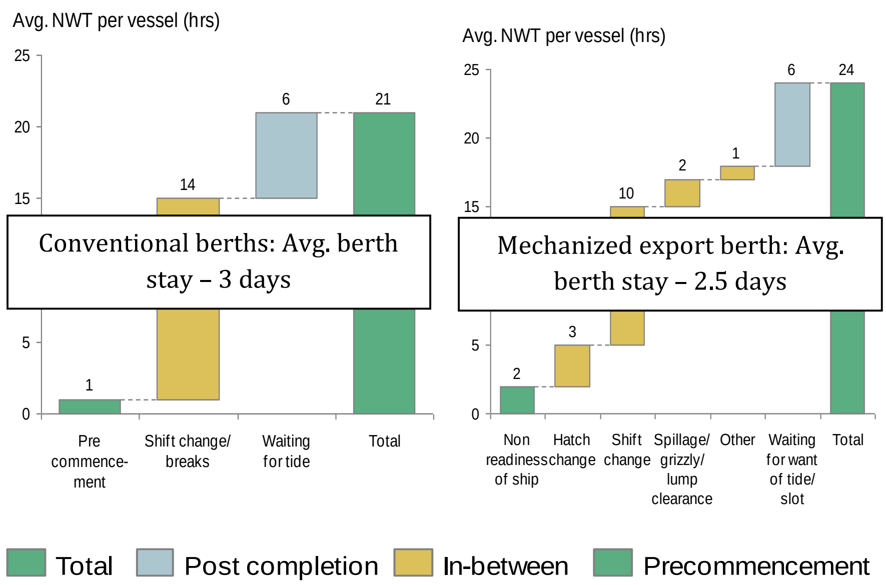


Figure 261: NWT Breakup

The following can be done to reduce non-working time at berth:

Hot seat changes need to be instituted for crane operators to reduce time wasted due to shift breaks. Stringent norms can be implemented to reduce time lost on ground. Marine waiting time can also be reduced by ensuring that vessels are brought in anticipation, creating additional waiting space inside the dock so that the vessels can sail out of the operating berth and berth at the waiting berths till high tide to sail out of the lock gate, and additional 2 tugs are needed exclusively for within the dock to ensure prompt shifting of vessels.

Recommendations

1. Haul out vessels as soon as they are finished

   a. Ensure that vessels are brought in anticipation
   b. Create additional waiting space inside the dock
   c. Add 2 tugs within dock exclusively for shifting

2. Put in place berth productivity norms and penalties

3. Implement hot seat changes for crane operators

4. Enforce submission of loading sequence prior to berthing

   a. Fix loading sequences for TNEB ships in consultation with customer to be considered
   b. Optimize hatch sequence to minimize distance to be traveled by loader

Expected Impact

This initiative will result in reducing NWT/ship (conventional dry) from ~21hrs to ~15hrs. Thus the incremental operating surplus will be ~Rs. 20 Crs.

9.2.1.3 Initiative: KoPT 1.4 Coal export capacity increase

Initiative Overview

Currently, mechanized coal berth, berth 4 operate at 750 TPH (FY15 baseline). With the addition of new stacker reclaimer, there is potential to increase this further to 1500 TPH. However, the same will not be achieved unless mandatorily enforced. Once the productivity of the berth is increased, the spare capacity can be used either to export further coal or to import coastal cargo.

Key Findings

Berth 4 is handling 1.2 MMT of coal export at 33% of occupancy. Even at 70% occupancy (projected cargo increase), berth 4 faces a slack at 1.3 MMT. Thus mechanized berths will reach full capacity and not be able to handle the projected cargo increase.

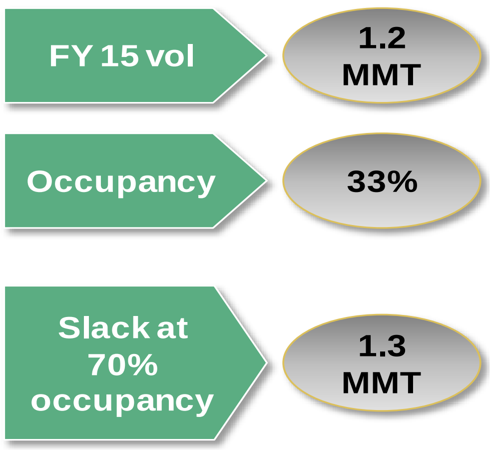


Figure 262: Berth 4

Currently, berth 4 is achieving a productivity of 750 TPH only, whereas most of the export vessels berthing at berth 4 are capable of receiving 1500 TPH. With addition of planned stacker reclaimer, vessels will be able to receive at 2100 TPH.

Thus implementing a productivity norm of 1500 TPH will bring occupancy down to ~35% (from 70%) with the proposed additional cargo. This free capacity can be used to accommodate coastal import cargo ~1-2 MMT through ship crane unloading at berth 4.

Berth 4 is ideal for coastal imports because it is a custom-free berth.

Recommendations

Set berth productivity norm of 1500 TPH to release further capacity. Use this free capacity to accommodate coastal import cargo that can be imported using ship cranes in case the export volume does not pick up.

Expected Impact

This initiative will result in incremental operating surplus of ~Rs. 20 Crs.

9.2.1.4 Initiative: KoPT 1.5 Increase in lock gate capacity

Initiative Overview

The cargo has to go through 4 areas—approach channel, lock gate, berth handling and then evacuation.

1. The approach channel does not have a limitation of capacity for cargo
2. The lock gate is restricted at 34 MMT {Ships per day (6) x Number of op. days (350)x Avg. parcel size (16,000)}
3. Berth handling capacity is restricted to 24 MMT (handled in FY14-15)
4. Evacuation capacity is restricted to 60 MMT

Berth handling is the clear bottleneck. Many initiatives have been incorporated to improve berth handling capacity, i.e., inside impounded up to ~36 MMT (excl. liquid bulk).

While the lock gate is not a constraint now, further capacity needs to be released to meet the increase in planned berth handling capacity.

Moving low parcel size liquid bulk vessels outside the lock gate can increase gate capacity by an additional 5 MMT.

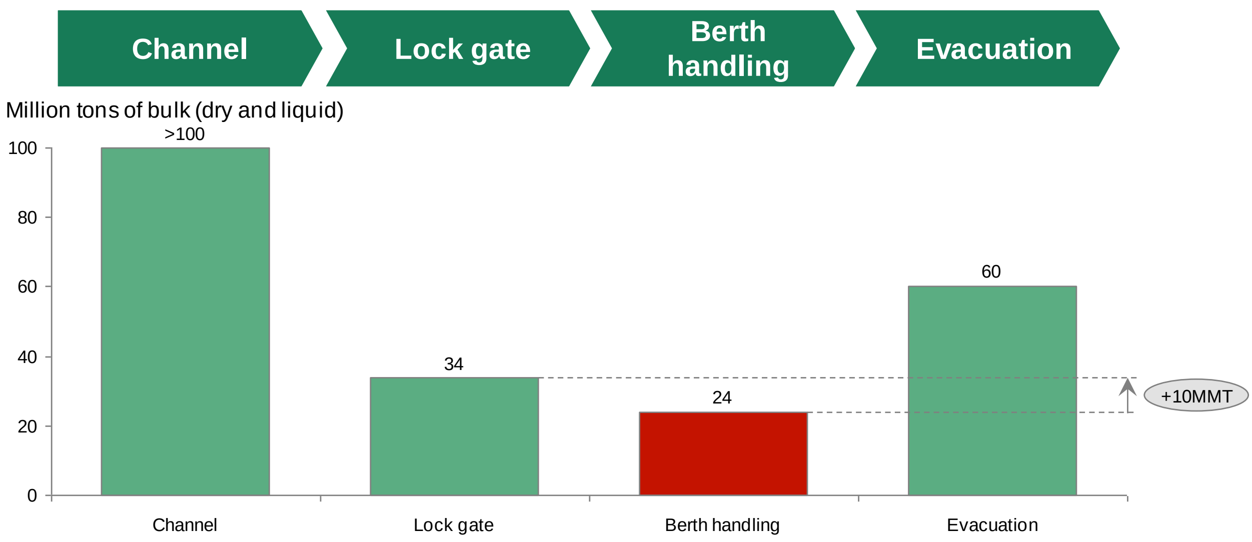


Figure 263: Capacities of individual process steps at HDC

Key Findings

Lock gate capacity has 10MMT headroom as of FY14-15. However, the lock gate capacity will have to be increased to incorporate planned berth handling capacity upgrades.

Liquid bulk is handled at berths 3, 5, 6 and 7. The liquid bulk vessels are normally of low parcel size, resulting in wastage of lock gate capacity. These vessels can be shifted outside the lock gate to increase gate capacity:

1. Through relay of pipelines, up to 120-150 edible oil/ chemical vessels can be accommodated to outside berth HOJ III, which has an occupancy of only ~16%, along with proposed BPCL POL volume. This will release capacity by ~2.5MMT
2. Another ~30-40 edible oil/ chemical vessels can be shifted to outside berth HOJ II, which has occupancy of ~60%, which will release capacity by ~0.5MMT
3. With capex investment, additional 120-150 edible oil/ chemical ships can be shifted to HOJ III if BPCL is shifted to Salokhali
    a. Existing edible oil/ chemical cannot be shifted to Salokhali as existing facilities will need to be shifted

Commodity	Number of vessels (2014-15)	Avg. parcel size (MT)	Total volume (MMT)
Liquid bulk (Edible oil, chemicals)	~500	6600	4
Dry bulk	~1000	~20,000	~20

Can add 6MMT of dry bulk capacity by moving liquid bulk outside dock

Figure 264: Shift liquid bulk vessels outside lock gate

After shifting liquid bulk outside lock gate, the liquid berths inside the impounded dock area can be used as waiting berths to help implement the KoPT 1.3 initiative.

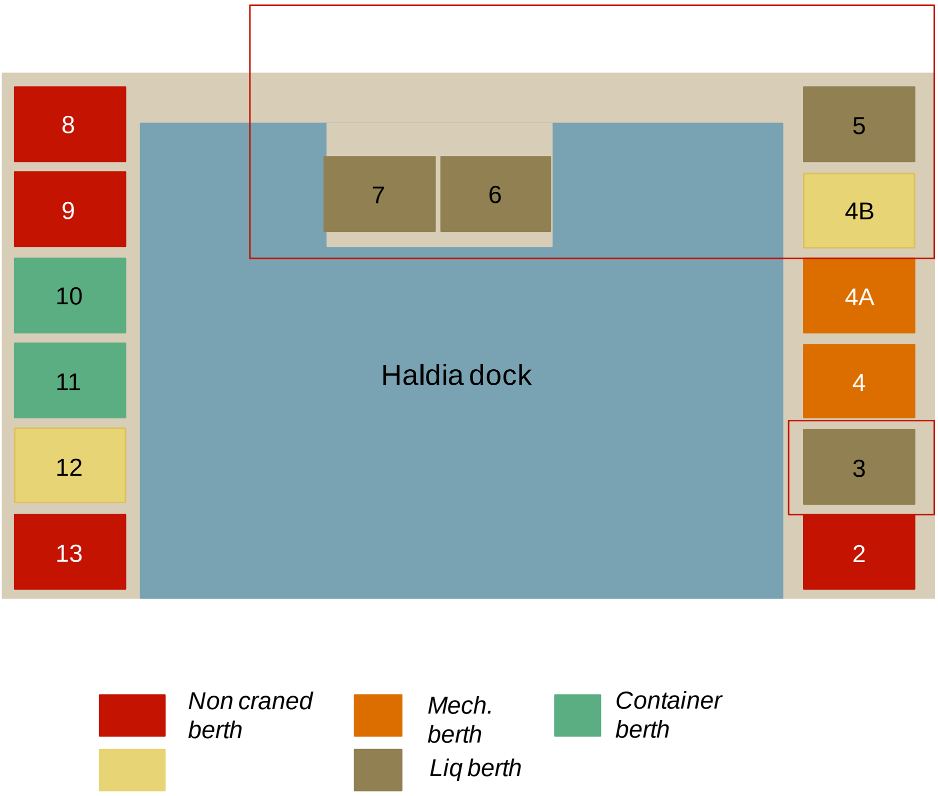


Figure 265: Liquid berths that can be waiting berths

Liquid berths cannot be converted to dry bulk berths due to lack of quay area and less strength. Berths 6, 7 and 3 can be converted into 3 waiting berths. Liquid bulk ships can be berthed inside dock in case there are no dry cargo ships waiting.

Expected Impact

Moving low parcel size liquid bulk vessels outside lock gate can increase gate capacity by additional 5 MMT.

9.2.1.5 Initiative: KoPT 2.1 Making transloading option attractive by reducing overall cost and creating a combined package

Initiative Overview

End-to-end cost to customer with transloading at Haldia currently works out to ~Rs. 2200/ton compared to Rs. 1800/ton via Dhamra and ~Rs. 2000/ton via Paradip.

The key drivers are:

1. High transloading cost (Rs. 550/ton)
2. High shore operations cost (Rs. 400/ton)

Due to the high cost, it is expected that while Haldia may get traffic due to current congestion at all east coast ports, it will lose share considerably once Dhamra phase 2 comes up.

Key Findings

Importers bring only 30-40% of their requirement via HDC due to low draft and higher logistics cost. Draught limitations force customers to discharge 60-70% cargo at other east coast ports.

Current lighterage point at Sagar has ~10.5 m draft. Therefore, a Panamax/Supramax vessel needs to lighten up to 40-50% before arriving at HDC. Importers are forced to lighten ships and discharge up to 20-30K tons at other east coast ports.

Figure 266: Draught Restriction

While Haldia has the advantage of rake availability and lower railway fare due to proximity to the hinterland, this advantage is lost due to higher end-to-end cost to customers as compared to Dhamra and Paradip. Haldia needs to reduce end-to-end cost to attract more cargo, and also enable cape handling through transloading.

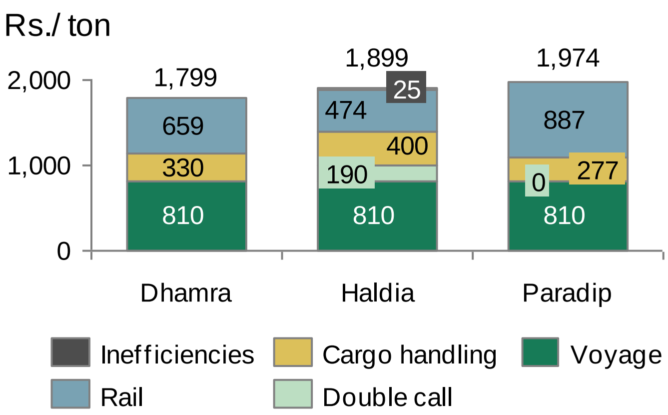


Figure 267: Cost comparisons from different east-coast ports for Tata Steel, Jamshedpur

Haldia end-to-end cost to customer is higher than other eastern ports such as Dhamra and Paradip. This cost is higher due to two major cost heads:

1. Shore handling (Rs. 165 vs. 60 per ton)
2. Plot rent (Rs. 23 vs. 7 per ton)

There are three key initiatives that will help reduce this end-to-end cost to customers:

2. Reduce overall plot rent—need to amend the SOR
3. Enforce licensing program across all conventional berths
4. Convert berths 2, 8 into BOT berths with contractors doing the shore handling

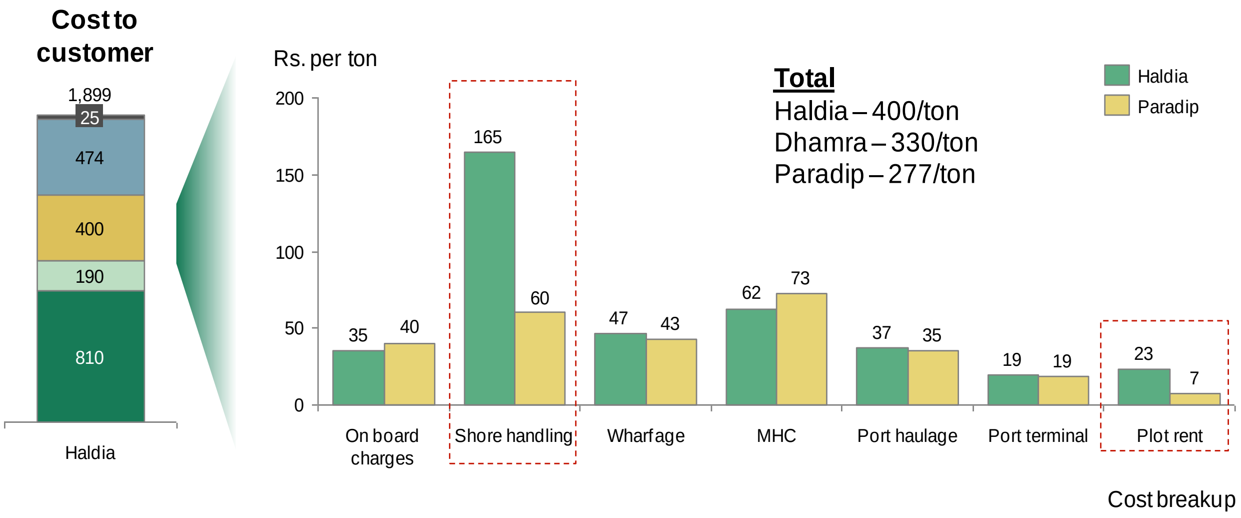


Figure 268: End-to-End cost breakup

Further, at current rates, it will be infeasible to bring full cargo by capsize vessels to HDC through transloading. Bringing capes to HDC through transloading proves to be more costly than taking cargo to Dhamra or Paradip port.

Initially, demand will continue at HDC due to congestion at other ports. However, once Dhamra completes expanding its cargo handling capacity in Phase II, HDC will lose volumes due to cost ineffectiveness.

Transloading cost can be reduced by:

1. Eliminating cargo loss by installation of weighbridge inside yard (already planned)
2. Reduce shore handling through licensing/ BOT-mechanized berths
3. Combined discount from both JITF and port-end to be provided

It will be critical to map transloading to cheaper sub-contracted/BOT berth to ensure cost-effective transloading. Joint package creation between JITF and the port is also essential.

This lower cost package (reduction of ~Rs. 200-250) must be worked out before Phase II of Dhamra port is completed.

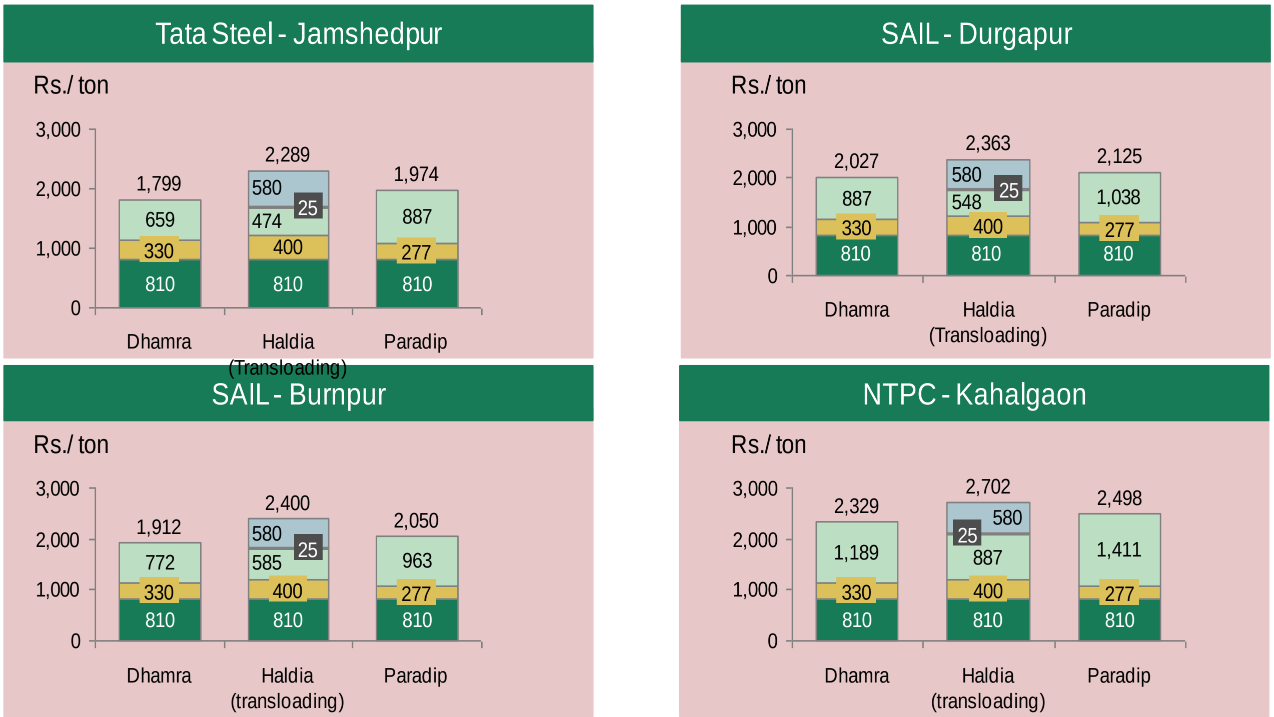


Figure 269: Cost comparisons between different east-coast ports and HDC transloading

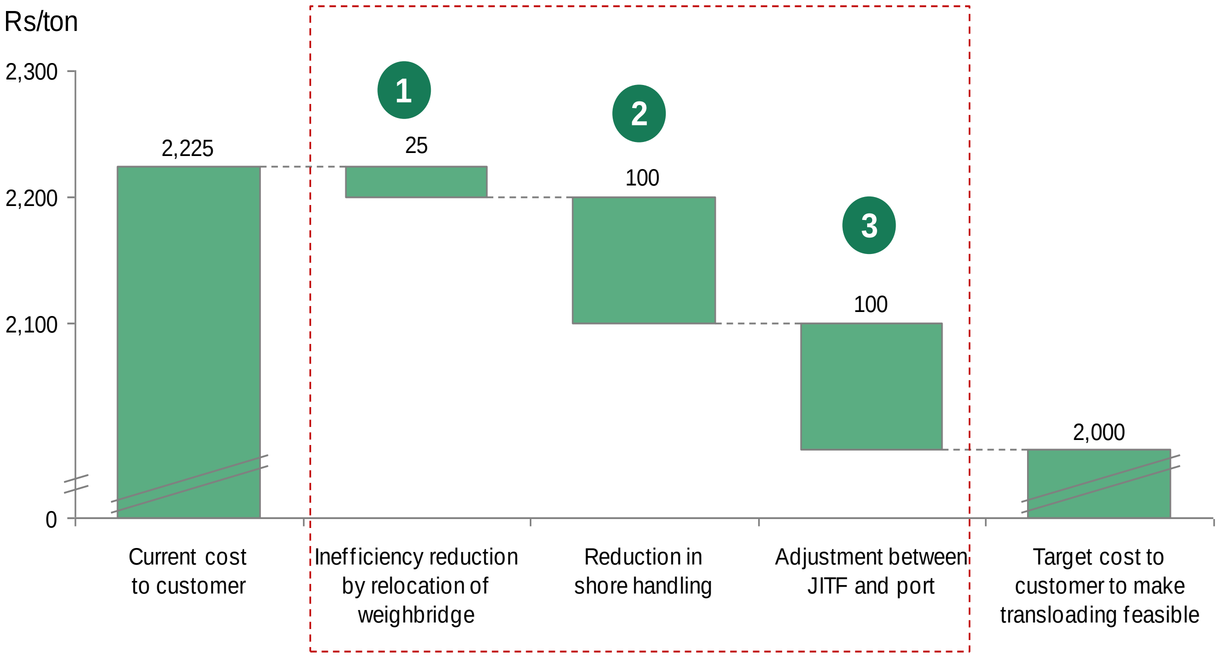


Figure 270: Proposed transloading cost reductions

Recommendations

1. Contract out two berths within dock with lower handling cost
2. Tie in outside terminal 2 with transloading once it becomes operations
3. Provide on priority berthing for transloading daughter vessels at these berths
4. Create joint package for transloading so that customer only needs to make one payment for ship-to-rake operations

Expected Impact

Increase in transloading tonnage by ~5MMT. The incremental operating surplus by FY16 will be ~Rs. 12 Crs, and by FY17 will be ~Rs. 24 Crs.

9.2.2 Container cargo

9.2.2.1 Initiative: KoPT 3.1 Addition of HMC to berth 3 in KDS, NSD

Initiative Overview

There are 5 container berths in KDS, NSD. Of these 5 berths, Berth 4, 5, 8 have HMCs operated by PSA, and Berth 3, 7 operate as crane-less berths. The productivity of HMC berths is already meeting benchmarks, thus converting the other 2 crane-less berths into HMC berths will help increase capacity.

Capacity can be further increased by converting existing break bulk berths into container berths.

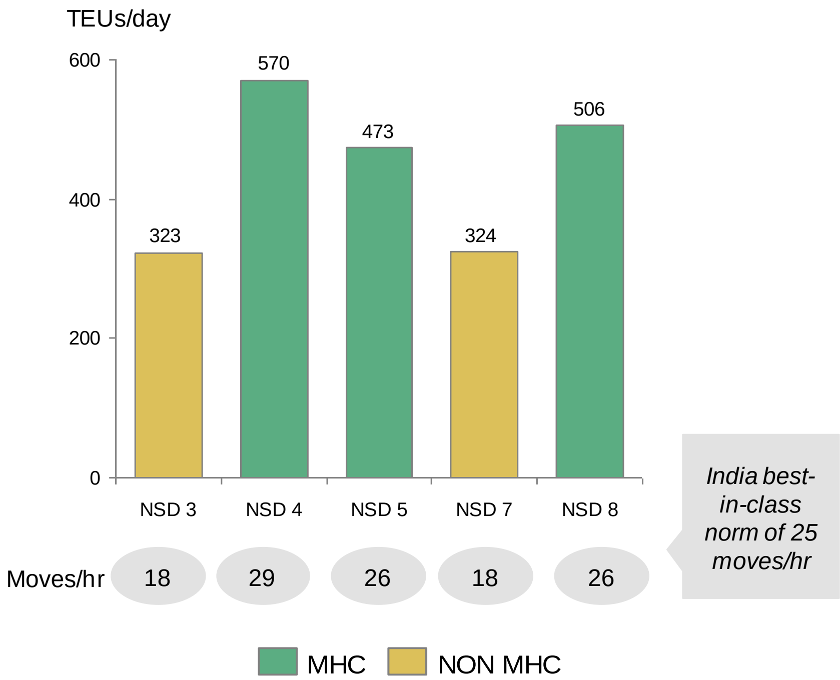


Figure 300: Container berths' productivity

Key Findings

- NSD 7 does not have the berth strength to hold an HMC, therefore, it needs to be operated as a crane-less berth.
- NSD 3 berth has the load bearing capacity to operate with an HMC. However, there is a shed on NSD 3. Due to the proximity of shed 3 to the berth, there isn't sufficient space for an HMC to operate. This shed is unutilized with an area of 183 x 15.2 mtrs. Dismantling the shed will create space to use the berth as an HMC container berth.

Figure 271: NSD 3

Container capacity can be further increased by converting an existing berth into a container berth in a phased manner, depending on the demand trend. NSD 1 and NSD 2 seem to be the most feasible options due to proximity to the container yard. NSD 13 and NSD 14 are far away from the container yard.

Berth No	Current commodity	Proximity to container yard
NSD 1	Break bulk	◐
NSD 2	Break bulk	●
NSD 13	Break bulk	○
NSD 14	Break bulk	○

Figure 272: Berths proposed for converting into container berths

Recommendations

- KoPT needs to renegotiate existing contract with BKCT for additional MHC at current or revised rate, or enter into a new contract to provide an MHC or issue a new tender for MHC with first right of refusal to BKCT

- The shed at NSD 3 needs to be demolished so that the berth can be used as an MHC berth

Expected Impact

There will be an immediate capacity release of ~10%, and incremental operating surplus of ~Rs. 5 Crs.

9.2.2.2 Initiative: KoPT 3.2 Reduce NWT by instituting hot seat changes and reducing marine wait time

Initiative Overview

Currently, out of the total time spent at berth, ~23-25% is non-working time. HMC berths have lesser idle time than non-HMC berths since the dock operations are not performed by BKCT on the non-HMC berths. However, ~25% of the NWT delays can be avoided by ensuring:

- Implementation and compliance of hot seat changes
- Prompt planning between Traffic and Marine departments for shifting of vessels after operations have been completed

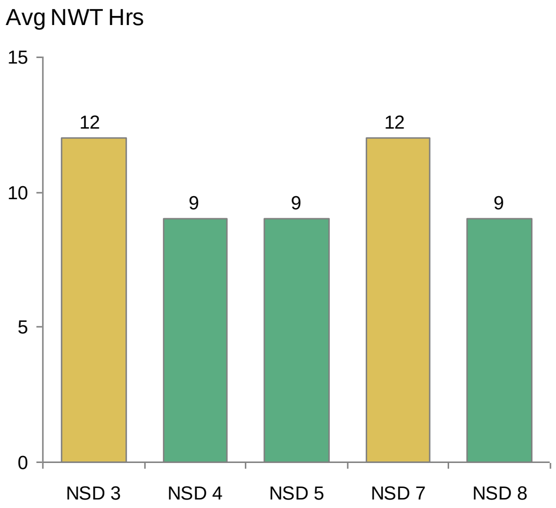


Figure 273: Berth-wise NWT (Hrs)

Key Findings

More than 80% of the non-working time is on account of time lost between shift changes, breaks and other marine delays.

Hot seat changes must be implemented with all relevant stakeholders—private stevedores, BKCT and marine department.

Almost 40% of the marine delays are due to late arrival of pilots and delays in communication between the Traffic and Marine departments. Effective planning between the traffic and marine departments is essential to ensure vessels are mandatorily moved to waiting buoys/non-working berths/lock gate after completion of operations.

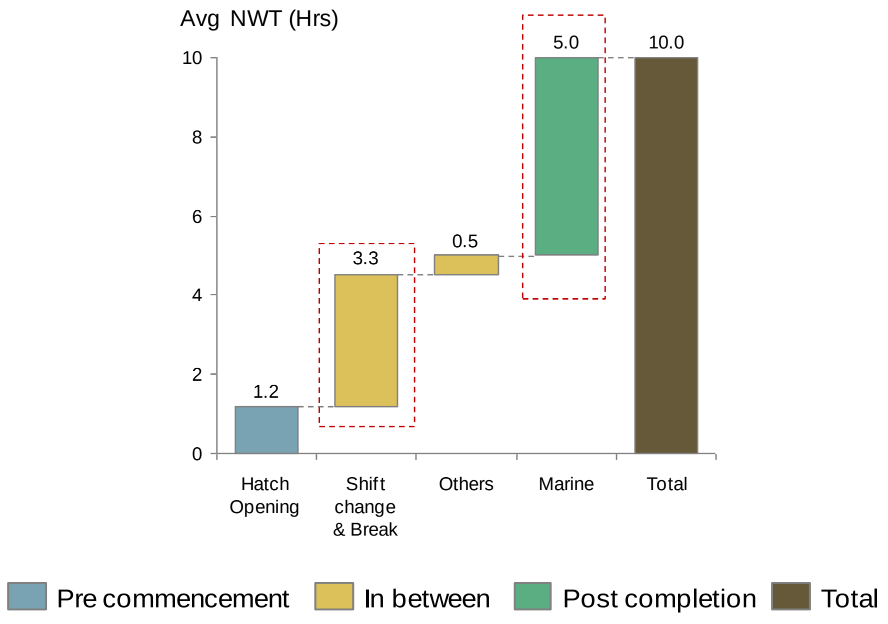


Figure 274: NWT break-up of container berths

Recommendations

1. Implement hot seat changes for shift changes and breaks with BKCT, marine department and private stevedores.

2. Establish a process to ensure effective communication between the Traffic and Marine departments for prompt shifting by using non-working berths, and waiting buoys and immediate response from the Marine department. The Marine department should be informed at least 2 to 3 hours prior to completion of operations to reduce waiting period for shifting of vessels.

Expected Impact

Reduction in average NWT will be ~2.5hrs/day, with an increase in operating surplus by ~ Rs. 6 Crs.

9.2.3 Evacuation

9.2.3.1 Initiative: KoPT 4.1 Improvement of truck traffic during night by facilitating night payment and customs clearance

Initiative Overview

High road congestion for container traffic has been observed at KDS. This is on account of high day-night modal skew. Due to lack of 24/7 clearance facilities, i.e., customs and payment, ~70% of trucks move out during the day and the remaining 30% move out at night, causing congestion.

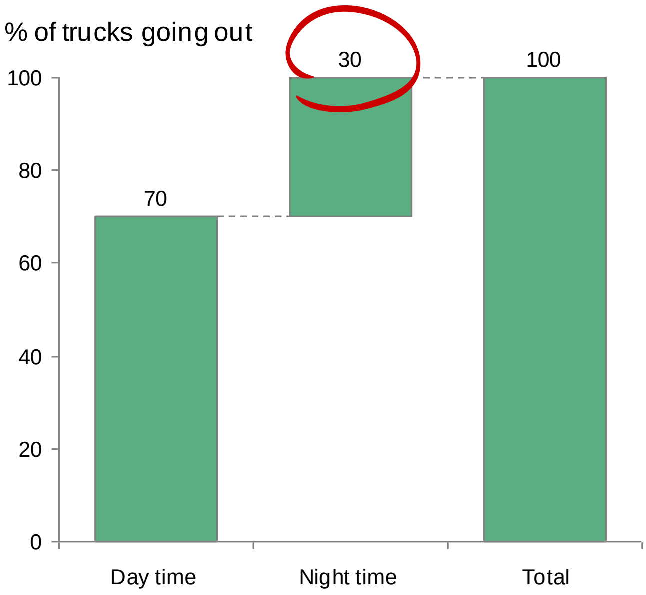


Figure 275: Road movement skew

Key Findings

Currently, ~70% of the trucks move out during the day causing road congestion. The following needs to be done to encourage even distribution of truck movement:

1. 24/7 payment window: An additional shift for cash department or complete e-payment facility must be created.
2. 24/7 customs clearance window: Need to align with customs to create a night shift as in break bulk at KoPT, and Containers at Chennai port.

The aforesaid measures are implemented at most of the other major ports.

Recommendations

1. Speak with customs to provide night shift
2. Implement night shift for port staff to collect port charges or create a complete e-payment facility

Expected Impact

This initiative will reduce congestion, which is necessary to increase container handling capacity to absorb growing demand.

9.2.3.2 Initiative: KoPT 4.2 Reduce rake turnaround time at KDS by improving railway infrastructure

Initiative Overview

There is high rail-road modal skew. Only 6% of the containers are moved by rakes, while ~30% volumes go out of Kolkata. This is on account of high rake TAT due to which customers prefer movements through trucks. Rake facility needs to be improved to reduce rake TAT in order to encourage an increase in rail movement.

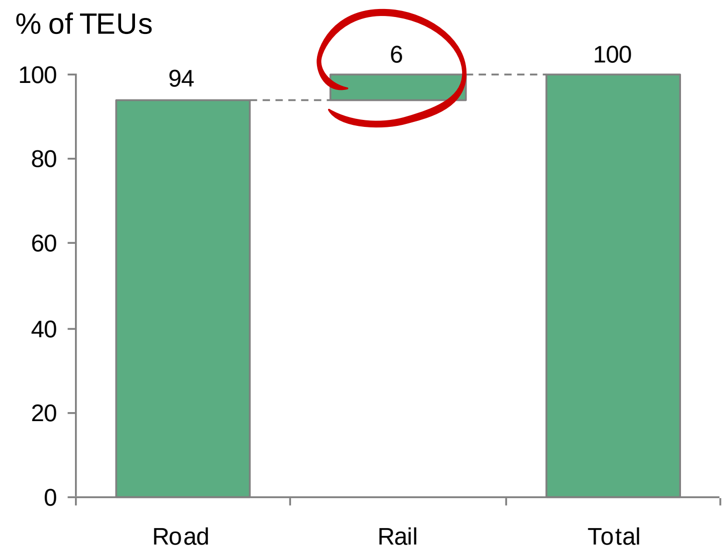


Figure 276: Truck-road modal skew

Key Findings

Currently, the rake TAT at KDS is quite high at ~22hrs, making road transport much shorter to key hinterland locations (e.g., Jamshedpur: Rake 3 days; Road 1 to 2 days).

Reasons for high TAT include:

1. Slow loading: Due to lack of space, only half rake can be parked at one siding. There are 2 sidings, however, only one is used because only one reach stacker can be accommodated due to less space. This results in half rake loading at a time.
2. Transit time: Due to poor maintenance of the marshalling yard, transit and shunting time of rakes is slower, there are multiple derailments and, due to half rake loading, there is a double transit.
3. Waiting for locos: Only 2 locos are available between KDS, NSD and the Concor yard.

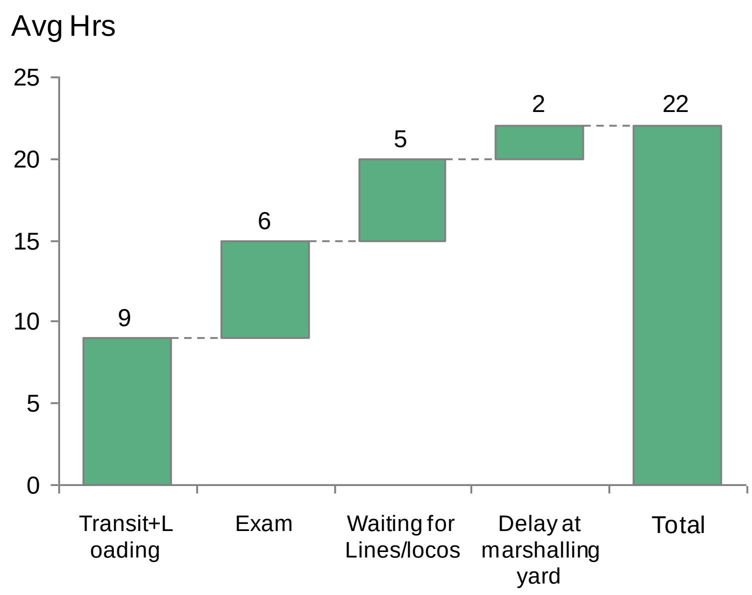


Figure 277: Average rake TAT break-up

Three initiatives are identified to reduce TAT by ~9hrs:

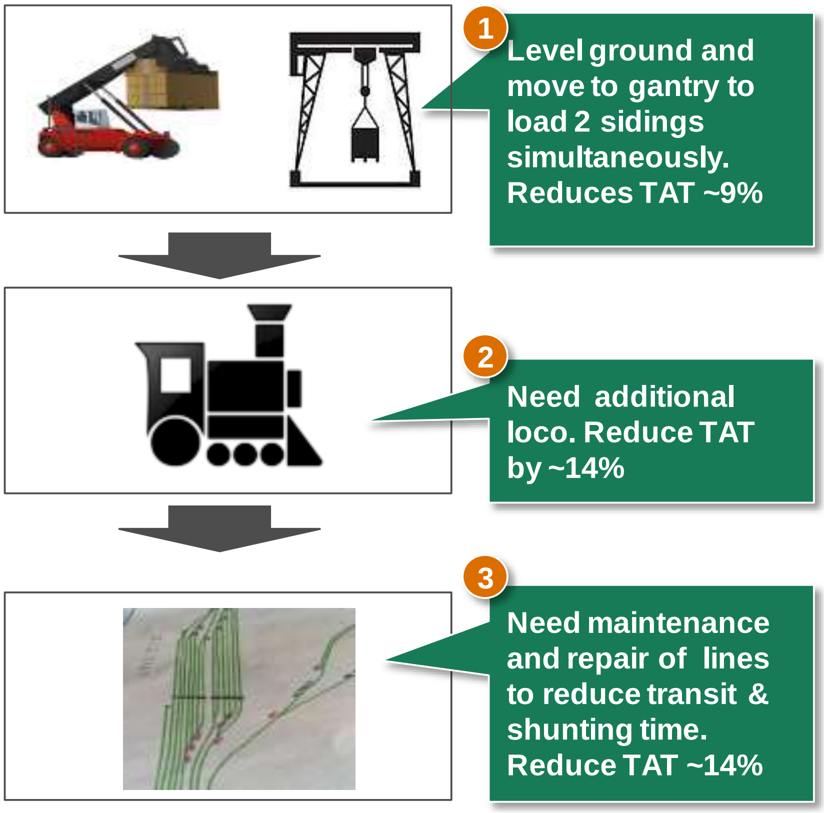


Figure 278: Reducing rake TAT

Recommendations

Initiate tender for rail mounted gantry crane with first right of refusal to BKCT. Level surface around the sidings to enable installation and use of rail mounted gantry crane. This will enable loading of 2 half rakes simultaneously.

Additional loco should be provided, which will be transferred from Haldia.

The EJC yard needs to be maintained to reduce transit time and derailment instances.

Expected Impact

This initiative will reduce congestion, which is necessary to increase container handling capacity to absorb growing demand by reducing rake TAT by ~9 hrs, and increasing rail movement capacity by ~40%.

9.2.3.3 Initiative: KoPT 4.3 Rail extension for coal handling at KDS

Initiative Overview

KDS also faces issues in bulk evacuation due to half loading and marshaling yard congestion. This TAT time can be reduced through improving rail facility.

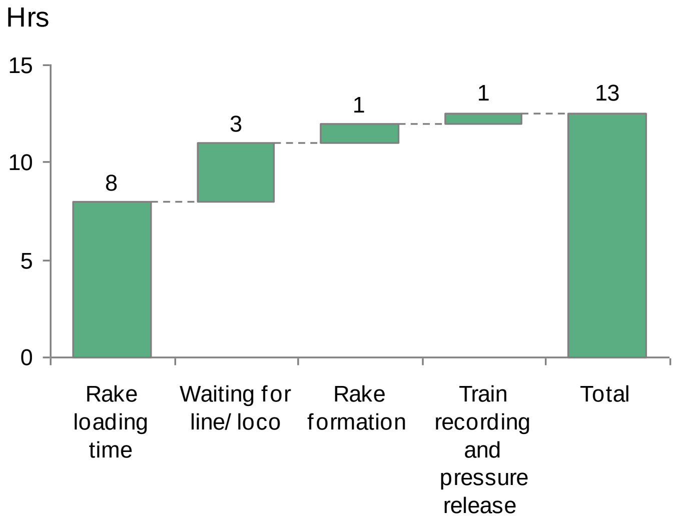


Figure 279: Rake TAT for bulk commodities

Key Findings

Half rake loading (insufficient place to load full rake), lack of loco availability and marshalling yard congestion are hampering rake TAT for bulk commodities as well.

Recommendations

Three initiatives to lower TAT and reduce congestion:

1. Extend railway line at KPD to allow complete rake loading in port premises; remove shed #26
2. Repair defunct lines at marshalling yard; reduce delays in rake leaving marshalling yard with proper FOIS training
3. Increase number of engines to reduce waiting time due to non-availability of engines

Expected Impact

Improved service and reduced road congestion.

9.2.4 Cost

9.2.4.1 Initiative: KoPT 5.1 Reduce dredging cost by encouraging contractors to deploy techniques to improve dredger's dredging time and by using Eden channel as primary channel for navigation

Initiative Overview

Key Findings

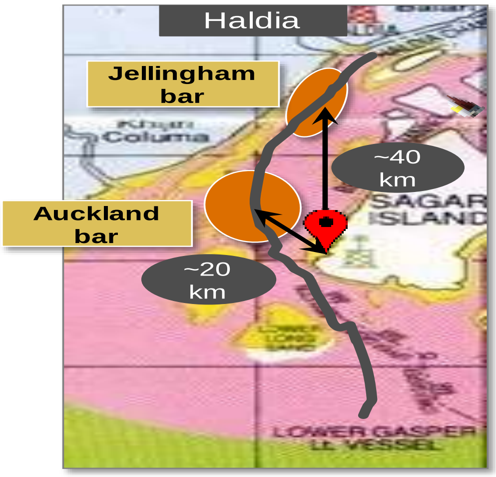
1. Barge Loading Initiative

The current navigation channel to Haldia Dock System passes through two major sand bars—Auckland and Jellingham, which currently limit the draft of the channel. The bars, which are currently at approximately 4.5m (Auckland) and 4m (Jellingham) below chart datum, need dredging around the year for maintenance.

Currently, this maintenance dredging work is contracted to the Dredging Corporation of India and costs ~Rs. 380 Cr per year. The current dredging is accomplished by four trailer suction hopper dredgers (two of 5500cbm hopper capacity and two of 4500cbm hopper capacity).

Distance to the dumping site and time lost in traveling is a key issue for maintenance dredging at Hugli. The dredgers dredge at Jellingham and Auckland and deposit most of the silt at the Sagar dumping site. Sagar dumping site, which is the main dumpsite for Hugli River dredging, is ~40NM south of Jellingham and ~15-20NM south of Auckland on an average. The dredgers, therefore, spend nearly 70% of their time traveling up and down the channel and only the remaining 30% time is spent dredging.

KoPT has introduced two additional techniques—side casting and short dumping to improve the utilization of dredger—which has resulted in some improvement. The major issue, however, is that both the methods are limited in the amount of silt that can be disposed using them, and the dredgers have to take recourse to the Sagar dump site for ~90% of the silt even after adopting both the techniques.



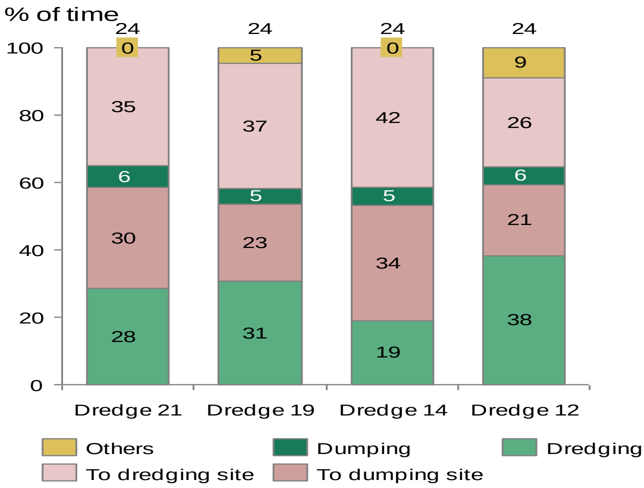


Figure 280: Haldia channel, time utilization of dredgers

Internationally, where long distances are involved between the dredge site and the dump site, one of the techniques adopted is to leverage split hopper barges to convey silt to the dump site. This way, the costlier time of the dredger is substituted by cheaper barge time in transportation of the dredged materials, enabling dredgers to spend more time dredging. This technique is currently employed in dredging of the Yangtze River for Port of Shanghai in China, and for the dredging of Rio de la Plata River leading to the port of Buenos Aires in Argentina.

BCG examines the prospect of using the barge loading technology for dredging at Jellingham bar. This technology, as per initial studies, can complement the two techniques that KoPT has already successfully deployed (side casting and short dumping) and result in substantial operational savings.

Barge Loading Technology:

Barge loading technology comprises of the following steps:

1. Barge moors with the trailer suction hopper dredger (TSHD)
2. TSHD loads the barges directly instead of loading its own hopper
3. Once full, the barge casts off from the TSHD and moves to the dumping site
4. Another barge moors with the TSHD in its place and the dredging continues

Dredging at Jellinham currently involves removal of ~4MMT of silt annually. This translates to a hopper load of ~40,000 cbm per day, assuming 325 days of dredging. Currently, this is done by two dredgers (with 5500 cbm hopper capacity), each doing ~4-5 loads per day.

With the use of split hopper barges of ~3000-3500 cbm capacity, the dredging job is expected to be done with one dredger of 4500 cbm capacity and 3 split hopper barges. The barges are assumed to move at a speed of 9 knots (as per Vuyk engineering standard for 3000cbm barges) and have a cycle time of ~6 hrs. The barges are expected to have a draft of ~5m, enabling it to navigate through the channel during most of the time. Assuming that the barge loading takes 1.5 hours (loading, mooring and cast off), total barge loading operation will take only 15-18 hrs. The dredger can use the remaining time for side casting in spring tide or short dumping during neap tide. The table below gives the detailed calculation:

Table 1: Estimation of number of barges needed

Speed of barge	9
Loading time	1.5
	UJLB
Distance to dump site	22
Barge TRT	6
Volume	39560
Number of self-loads	2
Volume to be dumped by barges	30560
Barge capacity	3000
Number of barge loads	10
Number of loads per barge	3
Total number of barges	3

Expected cost of operation

The cost of operation for the 4500 cbm dredger + 3 barges system is estimated to be around ~Rs. 100-120 Cr. The detailed calculations are given in the tables below:

Table 2: Operating cost of dredger (for one dredger)

	USD	Rs. (Crores)
Amortization	2,000,000	12.0
Interest cost	3,600,000	21.6
Fuel	1,514,500	9.1
Salary	1,120,000	6.7
Maintenance	3,000,000	18.0
Total	11,234,500	67.4

Table 3: Operating cost of split hopper barge

	USD	Rs. (Crores)
Amortization	266,667	1.6
Interest cost	240,000	1.4
Fuel	1,053,000	6.3
Salary	300,000	1.8

	USD	Rs. (Crores)
Maintenance	200,000	1.2
Total	2,059,667	12.4

Table4: Total cost with current dredging volume

	USD	Rs. (Crores)
Number of dredgers	1	
Number of barges	3	
Cost of dredger	11,200,000	67
Cost of barges	6,180,000	37
Total	17,400,000	105

Key assumptions taken:

	Unit	Value
Cost of dredger	USD	60,000,000
Fuel consumption (IFO 80)	MT per 24 hrs	20
Maintenance	%	5%
Crew	Number of people	32
Average salary per crew	USD per month	35000

Cost of barge	**USD**	**4,000,000**
Fuel consumption (HSD)	Ltrs/hr	150
Maintenance	%	5%
Crew	Number of people	12
Average salary per crew	USD per month	25000
	USD/MT	**233**
Cost of HSD	USD/Ltr	0.9
Number of operational days	Days	325
Dredger economic life	Years	30
Barge economic life	Years	15

2. Eden Channel Initiative

Opening Eden channel is another potential opportunity for further reducing dredging cost for Haldia. Eden Channel is an alternate self-maintained channel bypassing Auckland.

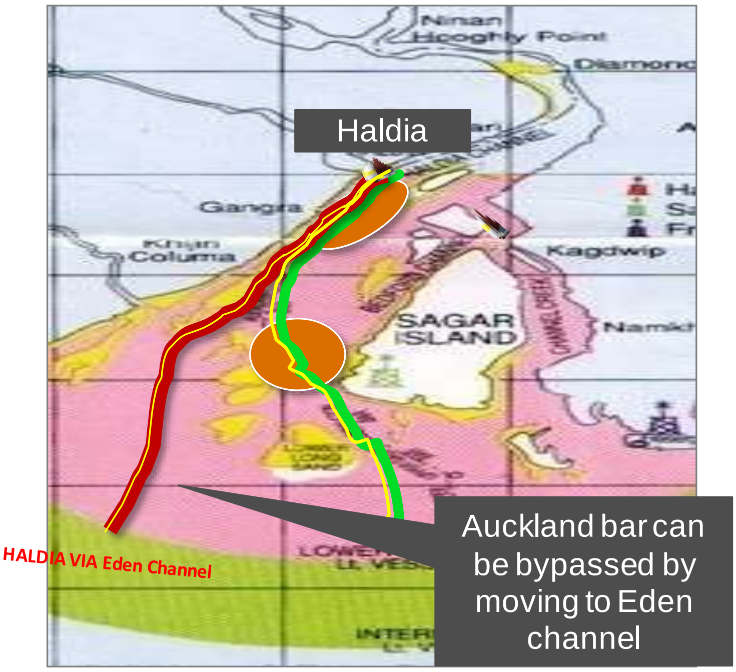


Figure 281: Eden Channel Map

As per Wapcos – HR Wallingford report, the Eden channel is expected to be open for 5-10 years. Additionally, there are indications that the channel might be stable.

1. Channel stability linked to formation of bar called Bedford sands
2. Bedford sand in regeneration phase since 2009

With Eden channel, dredging is required only for Jellingham. Only a small portion on Auckland bar might require dredging to maintain Kolkata channel.

Expected Impact

Total cost saving with barge loading and utilization of Eden channel will be ~Rs. 200 Crs.

9.2.4.2 Initiative: KoPT 6.1 Reduce loco hiring cost by relocating 2 good quality locos to from KDS to HDC instead of leasing new ones

Initiative Overview

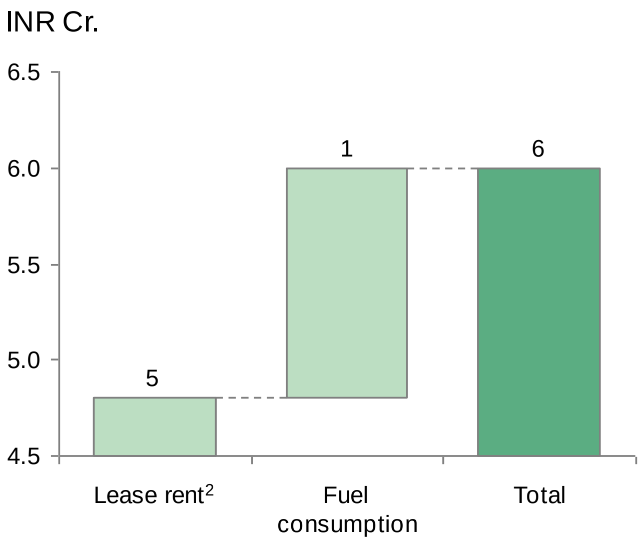
KDS has shortage of locos and has leased 2 locos while HDC has excess and incurs unnecessary resources on maintenance costs. This initiative focuses on redistributing engines between HDC and KDS.

Key Findings

12 owned engines are available in Haldia with a maximum of 6 engines used per shift. These locos include the following:

1. High powered DLW (5300MT1), 5 BHEL (4000MT) and 4 SAN (3200MT)
2. 6 each are used in the morning and afternoon shift, and 4 in the night shift

2 WDS6 type locomotives are hired at Kolkata from RITES on lease. The contract includes maintenance. This is a 2-year contract starting May 2015 with 85% guaranteed availability. The contact has an inbuilt 7% escalation clause. These locos are capable of pulling half rake only.



1) Maximum haulage capacity mentioned along with engine class 2) 16.4Lakh/month/loco charged by RITES as lease fees
Note: All locos are undergoing maintenance cost in Haldia which has been assumed to be constant in Kolkata too. 1 driver and 1 assistant /loco needs to be provided by KoPT
Source: Data received from ports, Interviews with port officials

Figure 282: Non-labor operating costs for 2 locos

There is potential to shift 3 locos to KDS from HDC to save the cost mentioned in the Figure above.

1 BHEL and 2 SAN to be shifted to Kolkata in a phased manner:

1. Phase 1: Shift 1 BHEL to operate alongside 2 WDS6 to reduce congestion. Set up and operationalize loco set up of CME or explore maintenance-only contract with RITES.
2. Phase 2: Shift 2 SAN and remove the hired engines. Contract can be terminated with notice period of 6 months based on performance in Phase 1.
3. 3 locos will increase the evacuation capacity in KDS.

Recommendations

- Shift identified loco to KDS. Appoint loco drivers to operationalize the same.
- Terminate the RITES contract for leased locos.

Expected Impact

Saving in costs will be ~Rs. 5 Crs.

9.2.4.3 Initiative: KoPT 6.2 Reduce tug operation cost at HDCby scrapping own tugs and replacing them by hired tugs

Initiative Overview

There is potential to reduce costs by hiring tugs instead of the current owning and operating model.

Key Findings

Cost comparison indicates that hiring tugs instead of operating owned tugs will be cheaper due to elimination of overtime and maintenance costs:

Cost head	Own Tug	Hired tug
Annual hire cost	-	5.2 Cr[1]
Total base salary expenses	2.7 Cr	2.7 Cr.
Overtime/provision component of salary	2 Cr	-
Annualized costs(depreciation)	2.2 Cr	
Fuel Cost	1.3 Cr	1.1 Cr
Maintenance cost (dry dock and AMC)	1.9 Cr	
Total	**10.1**	**9**

Major saving from overtime, maintenance

Figure 283: Cost comparison between own and hired tugs

Recommendations

- Decide approximate timelines for phasing out existing tugs. Proceed with finalizing technical and financial requirements to used hired tugs.
- Set up KPIs: Monitor fuel consumption/hour, actual hours of utilization per tug.

Expected Impact

Saving in costs will be ~Rs. 8 Crs.

9.2.4.4 Initiative: KoPT 6.3 Reduce security cost at KDS by reducing security cover for areas with lower activity

Initiative Overview

There is up to 15% variation observed in actual CISF headcount manning the port. Thus, KoPT should initiate resurvey operations to identify the right size/resize CISF headcount to save security costs.

Key Findings

Actual deployment of CISF manpower is in the range of ~ 75 to 85 % of maximum sanctioned strength of 748. The sanctioned strength was lowered down to 698 in min 2014, however, there was little to no change in the deployment, hence the CISF costs continue to remain the same.

KoPT should push for resurvey to reassess CISF requirements at various points because, from the sanctioned 698, at least ~40% of the time only 560-600 have been deployed—on an average, ~530 have been deployed during the year.

Additionally, there is a ministry guideline to KoPT to reduce ~Rs. 6 Crs of CISF cost.

Recommendations

1. Initiate CISF headcount requirement resurvey (last survey was done in 2004)
2. Finalize the headcount (to be deployed + buffer)

Expected Impact

Potential to reduce overall manning by ~70 to save ~Rs. 3 Crs cost.