MASTER PLAN FOR VISAKHAPATNAM PORT

Master Plan for Visakhapatnam Port

Prepared for

Ministry of Shipping / Indian Ports Association

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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.

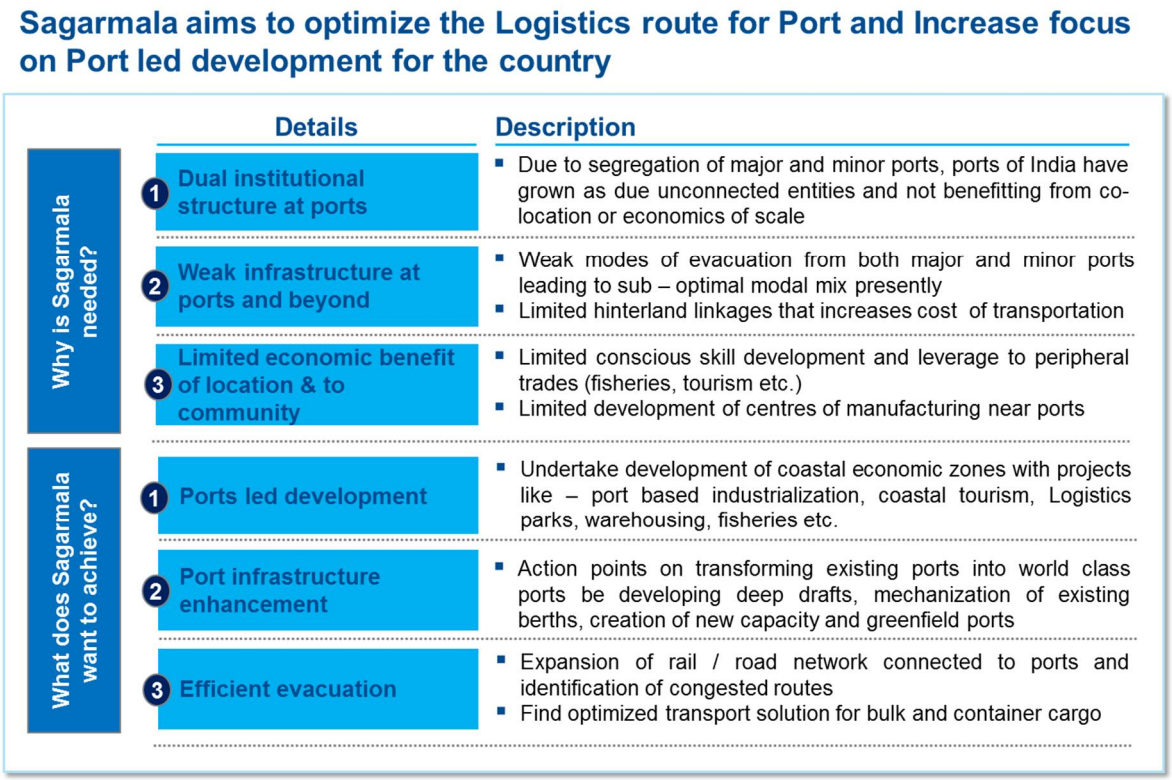


Figure 1.1 Aim of Sagarmala Development

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 experience in port-led development, the major engagement challenge to develop a set of governing principles of approach is shown in **Figure 1.2**.

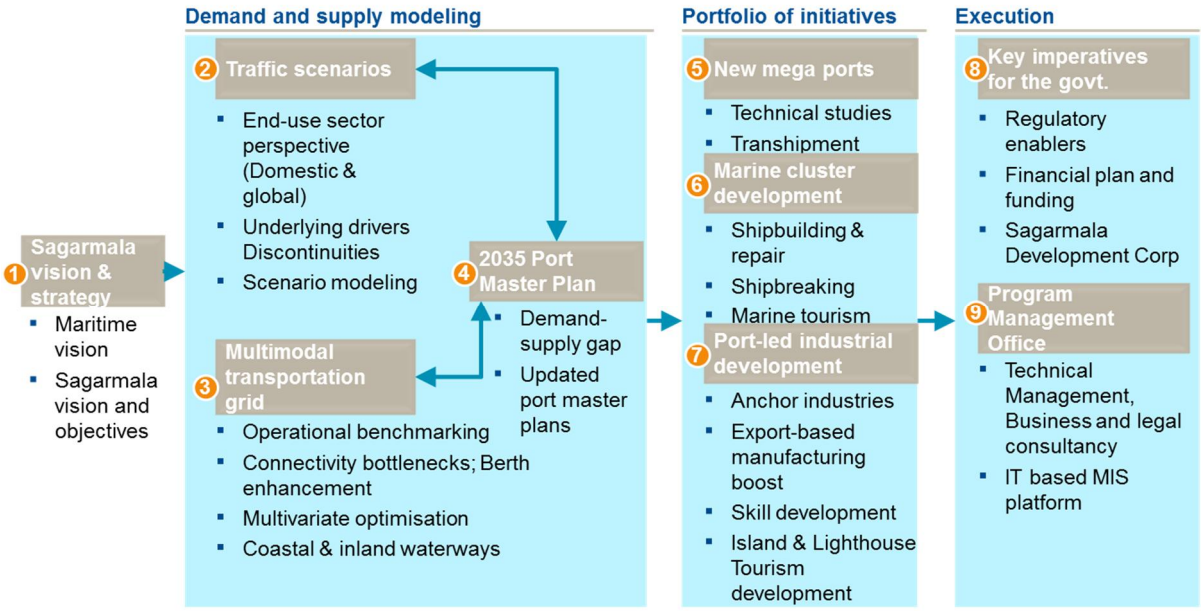


Figure 1.2 Governing Principles of Our Approach

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 are also identified. This would lead to the identification of regions along the coastline where the potential for the expansion of existing port exists. The various activities involved in the port led developments are charted in **Figure 1.3**.

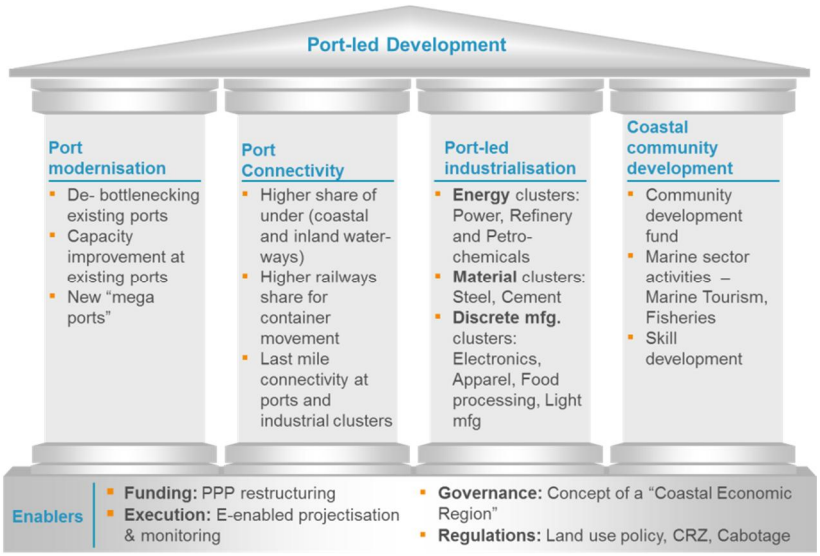


Figure 1.3 Port Led Developments

As part of the assignment, we are 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 would 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 Visakhapatnam Port 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 : Details of Ongoing & Planned Developments
Section 5 : Performance, Options for Debottlenecking & Capacity Assessment
Section 6 : Traffic Projections
Section 7 : Capacity Augmentation Requirements
Section 8 : Rail and Road - Internal Network and External Connectivity
Section 9 : Scope for Future Capacity Expansion
Section 10 : Shelf of New Projects and Phasing

2.0 THE PORT AND SITE CONDITIONS

2.1 Visakhapatnam Port as at Present

2.1.1 Location Plan and Harbour Details

The location of the port is shown in the **Figure 2.1**.

Figure 2.1 Location of Visakhaptnam Port

Port of Visakhapatnam is one of the leading major ports of India and is located on the east coast midway between Kolkata and Chennai. The Port is located at Latitude 17° 41' N and Longitude 83° 18' E. The time zone is GMT +5:30 hr.

The Port has two components viz., Inner harbour and an Outer harbour. The Outer Harbour is accessed through an approach channel which is 3.1km long; 200m wide and 20m deep. This is up to the Dolphin's nose light house. This leads to a turning circle of 610m diameter. The Inner Harbour is accessed through an extension of this approach channel which is 1.1km long (from Dolphin's nose light house); the width varies from a minimum of 111m to 168m and is 16.1m deep. This leads to a turning circle of 440 m diameter.

The Inner Harbour is a natural harbour with a turning basin and three navigable arms – northern, western and north-western. The total water spread is about 100 hectares. It accommodates 18 berths. It can accommodate fully loaded Panamax vessels of 230m LOA; 32.5m beam and 14.5m draft.

The Outer Harbour is an artificial harbour with a total water spread area of 200 hectares. Its basin is protected by two breakwaters: 1070m long eastern breakwater and 1540m long southern breakwater. It accommodates 6 berths. It can accommodate fully loaded cape size vessels of 320 m LOA; 50 m beam and 18.0m draft.

The port has a vast hinterland and is surrounded by many major industries such as M/s RINL, SAIL, NALCO, NMDC, MMTC, Hindustan Shipyard, Coromandel Fertilizers, Hindustan Zinc Ltd., RCL, HPCL, etc. within the vicinity of port. The Headquarters of Eastern Naval Command also exists adjacent to Visakhapatnam port. The inner harbour channel is shared by the Port and Eastern Naval Command for movement of vessels.

The relative locations of VPT inner harbour, VPT outer harbour, Eastern Naval Command and Hindustan Shipyard are shown in the satellite picture hereunder in **Figure 2.2**.

Figure 2.2 Relative Locations of VPT Inner Harbour, VPT Outer Harbour, Eastern Naval Command and Hindustan Shipyard

2.1.2 Road Network and Connectivity

The total road network within the Port limits is about 85 km out which 23.5 km is available within the operational area connecting the entire stacking areas for free movement of vehicles. A 12.47 km port connectivity road was implemented jointly by the Port and NHAI through a SPV "Visakhapatnam Port Road Limited". This flyover cum road project facilitates smooth movement of cargo traffic between Port and National Highway-5.

The port is well connected by a 4 lane road to NH-5 (Chennai-Kolkata) with access to Tamil Nadu and Odisha/West Bengal. The distance to Chennai is 790 km, while that to Bhubaneswar is 442 km.

2.1.3 Rail Network and Connectivity

The port is having an internal rail network connecting the berths handling bulk and container cargo. This railway network operated by the port is the largest amongst Indian Ports with over 200km rail length and over 30 Sidings. The Port is equipped with 15 WDS-6 locos of 1400 HP and 3 WDG-3 locos of 3100 HP capacity for carrying out marshalling operations.

The Port is also well connected with the Indian railways network directly through the Waltair Railway Marshalling Yard to Chennai-Howrah Main line of East Coast. This line branches off at Kothavlasa leading to Bailadilla Iron Ore mines in Chhattisgarh. This main line goes further up North passing through coastal Orissa, West Bengal up to Assam facilitating movement of imported fertilizers petroleum products etc. to various stations.

2.2 Site Conditions

2.2.1 Meteorological Conditions

2.2.1.1 Climate

The Climate of this region is governed by its location in the tropics and the monsoons. The climate of the South East coast of Bay of Bengal is characterized by the recurring seasonal monsoons, which divide the year into four seasons as follows:

- The pre-monsoon period is from March to May, usually the beginning of the hottest period of the year, when the winds shift towards south-westerly direction.
- South-west monsoon period is from the middle of May up to the middle of October with predominantly south-Westerly winds, cloudy weather and frequent rains.
- The post-monsoon period is from the middle of October to the end of November with variable weather and witnesses cyclones with relatively greater frequency.
- The North-east monsoon period is from the end of November to the end of February with predominantly north-easterly winds. Cyclones are frequent during November.
- The climatic division is, of course, not absolute and there is some overlap between seasons.

2.2.1.2 Temperature

There is a seasonal variation in temperature. May and June are hotter months whereas December and January are colder months.

The annual mean maximum temperature is 30°C and the annual mean minimum temperature is 24.3°C.

The highest temperature so far recorded was 44.4° C in the month of June in 1923 and the lowest temperature was 12.8° C in the month of January in 1958.

2.2.1.3 Relative Humidity

The humidity is comparatively high and fairly uniform throughout the year. The mean daily relative humidity over a year is about 76% at 0800 hrs and 72% at 1700 hrs. The highest recorded value is 81% and lowest recorded value is 64%.

2.2.1.4 Rainfall

The rainy season persists mainly during the south-west monsoon and also during north-east monsoon. September and October are the wettest months of the year with an average rainfall of 167.3 mm and 259.3 mm respectively. The average annual rainfall is about 973.6 mm. The average number of rainy days per year is 50.

2.2.1.5 Visibility

Visibility is good throughout the year as fog is infrequent at sea in all seasons. Reduction in visibility is mostly due to heavy rainfall during the south-west monsoon. The highest monthly average duration recorded of fog is 0.1 day in some months from December to May.

2.2.1.6 Wind

The predominant direction of wind is south-west or north-east depending on the monsoon season. The south-west monsoon winds are relatively stronger than the north-east winds. The maximum wind speed recorded is 110 KMPH in May 1950 from east-north-east. It is, however, known that wind speed as high as 150 KMPH may be experienced occasionally during cyclones in the Bay of Bengal.

The wind rose indicating the wind climate for the four quarters of the year (viz. January-March; April-June; July-September & October-December.) is presented hereunder.

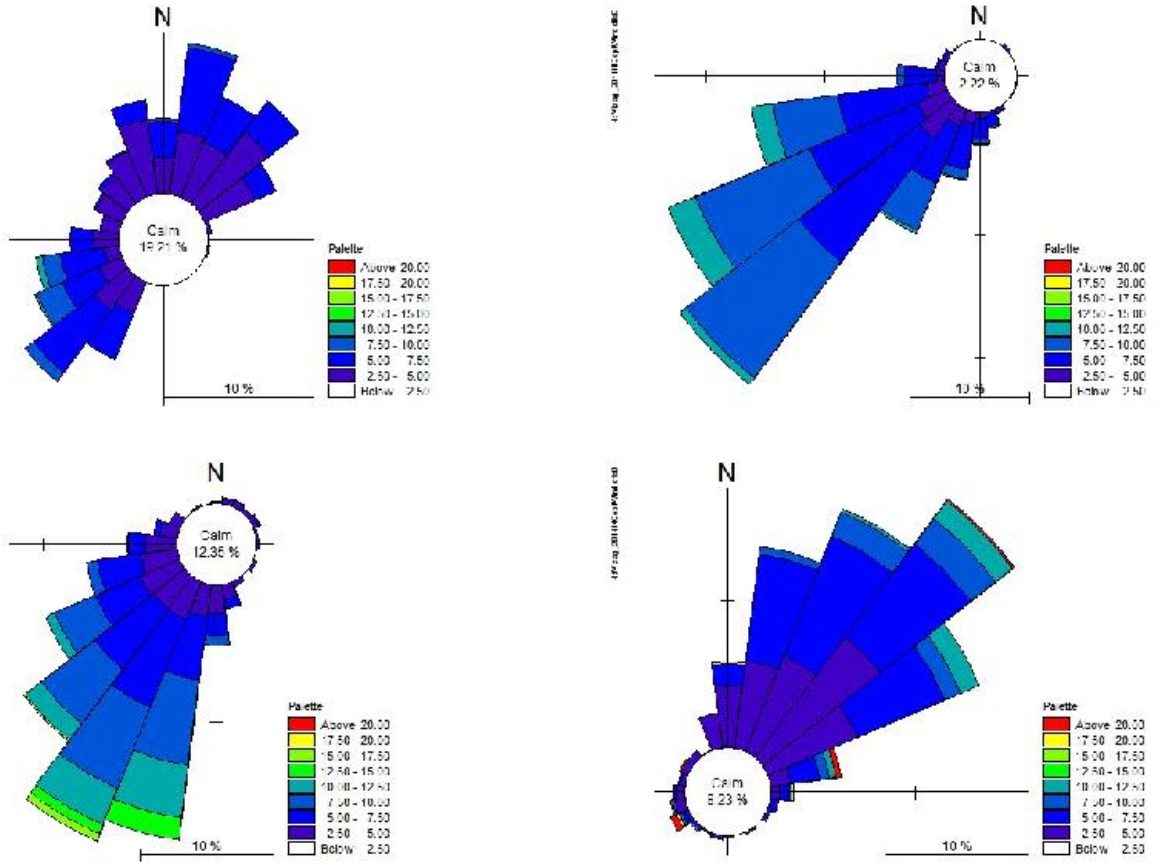


Figure 2.3 Wind Rose Diagram

2.2.1.7 Cyclones

Cyclones are common to occur in the Bay of Bengal.

Average number of cyclones occurring at Visakhapatnam is 3 to 4 per year. Cyclonic storms and depressions occur with greatest frequency is August, October and November generally.

2.2.2 Oceanographic Data

2.2.2.1 Tidal Data

The tides at Visakhapatnam are semi-diurnal with tidal levels, relative to the Chart Datum (CD), as follows:

Highest high water recorded (Nov. 2007)	: +2.38 m
Mean high water level spring	: +2.06 m
Mean high water level neap	: +1.50 m
Mean sea level	: +0.80 m
Mean low water level spring	: +0.16 m
Mean low water level neap	: +0.50 m
Chart datum (CD)	: 0.00 m
Lowest low water recorded (March 2007)	: (-) 0.39 m

During the 'tsunami' occurred in December 2004 the max. & min. levels of sea water have varied between a maximum of +3.0 m to a minimum of –1.0 m CD.

2.2.2.2 Waves

The wave rose indicating the wave direction and period for the four quarters of the year (viz. January-March; April-June; July-September & October-December.) is presented hereunder. From this data, it is observed that the external waves of H_s = 0 to 1 m occur for about 150 days and H_s > 2 m occur for about 15 days in a year. From the wave rose diagram it is seen that the predominant wave direction will be form SSE to SE during south-west monsoon period from May to August. This will change to ESE direction during September and October. During the months of November to January, the predominant wave direction would be from ESE quadrant. The months of December to April are relatively calm except for occurrence of occasional cyclones.

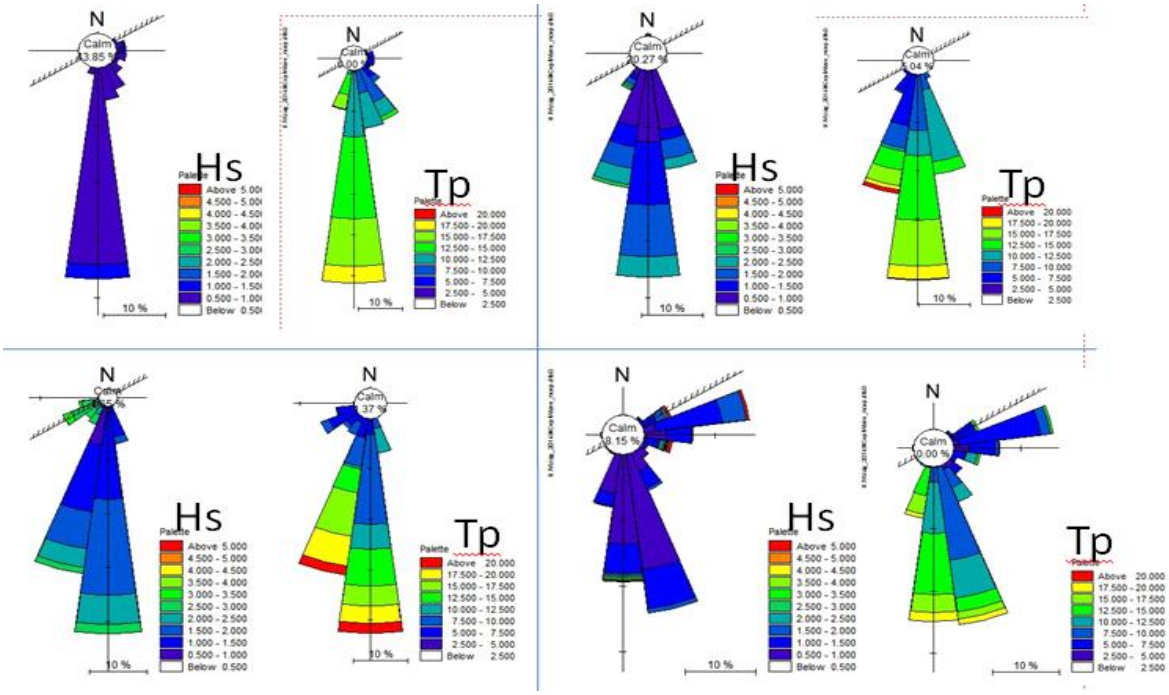


Figure 2.4 Wave Rose Indicating the Wave Direction and Period for the Four Quarters of the Year

2.2.2.3 Currents

Currents in the Bay of Bengal are seasonal and are mainly due to south-west and north-east monsoons. From February to June offshore currents flow towards the north-east and from August to December towards south-west at velocities ranging from 0.5 to 1 knot. In the vicinity of Visakhapatnam coast currents are neither related to wind nor to tides in any appreciable way. Towards north, the coast bears about 50° to the east. Hence if a wave orthogonal bearing 130° to the east the wave crest will be parallel to the coast and there will be no steady longshore current. This concludes that the determining factor for the direction of current is the direction of the predominant wave.

2.2.2.4 Littoral Drift

Visakhapatnam is situated on the east coast and is subject to intense littoral drift moving from south to north. Interception of the littoral drift by any artificial barrier causes up-coast accretion and shoaling and compensating erosion along the down-coast because of mass discontinuity of the natural littoral drift. There is a strong littoral drift of sand northwards from March to September. Maximum amount of drift takes place from May to August when the waves are the highest. It is believed that the drift is largely confined to a zone within 200 m of the shore and is within the 6 m contour. The quantum of annual maintenance dredging carried out in 2009-2010 was 4.46 lakh cubic meters.

3.0 DETAILS OF EXISTING FACILITIES

The VPT Port has three distinct basins:

- Inner Harbour has a water spread of 100 ha and it comprises of an entrance channel of 1.62 km in length and 14.5 m draft, a turning basin and three navigable arms – northern, western and north-western accommodating a total of 18 berths.
- Outer Harbour is a protected tranquil basin of 200 ha encompassed by set of three breakwaters. It has 6 berths and draft of 18.0 m.
- Within outer harbour an area of 24 ha is designated as Fisheries harbour.

3.1 Inner Harbour

In the Inner Harbour, the northern arm is the main commercial arm of the Port and accommodates 15 multi-commodity berths (including BOT berths). The north-western arm is fully utilized by the Eastern Naval Command. A part of the western arm is used by the Hindustan Shipyard Limited and part by the Port where three captive berths (two oil berths and one fertilizer berth) are located. Thus, the total number of berths in Inner Harbour is 18 including BOT berths.

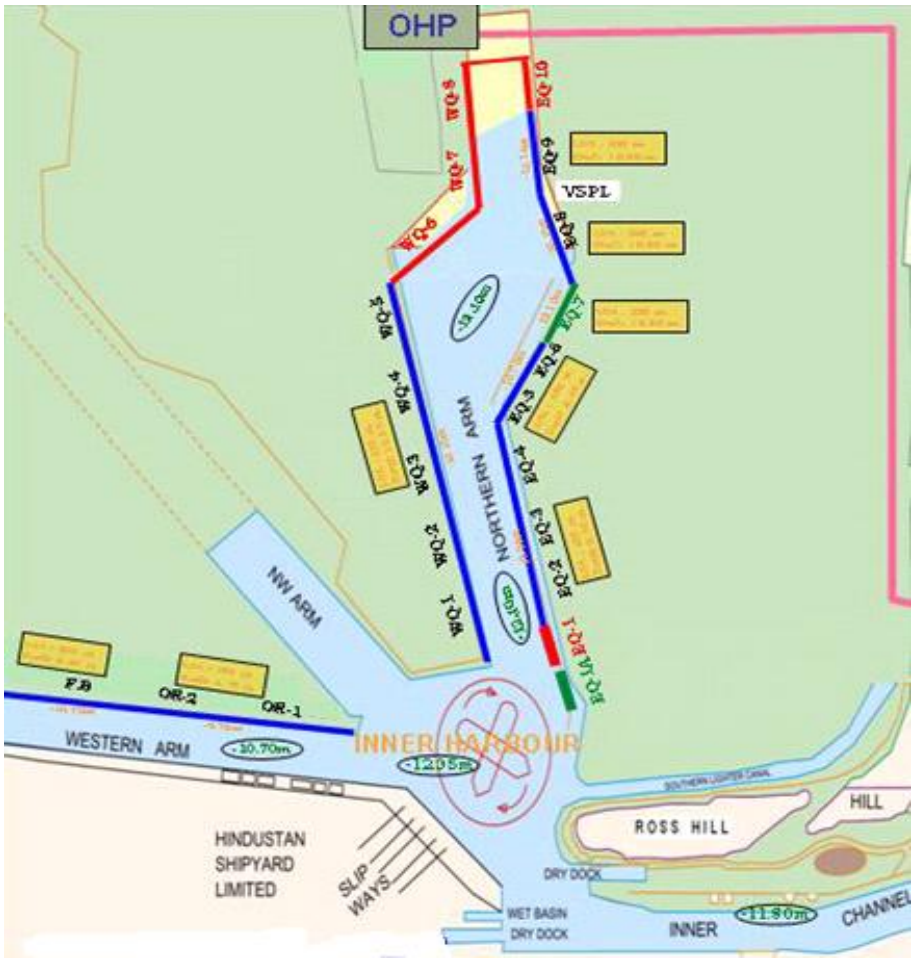


Figure 3.1 Inner Harbour

3.1.1 East Quay

There are 10 berths on the east quay viz. EQ 1 to EQ 10. These are designed to handle partially loaded Panamax vessels. The brief details of the berths are provided in **Table 3.1**.

Table 3.1 Berths Details of East Quay

Berth No.	Cargo Handled	Length (m)	Design Draft (m)
EQ-1	Steam Coal	280	14.0
EQ-2	PET coke, other dry bulk including Iron ore, food grains, containers, steel products etc.	100	10.6
EQ-3		167	10.6
EQ-4		231	10.6
EQ-5		167	11.0
EQ-6	Anthracite coal, BF slag's, steel, Thermal coal, fertilizers, Phosphoric Acid, fertilizers raw materials	183	11.0
EQ-7	Finished Fertilizers including Muriate of Potash	255	12.5
EQ-8	Urea, Magnetite, fertilizers raw materials	255	14.5
EQ-9	Steel, Gen. Cargo, steam coal, lam coke, feldspar and granite	255	14.5
EQ-10	Caustic Soda, Bio diesel, edible oils & chemicals	-189	14.0

In recent times, to meet the demands of trade, the port has taken action for phase wise deepening of Inner Harbour berths to cater to fully laden Panamax vessels and also refurbishing the berthing facilities to handle such vessels.

In line with this, the Port has awarded a concession to M/s Adani Vizag Coal Terminal Ltd. (a SPV formed by the consortium of Mundra Port & SEZ Ltd and Adani Enterprises) for developing EQ 1 berth to handle fully loaded Panamax vessels up to 80,000 dwt. The project involved dismantling the old EQ1 berth of 167 m and part of EQ 2 berth and constructing a new EQ 1 berth of 280 m long and 16.10 m deep. This will handle steam coal through a complete mechanised system with 2x100 T Harbour Mobile Cranes; 1 stacker; 1 reclaimer; 1 stacker-cum-reclaimer; 1 wagon loader and an interconnecting conveyor system. This new berth is provided with a stockyard of 101,200 m2 area. This is expected to handle a minimum 6.41 MTPA. The concession agreement was signed in August, 2012 and the project was completed in September, 2014. The commercial operations commenced during October, 2014.

The remaining portions of EQ 2, EQ 3 and EQ4 remain as old monolithic type construction with a draft of 10.06 m.

EQ 5 & EQ 6 also remains as the old berth.

EQ 7 has been given on license to M/s ABG and the project is presently on hold. The details are covered in a subsequent section.

EQ 8 & EQ 9 berths have been given on license to M/s Vizag Seaport Pvt. Ltd. for handling coal, fertilisers, limestone, other dry bulk, breakbulk and non-hazardous liquid cargo. They have reconstructed the berths with diaphragm wall and a system of vertical and raker piles. The berths have been designed for a length of 255 m each and with 14.5 m water depth. They have been assigned a combined stockyard of 90,000 m^2 area. These berths are mechanised with grab unloaders, conveyor system, stacker and reclaimer and rail loading facility.

3.1.2 Development of New Berth EQ -10

The Port has taken up the development of Eastern Quay-10 (EQ-10) berth in the Northern arm for handling Liquid Cargo (excluding POL products) with a throughput of 1.85 MTPA on Design, Build, Finance, Operate, and Transfer (DBFOT) basis.

The License to develop EQ-10 was awarded to a consortium of M/s IMC Limited who formed a SPV named M/s AVR Infra Pvt Ltd (AVRIPL) for this purpose. The concession agreement for a thirty-year concession period was signed during August 2010.

The berth will have a length of 180.9 m and will be able to cater to vessels up to 14 m draft. 60 m of berth length was already constructed by M/s. Vizag Sea Port Ltd., as shore protection to their berth EQ-9 and this will become part EQ-10 berth. The concessionaire will be building additional 120.9 m of berth length and another 50 m of return end to retain the earth. In addition an area of about 30,000 m^2 of land at North of S-4 conveyor for development of receipt, storage and dispatch facilities and about 3,200 m^2 of land for laying pipelines are leased to the Concessionaire.

For storing the products, 6 numbers of MS vertical cylindrical storage tanks each of 14 m diameter and 20 m height are constructed. These are connected to the berth by 1x12”+2x10” dock lines. The ship-shore transfer will be effected through 8” or 6” SS flexible hoses with a discharge rate of 300 TPH.

In addition a 2” fresh water line and a 1.5” nitrogen purging line are provided. Pig launchers & Pig receivers are also provided for clearing purposes.

The location of the berth with the backup area is shown in the satellite picture in **Figure 3.2**.

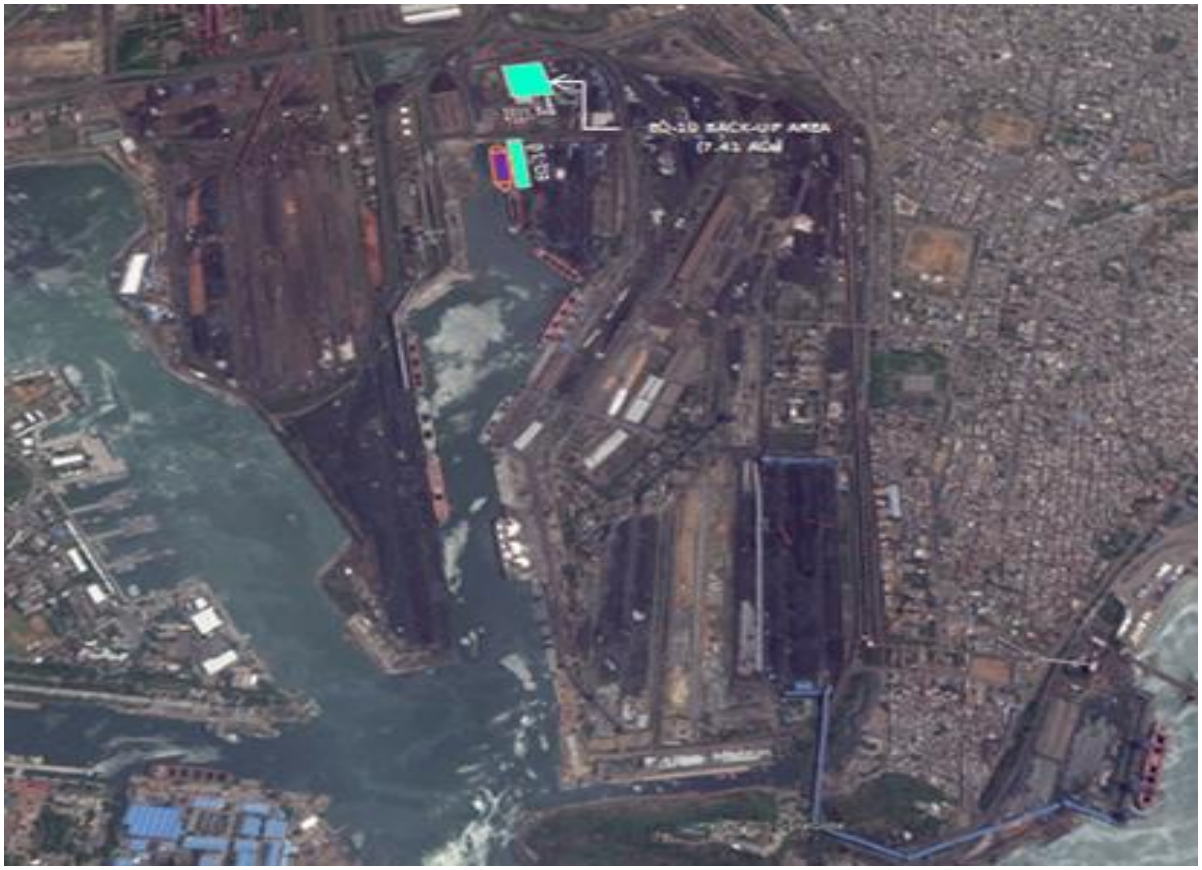


Figure 3.2 Berth with the Backup Area

3.1.3 West Quay

There are 6 berths on the west quay viz. WQ 1 to WQ 6. These were designed to handle partially loaded Panamax vessels (**Table 3.2**).

Table 3.2 Berths Details of West Quay

Berth No.	Cargo Handled	Length (m)	Design Draft (m)
WQ -1	Iron Ore	212.0	13.0
WQ -2	Coking Coal & iron Ore, Granite & Thermal coal	226.7	13.0
WQ -3	Coking coal, steel, thermal coal, soya, PET coke & iron ore	201.12	13.0
WQ -4	Iron ore, Iron ore pellets, steam coal, limestone & steel	243.0	11.0
WQ -5	Alumina, Iron ore, granite & Caustic soda	241.7	11.0
WQ -6	CP coke , LAM coke, steel and granite	255.0	14.0

WQ1, WQ 2 & WQ 3 berths were strengthened to cater to 12.5 m draft vessels. WQ 4 and WQ 5 berths are old.

WQ 6 berth has been given on license to a consortium of M/s. ABG Infralogistics Limited on DBFOT basis who formed a SPV named M/s West Quay Multiport Pvt. Ltd. (WQMPL) for this purpose. This berth will handle LAM coke, CP coke, steel and granite blocks with capacity of 2.08 MTPA. They have reconstructed the berths with diaphragm wall and a system of vertical and raker piles. The berths have been designed for a length of 255 m and with 16 m water depth. They have been assigned a combined stockyard of 14.67 acres area with 2.47 acres behind the berth and 12.2 acres north of VPT flyover. This berth is semi-mechanised with 2 no. 60 T cranes and front end loaders.

3.1.4 Western Arm

The western arm accommodates on the northern side a captive berth of M/s. Coromandal Fertilisers for handling fertilisers and two liquid bulk berths OR 1 & OR 2. These two berths are connected to the refinery and marketing terminals of oil companies. The details of these berths are given in **Table 3.3**.

Table 3.3 Berths Details of Western Arm

Berth No.	Cargo Handled	Length (m)	Design Draft (m)
FB	Fertilizers	173.13	10.06
OR-1	POL	183	10.06
OR-2	POL	183	10.06

3.2 Outer Harbour

In the Outer Harbour, there are two finger type Ore Jetties, OB-1 and OB-2, one Off-shore Oil Tanker Terminal (OSTT), Vizag General cum Bulk Cargo Berth (VGCB), coal terminal operated by Vedanta, an exclusive Jetty for LPG, one Container Terminal operated by M/s Visakha Container Terminal Private Limited. **Table 3.4** provides details of these berths.

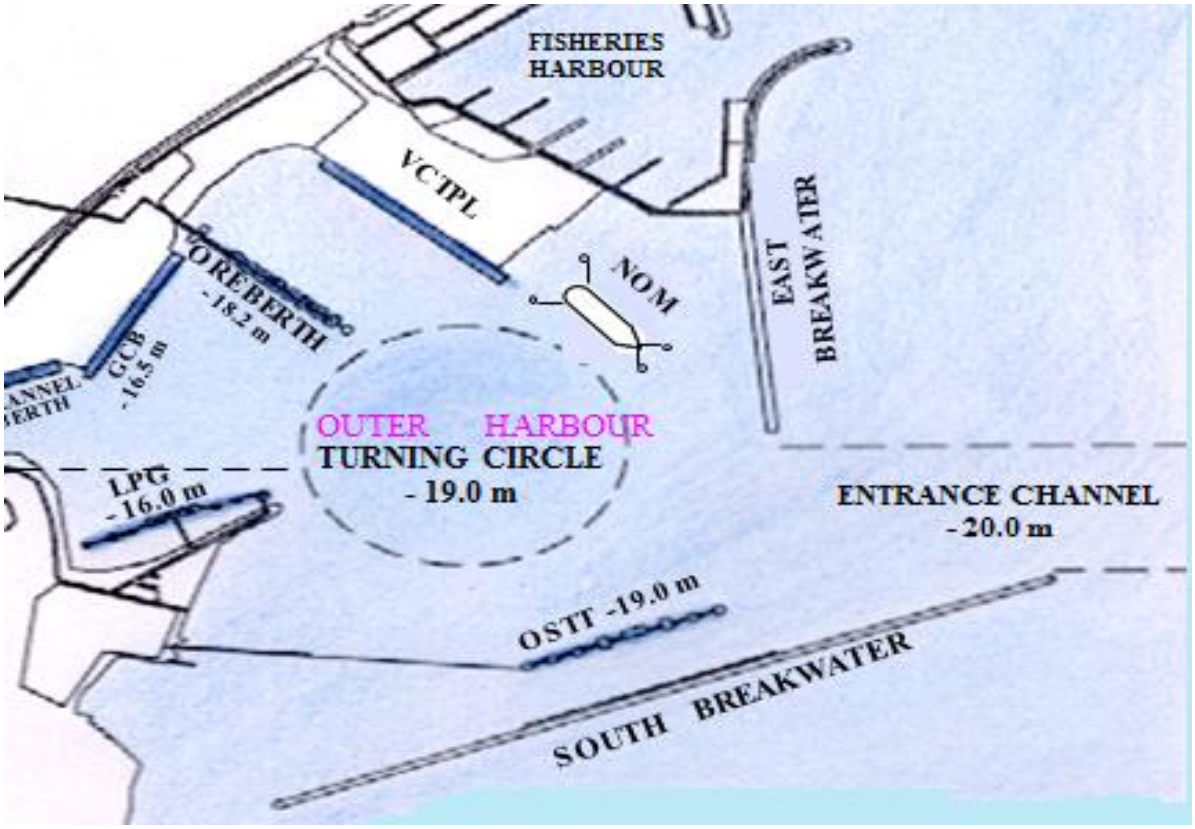


Figure 3.3 Outer Harbour

Table 3.4 Berths Details of Outer Harbour

Berth No.	Cargo Handled	Length (m)	Design Draft (m)
VCTPL	Container	451.0	14.5
LPG Jetty	LPG	370.9	14.0
OSTT	Oil	408.0	17.0
OB1	Iron Ore	270.0	16.5
OB2	Iron Ore	270.0	16.5
SPM	Crude Oil	---	---
VGCB	Coking Coal & Steam Coal	356.0	18.1

The satellite picture of Container berth, Ore berth and the GC berth is presented as **Figure 3.4**.

Figure 3.4 Container Berth, Ore Berth and the GC Berth

3.2.1 Container Berth

The container terminal is being operated by M/s. Visakha Container Terminal Pvt. Ltd.; the licensee has been awarded this project through BOT Basis. This terminal has a total berth length of 451 m with a depth of 16.5 m and capable of accommodating up to 100,000 dwt vessels. The terminal is equipped with 4 Post Panamax RMQCS, 6 Rubber-tyred Gantry cranes and 6 Reach stackers. The terminal has 2,500 TEU ground slots and can handle up to 4.13 lakh TEUs per annum. There are two on dock railway sidings for evacuating containers through rail.

3.2.2 Ore Berth

The ore berth is located on the southern side of the container terminal (**Figure 3.5**). It has been designed as a finger jetty capable of accommodating initially 150,000 dwt and ultimately 200,000 DWT ore carriers. Two carriers can be berthed one on each side .Presently the jetty has a water depth of 17.50 m. The overall length of the berth between centre lines of extreme mooring dolphins is 371 m with permissible vessel length of 270m. The berth is supported by a fully mechanised system backed up by a stockyard located north of inner harbour dock arms. The berth is served by a single 8000 TPH capacity ship loader. The stockyard has a capacity of 120,000 T and is equipped with 3 wagon tipplers (2×100 T +1×120 T); 2 stackers each of 2700 TPH; 3 reclaimers each of 4000 TPH and a closed conveyor system linking the yard to the berth.

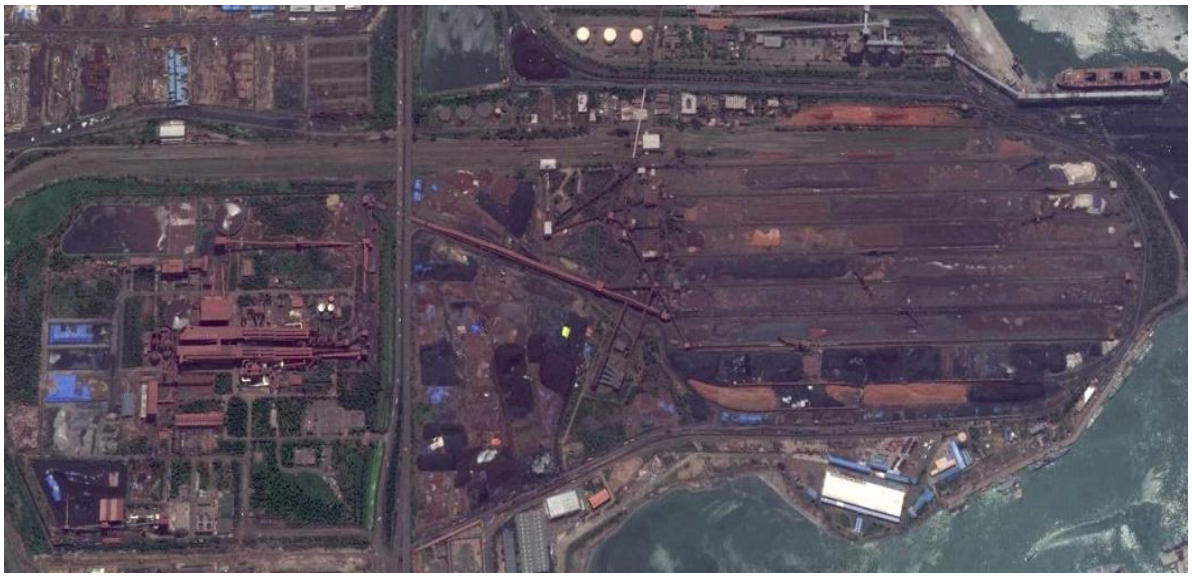


Figure 3.5 Satellite Picture of the Stockyard

3.2.3 Vizag General Cargo Berth

The old general cargo berth, capable of handling 100,000 DWT vessels, was given on license to M/s. Vizag General Cargo Berth (VGCB) Pvt Ltd. on PPP mode during 2010 for upgrading it to handle 200,000 dwt coal carriers (**Figure 3.6**). It was proposed to handle coking coal and steam coal imports through this berth. The upgradation included strengthening the berth to take the loads of a 200,000 dwt vessel. The old 22.2 m wide deck was further extended by 21 m with crane rails. The structural integrity of the old berth was also critically examined as part of this upgradation. The licensee was allotted a space of 129,930 m^2 in the eastern yard for locating the stockyard. The material handling system included 3 ship unloaders each of 5000 TPH capacity; 1 stacker of 3000 TPH capacity; 1 reclaimer of 3500 TPH capacity; 1 wagon loader of 3500 TPH capacity and interconnecting conveyor system. The upgraded berth was commissioned in April 2013.

Figure 3.6 Satellite Image of the entire VGCB

3.2.4 Offshore Tanker Terminal

The offshore tanker terminal is located parallel to the south breakwater (**Figure 3.7**). It is made up of concrete caissons for mooring/berthing dolphins and for service platform. The overall length is 408 m and is designed to handle Suezmax tankers up to 150,000 DWT. This terminal is connected to the HPCL refinery through a 36" diameter pipeline. This pipeline is partially submarine and partially on-land over a trestle. This terminal was originally provided to handle the crude oil imports and later facilities were supplemented to handle POL products also. However, this berth is out of commission as it suffered considerable damage due to the Hudhud cyclone which hit Visakhapatnam during October, 2014.

Figure 3.7 The Offshore Tanker Terminal and the Pipeline Trestle

3.2.5 LPG Berth

The LPG berth is located parallel to breakwater. This berth is designed to handle Panamax vessels up to 80,000 dwt. The layout is of isolated berthing and dolphins with a central service platform. This berth handles POL products also along with LPG. The berth is connected to the adjacent LPG cavern of M/s South Asia LPG Pvt Ltd. (a joint venture of HPCL & Total) and also to the tankage of IOC and Eastern India Petroleum Ltd., a private company (**Figure 3.8**).

Figure 3.8 LPG Berth and the Terminal of South Asia LPG Pvt. Ltd.

3.3 Offshore Single Buoy Mooring

HPCL have set up a single buoy mooring at about 4.5 km offshore for handling Very Large Crude Carriers up to 330,000 DWT for handling the crude oil imports for their refinery. This has been constructed with an understanding and cooperation of the port. This is connected to first to the strategic crude oil storage cavern near Lova Garden and from there linked to their refinery. The submarine pipeline is of 48" diameter.

This has been constructed with an understanding and cooperation of the port. The port will provide the pullback tugs whenever a tanker is discharging at the SBM. A satellite picture of the SBM along with a tanker is shown in the **Figure 3.9** and the turret buoy with floating hoses is shown in the **Figure 3.10** hereunder.

Figure 3.9 Relative Location of VPT Eastern Breakwater and the SBM

Figure 3.10 Turret Buoy with Floating Hoses

4.0 DETAILS OF ONGOING & PLANNED DEVELOPMENTS

4.1 General

In recent times, to meet the growing traffic demands, Visakhapatnam Port Trust has initiated action for creating additional terminal facilities. The expansion projects, which are awarded and are currently ongoing consists of development of three new berths, i.e., EQ-1A, EQ-10 and extension of existing container terminal. All the three berths are developed under PPP mode. The other ongoing projects under PPP mode are the Mechanization of existing EQ-7 berth to handle finished fertilizers and the Mechanization of existing OHC and Ore-berths OB-1 & OB-2 to handle Iron-ore. Another project that is planned with Internal Resources of the VPT to handle Manganese Ore, Bauxite, Gypsum, limestone, etc. This project involves development of two Berths WQ-7 and WQ-8 (renamed as WQ-North), with 280 m length each.

The expansion proposals in the pipeline are conversion of the existing Berths EQ-2, EQ-3, EQ-4 and part of EQ-5 into two Berths of 280 m length each under PPP mode.

Projects Awarded and Currently Ongoing are detailed hereunder.

4.1.1 Development of New Berth EQ-1A

The Port Authority has decided to develop Eastern Quay-1A (EQ-1A) berth on south side of EQ-1 berth for handling thermal coal and steam coal in the inner harbour on Design, Build, Finance, Operate, and Transfer (DBFOT) basis.

The License was awarded to a consortium of M/s SEW Infrastructure Ltd. who formed a SPV named “M/s SEW Vizag Coal Terminal Pvt Ltd” (SVCTPL) for this purpose. The Concession Agreement for a thirty-year concession period was signed during February 2012.

The berth has been designed for handling fully loaded Panamax vessels of 80,000 DWT with a draft of 14.0 m with a dredge depth of (-) 16.1 m. The total length of the berth is 280 m and the berth is divided into two portions based on the type of construction i.e. land based and marine based.

The berth will be fully mechanised with the following material handling system:

- 2 ship loaders each of 1500 TPH capacity
- 1 stacker of 1500 TPH capacity
- 1 reclaimer of 1500 TPH capacity
- 1 stacker cum reclaimer of 1500 TPH capacity
- 1 twin wagon tippler of 27 tips/hr capacity
- Interconnecting conveyor system of 3000 TPH capacity
- 2 each of pay loaders and dozers

An area of 1,01,200 m^2 has been allotted for stacking the coal at the east dumps from where the cargo will be handled through rakes.

The berth is planned to have a capacity of about 7.36 MTPA.

The location of the berth with the backup stackyard area is shown in the satellite picture in **Figure 4.1** hereunder.

Figure 4.1 Berth with the Backup Stackyard Area

4.1.2 Mechanization of Existing Berth EQ - 7 to Handle Finished Fertilizers

At present finished fertilizers are handled at EQ berths with the help of wharf cranes. Keeping in view the increased demand for fertilizers and the need to enhance efficiency, the Port has decided to undertake mechanisation of Eastern Quay-7 (EQ-7) berth in the Northern arm for handling finished fertilizers with a throughput of 5.21 MTPA on Design, Build, Finance, Operate, and Transfer (DBFOT) basis.

The License to develop EQ-7 was awarded to a consortium of M/s ABG Infra logistics Limited, who formed a SPV named “M/s Vizag Agri Port Pvt. Ltd” for this purpose. The concession agreement for a thirty-year concession period was signed during May 2012.

The length of EQ – 7 berth is 255 m which can accommodate Panamax vessels of 233 m long and 12.5 m draft finished fertilizer, Murate of Phosphate (MOP) and general cargo are expected to be handled.

The concessionaire has been allotted a land measuring 225,267 m^2 for silos, storage sheds, railway loading facility and truck parking area.

The material handling system includes:

- Ship – shore transfer through gantry type ship unloaders with 35 T capacity and with a discharge rate of 800 TPH
- Conveyor system for 3.08 km length with 1200 mm wide belts
- 2 no. scraper reclaimers
- 8 no. front end loaders
- 12,000 T capacity silos with automatic bagging plant of 8,400 TPD capacity
- 28,000T storage shed with railway loading platform for loading two rakes simultaneously.
- Truck parking area.

The location of the berth with the backup area is shown in the satellite picture in **Figure 4.2** hereunder.

Figure 4.2 Location of the Berth with the Backup Area

4.1.3 New Container Terminal Adjacent to the Existing Container Terminal

Keeping in view the anticipated increase in container traffic and also to maintain additional potential, the Port has decided to undertake development of a new berth as an extension to the existing container berth to handle container cargo on Design, Build, Finance, Operate, and Transfer (DBFOT) basis. The new terminal is expected to have a capacity of 0.54 MTEU.

The License to develop the Container terminal extension was awarded to the existing Operator M/s. Visakha Container Terminal Pvt Ltd. (VCTPL). The concession agreement for a thirty-year concession period was signed during Dec 2014.

The new berth will be 395m long and 34m wide, and will be designed for 19 m water depth to accommodate vessels up to 150,000 DWT. However, initially the dredging will be done up to (-) 16.5 m only. The concessionaire has also been allotted 141,000 m^2 area to be reclaimed immediately behind the berth and another 24,570 m^2 behind GCB. For retaining the filling in the backup area, rock bund will be constructed. Heavy duty pavements will be laid for the RTG operating area and loaded container stacking area and light duty pavements for road ways and empty container stacking area. This is expected to accommodate about 2370 TEU ground slots.

The following container handling equipment will be provided:

- 3 no. quayside gantry cranes
- 9 no. Rubber Tyres Gantry cranes
- 5 no. reach stackers
- 1 no. top lift truck
- 24 tractor-trailer units

The location of the berth with the backup area is shown in the satellite picture in **Figure 4.3** hereunder.

Figure 4.3 Location of the Container Terminal

4.1.4 Upgradation of Existing Facility and Creation of New Facility to Handle Iron-Ore

To cater to the future growing traffic needs, the Port has decided to up-gradate the existing facility and to create a new facility for iron ore handling on Design, Build, Finance, Operate and Transfer (DBFOT) basis. With these, the capacity is expected to be enhanced to 23 MTPA.

The License for these was awarded to M/s. ESSAR Ports Ltd. The concession agreement for a thirty-year concession period was signed during May 2013.

The original ore handling complex was developed in 1966 to cater to iron ore loading into vessels of size 35,000 DWT and was upgraded in 1976 for a capacity of 8 MTPA with mechanized handling facilities to handle vessels of 100,000 DWT. Since then the OHC is being constantly upgraded in line with changing requirements of the trade.

Some of the major upgradations are:

i) Addition of 3rd wagon tippler in 1989;
ii) Replacement of old 2000 TPH reclaimer by 4000 TPH reclaimer in 1991;
iii) Replacement of 4000 TPH reclaimer of 1976 in 1996;
iv) Replacement of twin wagon tippler in the year 1992;
v) Replacement 2700 TPH capacity stacker in the year 2003;
vi) Addition of 4000 TPH bucket wheel reclaimer in the year 2000;
vii) Up-gradation of berth to handle 1,50,000 DWT Vessels.

The present project includes the upgradation of the following existing facilities

i) Construction of a mooring dolphin and extension of the ore berth by about 50 meters to accommodate 200,000 DWT vessels
ii) Dredging at the berth to a depth of 21 meters to cater to 200,000 DWT vessels
iii) Strengthening the existing two stockpiles (east & middle) at OHC with a view to increase the stacking capacity
iv) Develop the backup area, water supply area, illumination, firefighting, railway, and road facilities
v) Replacement of existing equipment as listed below:
    - Ship loader 1 × 8000 TPH
    - Reclaimer 2 × 4000 TPH
    - Stackers 2 × 2700 TPH
    - Twin tippler 1 × 1500 TPH
    - Rotary tippler 1 × 1500 TPH
    - Mobile crane 1 × 45 T
vi) Strengthening a part of the existing conveyor system, surge bin and procurement of belts, up-gradation of dust suppression equipment

The creation of new facility at West Quay-1 (WQ-1) berth in Inner harbour includes:

i) Develop stacking area in continuation to the proposed berth to be made available on long-term lease for the concession period of 30 years
ii) Provision of mechanical equipment for unloading iron ore from railway wagons, stacking in the stack yard, and reclaiming the ore with handling equipment comprising 1 x. twin wagon tipplers, side arm charger (handling full rake) with suitable railway tracks, 1 x stacker of 2700 TPH, 1 × reclaimer of 3000 TPH, belt conveyor x 3000 TPH (2.98 Km long),
iii) Provision of one ship loader of 3000 TPH for loading the iron ore into the ships at the berth and other ancillary equipment
iv) Develop back up area, water supply, area illumination, firefighting, railway and road facilities required including development of the land
v) Develop utilities and services such as communication, office accommodation, etc. required for operation of the berth.

The location of the berth with the backup area is shown in the satellite picture in **Figure 4.4** hereunder.

Figure 4.4 Location of the Berth with the Backup Area

4.1.5 Development of Two Numbers of Berths WQ-7 and WQ-8 (Renamed as WQ-North)

To meet the anticipated demand of dry bulk cargo, a proposal to develop two berths in West Quay North has been taken up. The cargo profile includes Manganese Ore (IMP), bauxite, gypsum, BF Slag, Ilmenite sand, Limestone and other bulk cargo. An extent of 1.01 lakh sq. meters has been allotted as storage area. The assessed capacity is 6.39 MT. The port is developing these berths from internal resources. Work was awarded to ITD Cementation India Ltd. during October, 2015.

The location of the project is at the extended northern arm. The proposal is to club the existing WQ 7 berth and the proposed WQ 8 berth to be developed in continuation as a single quay length of 560 m to accommodate two Panamax vessels. The berth shall be designed for an initial dredged depth of 13.5 m below CD and an ultimate depth of 16.1 m below CD. Development of back up area, water supply, area illumination, and fire-fighting, railway and road connectivity are also part of the project. Since the backup area is not sufficient to store cargo, this has to be developed in the process involving demolishing existing structures, filling up the area and ground improvement measures.

The location of the berths with the backup area is shown in the satellite picture in **Figure 4.5** hereunder.

Figure 4.5 Location of the Berth with the Backup Area

4.2 Conversion of Existing Berths EQ-2, EQ-3, EQ-4 and Part of EQ-5 in to Two Numbers of Berths

The Port has undertaken “Development of Multipurpose Terminal by revamping of EQ 2 to EQ 5 berths to cater to 14.0 m draft vessels in Inner Harbour" on Design, Build, Finance, Operate and Transfer (DBFOT) basis. These berths will have throughput increased to 6.0 MTPA.

The existing EQ 2 to EQ 5 berths are of monolithic construction with a draft of 10.06 m are to be replaced by a single multipurpose terminal of 560 m length to cater to fully laden Panamax vessels of 14 m draft. A berth length of 280 m is required for the safe mooring and operation of the design vessel with 230 m length. The remaining length of EQ 2 together with EQ 3 and EQ 4 berths and a portion of EQ 5 berth (about 89m) are proposed to be merged for developing a multipurpose terminal to cater two vessels each of 230m.

Harbour Mobile cranes (HMC) are proposed for ship to shore handling with grab attachments to handle bulk cargo viz. Pet Coke, Other bulk. For handling steel products and containers, the same type of HMC will be adequate to handle these two types of cargos with hook and spreader attachments. For Shore clearance, dumpers and pay loaders are proposed for bulk cargoes, Fork Lift Trucks (FLT) and mobile cranes are proposed for steel cargo and for container handling, Rubber Tyred Gantry (RTG) cranes, tractor trailers and reach stackers are proposed.

The Mechanical Equipment proposed for the terminal are

- 3 no. of 100 T Harbour Mobile cranes
- 5 no. of 25 tons capacity dumpers
- 5 no. of 10 tons capacity pay loaders
- 2 no. of 25 tons FLT v)1 no of 25 tons mobile cranes
- 4 no. of RTGs
- 8 no. of Tractor trailers
- 2 no. of Reach stackers
- Food grain handling Equipment: Ship loaders, conveyor and silos.

The location of the berths and the layout are given in the drawing in **Figure 4.6**.

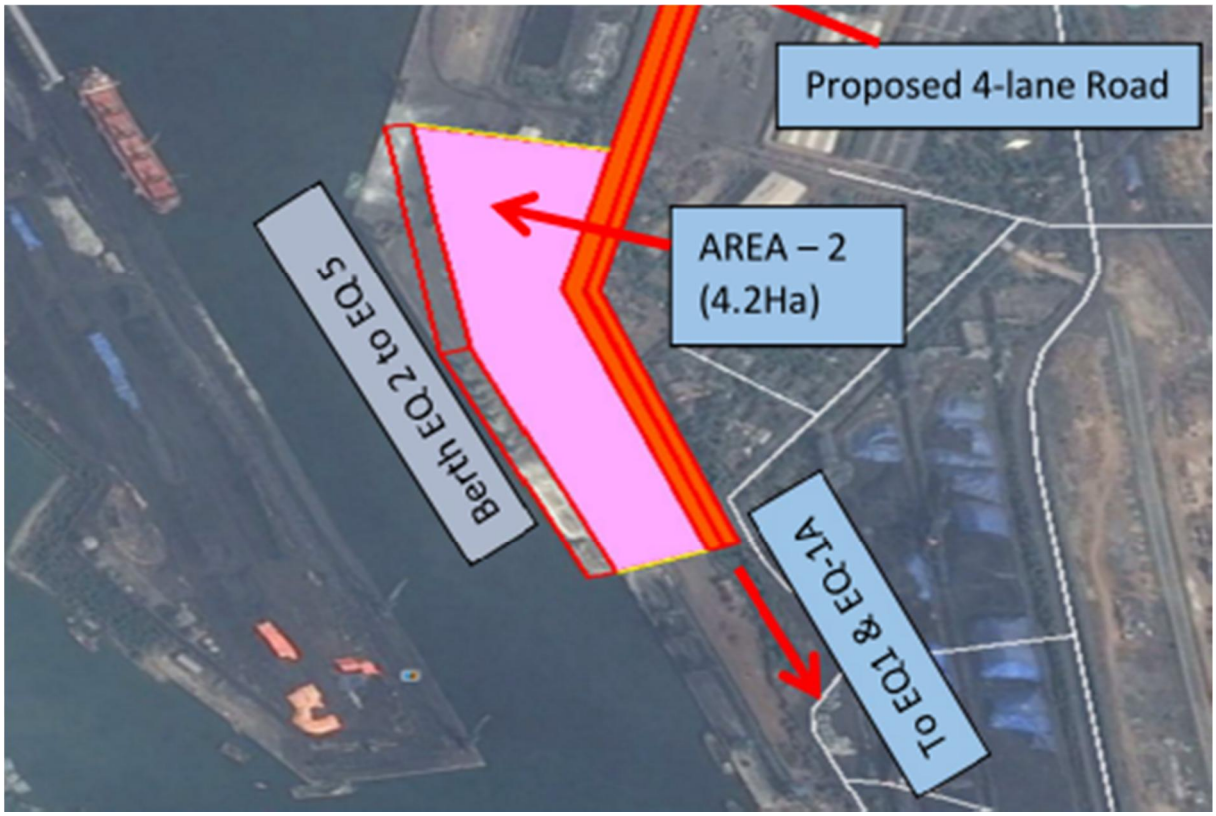


Figure 4.6 Location of the Berths and the Layout

5.0 PERFORMANCE, OPTIONS FOR DEBOTTLENECKING & CAPACITY ASSESSMENT

5.1 General

The total cargo handled through the existing facilities, during the past 5 years is presented in the following **Table 5.1**.

Table 5.1 Cargo Handled During Last 5 Years (MTPA)

S. No.	Commodity	Berth	2014-15	2013-14	2012-13	2011-12	2010-11
Liquid Bulk							
1.	Crude	OSTT, SPM	8.66	7.89	7.89	8.72	8.13
2.	POL	OR 1, OR 2, LPG	4.33	4.25	4.5	4.37	4.49
3.	LPG	LPG	1.12	1.05	1.1	1.01	1.06
4.	Chemicals	EQ3, EQ5, EQ6, EQ7, FB,OR 1, OR 2, WQ1, WQ2	1.72	1.56	1.26	1.46	1.25
Dry Bulk							
5.	Thermal Coal	EQ5, EQ6, EQ7, WQ1, WQ2, WQ3, WQ5	2.78	2.74	2.95	3.19	3.54
6.	Steam Coal	EQ1, EQ4, EQ5, EQ6, EQ7, EQ8, EQ9, WQ1, WQ2, WQ3, WQ4, WQ5, OB1, OB2, VCTPL, VGCB	9.37	3.4	4.31	4.04	2.61
7.	Coking Coal	EQ3, EQ5, EQ7, EQ8, EQ9, WQ1, WQ2, WQ3, WQ4, WQ5, OB1, OB2, VCTPL, VGCB	6.07	6.93	6.8	6.87	7.92
8.	Iron-ore	EQ1, EQ2, EQ3, EQ4, EQ5, EQ6, EQ7, EQ8, EQ9, WQ1, WQ2, WQ3, WQ4, WQ5, OB1, OB2, VCTPL, VGCB	8.37	13.03	12.57	16.24	19.35
9.	Fertilisers	EQ-1, EQ-3, EQ-4, EQ-5, EQ-6,EQ-7, EQ-9, FB, WQ-1, WQ-2, WQ-3, WQ-4, WQ-5, OB1, OB2, VCTPL	2.37	2.43	1.99	0.002	0.002
10.	Alumina	EQ3, EQ4, EQ5, EQ6, EQ7, WQ5	1.29	1.49	1.23	0.97	0.96
11.	Manganese Ore	EQ1, EQ3, EQ4, EQ5, EQ6, EQ7,EQ8, EQ9, WQ1, WQ2, WQ3, WQ4, WQ5, OB1, VCTPL, VGCB	1.34	0.98	1.09	0.80	0.94
12.	**Containers**	EQ2, EQ3, VCTPL	4.37	4.92	4.55	4.21	2.57
13.	**Break Bulk**	EQ1, EQ2, EQ3, EQ4, EQ5,EQ6, EQ7, EQ8, EQ9,WQ1, WQ2, WQ3, WQ4, WQ5, OB1, OB2, VCTPL	1.68	1.64	1.27	1.39	1.06

5.2 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 Visakhapatnam Port is given in the **Appendix 1**. The key observations are as follows:

The 3 main cargos handled at VPT include coal, POL and iron ore. Competition is driving volume pressure across all 3 commodities. Hence, BCG has focused on demand creation and generating additional revenues from existing operations and cargo demand through improving overall port throughput.

They have dwelt mostly on the performance of VGCB berth under privatised operation. According to them, VGCB is operating at below par capacity. As against their stipulated capacity of 10 MTPA, they handled only 7 million tonnes during 2014-15. One of the main reasons for the low performance was the lack of adequate rakes for cargo evacuation. While they needed to evacuate through 7 to 8 rakes per day, they were able to operate only 4 rakes per day. According to them, the lack of adequate rakes is due to the delay in implementation of electrification and doubling of Raipur – Vizianagaram line which is expected to be completed by end 2018. This line connecting to Chhattisgarh, Madhya Pradesh and Western Odisha is popularised by major steel plants in India and remains the key hinterland driving coal cargo volumes through VPT.

The average inventory storage was assumed to be 10 days. However, due to the slow evacuation the actual inventory storage has doubled and in some cases trebled. As a result, instead of operating at a capacity of >80,000 MT/day, the berth is only able to operate at ~30,000 – 35,000 MT/day for full vessel. In order to overcome this problem, they have suggested allotment of additional land to them to improve their performance. They have suggested movement of existing FCI go downs to the periphery of the port and use of the land parcel of ~28–30 acres near the VGCB terminal for coal storage. This will also reduce coal storage on the port periphery and replace coal with clean cargo of FCI.

They have suggested the rationalization of existing storage cost at PPP–BOT terminals. The rationalization of storage cost needs to be worked out with TAMP as there are no existing clauses in the current contract which provide for change in storage cost structure. Lowering of storage charges from their current levels will only serve to make the existing operations more effective and attract additional cargo to high productive, high profitability berths. This will also reduce lighter age operations and hence conventional coal handling operations at VPT.

5.3 Performance of the Berths

AECOM has carried out a detailed analysis of the performance of the berths during 2014 -15 and the results are furnished in the **Table 5.2** to **Table 5.6** hereunder.

Table 5.2 Performance of Liquid Bulk Berths During 2014-15

S.No	Berth	Occupancy	Cargo	Volume	No. of Ships	Ship/ Parcel Size	Maximum	Minimum	Average
1	Single Buoy Mooring	22%	Crude	25,66,661	20	Ship size - VLCC	3,05,871	2,65,539	2,92,352
						Parcel size - VLCC	1,82,204	72,000	1,28,333
				19,71,329	16	Ship size - Suezmax	1,60,791	1,47,468	1,52,606
						Parcel size - Suezmax	1,45,038	3,439	1,23,208
				9,72,494	16	Ship size - Others	1,13,918	73,580	83,702
						Parcel size - Others	1,05,816	49,981	60,781
				55,10,484	52				
2	OSTT	Out of commission from November 2014 due to cyclone damage	Crude	22,45,123	20	Ship size - Suezmax	1,59,901	1,47,468	1,52,398
						Parcel size - Suezmax	1,42,860	20,467	1,12,256
				11,65,870	26	Ship size - Others	1,05,849	73,531	83,961
						Parcel size - Others	84,940	20,009	44,841
				34,10,993	46				
3	OR 1	79%	POL	15,98,853	175	Ship size	51,673	4,851	31,347
						Parcel size	31,443	949	9,136
			CHEMICALS	1,30,919	58	Ship size	47,878	9,051	17,970
						Parcel size	10,527	200	2,250
				17,29,772	233				
4	OR 2	82%	POL	12,15,121	170	Ship size	51,603	3,851	25,985
						Parcel size	31,059	105	7,148
			CHEMICALS	2,18,124	143	Ship size	32,950	8,804	15,626
						Parcel size	8,483	162	1,525
				14,33,245	313				
5	LPG	70%	LPG	11,12,281	234	Ship size	64,220	23,257	55,145
						Parcel size	17,004	200	4,753
			POL	17,93,842	104	Ship size	76,586	10,314	46,182
						Parcel size	50,549	1,993	17,248
				29,06,123	338				

Table 5.3 Performance of East Quay (VPT) Berths During 2014-15

S. No	Berths	Occupancy	Cargo	Volume	No. of Ships	Parcel Size	Maximum	Minimum	Average
1	EQ3 EQ4 EQ5 EQ6 EQ7	Varies from 70% to 79% Average 72%	Coal/Coke	4,23,979	38	Parcel size	42,744	400	11,157
			Iron/Manganese ore	3,35,767	63	Parcel size	23,740	300	5,330
			Fertilisers	22,05,395	128	Parcel size	53,044	200	17,230
			Caustic Soda	3,47,059	29	Parcel size	18,806	299	11,968
			Foodgrains	2,69,540	47	Parcel size	30,890	280	5,734
			Steel Products	9,51,320	118	Parcel size	42,744	15	8,062
			Chemicals	3,85,610	38	Parcel size	18,806	299	10,147
			Others	10,18,215	388	Parcel size	42,850	3	2,624
				59,36,885	**849**				**6,846**

Table 5.4 Performance of West Quay (VPT) Berths During 2014-15

S. No.	Berths	Occupancy	Cargo	Volume	No. of Ships	Parcel Size	Maximum	Minimum	Average
1	WQ 1 WQ 2 WQ 3 WQ 4 WQ 5 WQ 6	Varies from 68% to 79% Average 74%	Coal/steam; coking, & coke	36,73,700	253	Parcel size	55,634	400	14,521
			Iron/Manganese ore	27,11,028	139	Parcel size	51,000	147	19,504
			Thermal coal	27,45,701	75	Parcel size	49,197	12,212	36,609
			Alumina Powder	11,84,725	39	Parcel size	30,600	29,470	30,378
			Bauxite	6,41,083	18	Parcel size	56,195	4,762	35,616
			Caustic soda	3,21,546	38	Parcel size	15,970	4,028	8,462
			Rock Phosphate; Sulphuric Acid	2,35,799	22	Parcel size	42,171	2,004	10,718
			Others	6,42,777	218	Parcel size	52,399	37	2,949
				1,21,56,359	**802**				**15,197**

Table 5.5 Performance of OB 1 and OB 2 Berths During 2014-15

S. No.	Berth	Occupancy	Cargo	Volume	No. of Ships		Maximum	Minimum	Average
1	OB 1	79%	Iron ore	7,48,991	14	Parcel size	1,46,858	1,200	53,499
			Steam/coking coal, coke	5,21,258	56	Shifting			
			Others	1,87,570	23	Shifting			
				14,57,819	93				
2	OB 2	82%	Iron ore	50,69,666	81	Ship size	1,75,019	15,148	94,338
						Parcel size	1,38,218	4,100	62,588
			Steam/Coking coal	90,190	7	Shifting			
			Others	29,267	3	Shifting			
				51,59,856	88				

Table 5.6 Performance of PPP Berths During 2014-15

S. No.	Berth	Occupancy	Cargo	Volume	No. of Ships		Maximum	Minimum	Average
1	EQ 8 & EQ 9 VSPL	61% & 74%	Coal / Coke	35,85,538	192	Parcel size	54,539	550	18,675
			Manganese ore	8,42,914	152	Parcel size	30,000	800	5,545
			Gypsum	5,15,505	21	Parcel size	43,660	4,000	24,548
			Others	1,80,053	9	Parcel size	55,000	1,502	20,006
				49,43,957	374				
2	VCTPL	57%	Containers 1	30,70,697	340	Ship size	86,583	2,180	36,538
						Parcel size	36,350	9	9,031
			Containers 2	12,17,580	159	Ship size	46,700	9,944	27,277
						Parcel size	20,631	20	7,658
				42,88,277	499				
3	VGCB	78%	Steam Coal	36,24,315	94	Ship size	1,64,303	37,352	83,351
						Parcel size	1,43,629	3,000	38,557
			Coking Coal	33,38,204	108	Ship size	93,316	40,913	78,492
						Parcel size	89,672	8,500	30,009
			Bauxite & Gypsum	1,07,682	8				
				69,62,519	210				
CAPTIVE BERTH									
4	FB	25%	Liquid Ammonia; Rock Phosphate; Molten sulphur; Sulphur	5,04,357	45	Parcel Size	38,664	488	11,207
				5,04,357	45				

The following observations are made from this analysis:

- Except for SBM, all other liquid bulk berths are having high levels of berth occupancy. This is because POL products are mostly handled for marketing purposes and the parcel size is relatively small. So is the case with chemicals. This situation is likely to continue in the future also. Hence the port should plan additional berth to reduce the high berth occupancy of the existing berths.
- The productivity of the berths depends largely on the parcel size and the mechanisation of handling system.
- The productivity of east quay berths are less as compared to that of west quay berths. This is mainly because of the parcel size.
- The OSTT has been severely damaged during the cyclone of November 2014 and has been out of commission since then. It may take quite some time for it to be refurbished and re-commissioned. However, since it has been handling mostly crude oil, the SBM will be able to take care of its share without any problem.

5.4 Measures for Capacity Enhancement

The Port has already taken a series of measures to enhance its capacity. One of the important actions was to dredge the inner harbour basin and berths to handle fully loaded Panamax vessels.

Secondly, in order to streamline the cargo handling operations, the Port has awarded several PPP projects for specific cargo and with full mechanisation. These projects are as follows:

- EQ I was already awarded to Adani Vizag Coal Terminal Pvt Ltd. for handling thermal coal. Its capacity is 6.5 MTPA
- EQ 1A has been awarded to SEW Vizag Coal Terminal Pvt Ltd. for handling Thermal and Steam coal. Its capacity is expected to be 7.5 MTPA
- EQ 7 has been allotted to Vizag Agri Port Pvt Ltd. of ABG for handling finished fertilisers. Its capacity is expected to be 5.2 MTPA
- EQ 10 has been awarded to AVR Infra Pvt Ltd. of IMC for handling liquid cargo other than POL products. It is expected to handle 1.8 MTPA
- VCTPL has been awarded an extension to handle 0.54 MTEU containers.
- OB 1, OB 2 along with WQ 1 has been allotted to Essar Ports Ltd. to upgrade the existing mechanised system in OB 1 & OB 2 and to install new mechanised system at WQ 1 for handling iron ore. All these berths are expected to handle a consolidated volume of 23 MTPA.
- Proposals to develop two numbers of Berths WQ-7 and WQ-8 with Internal Resources, to handle Manganese Ore, Bauxite, Gypsum, limestone, etc., with a throughput of 6.39 MTPA.

In addition to these capacity adding programmes, the Port should look into the availability and utility of the backup land for stockyards for dry bulk terminals.

6.0 TRAFFIC PROJECTIONS

6.1 General

In terms of volumes, Visakhapatnam is the fifth largest major port in the country handling approximately 58 MTPA of cargo. Visakhapatnam is located on the northern coast of Andhra Pradesh and serves the Central and Eastern hinterlands of the country like Telangana, Chhattisgarh, Madhya Pradesh and Southern Odisha.

Currently the port handles ~12 MTPA of thermal coal and ~14.6 MTPA of POL. Other major commodities include coking coal, containers, fertilizers and iron-ore. Going into the future we expect the total traffic at the port to go to ~80 MTPA by 2020 and 100-110 MTPA by 2025.

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 next 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 Vishakhapatnam up to 2035 has be derived as presented in this section.

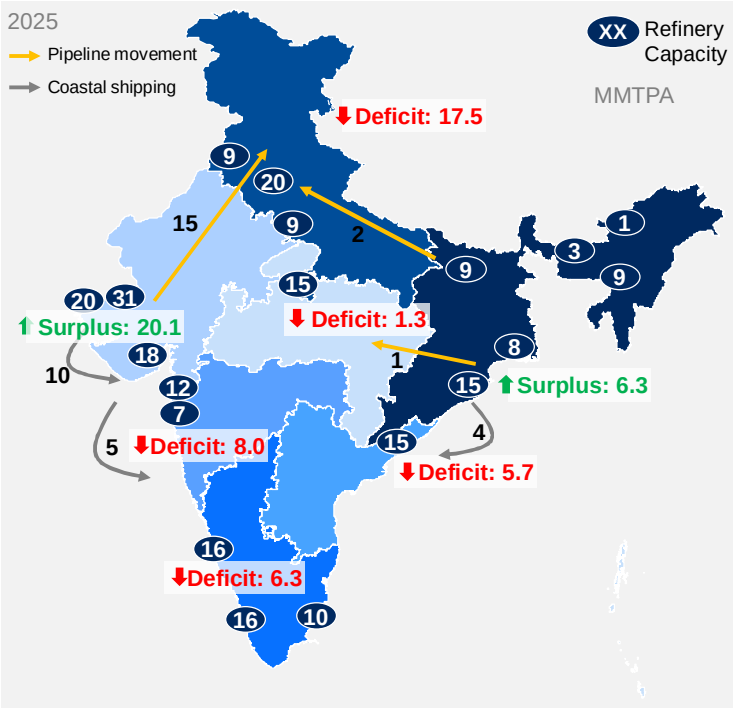
6.2 Major Commodities and their Projections

6.2.1 POL

POL crude and product constitute the biggest portion of traffic handled at the port. Visakhapatnam handles roughly 15 MTPA of POL which comprises approximately 8 MTPA of crude import, 4.6 MTPA of product movement and 1.1 MTPA of LPG imports.

Expansion of HPCL in the future will lead to traffic of roughly 15 MTPA of crude import by 2025. POL coastal traffic is expected to reach 7.5 MTPA by 2025 which includes 4-5 MTPA of coastal shipping potential from Paradip to Vizag port to cater to the demand of Andhra Pradesh and Telangana. (**Figure 6.1**).

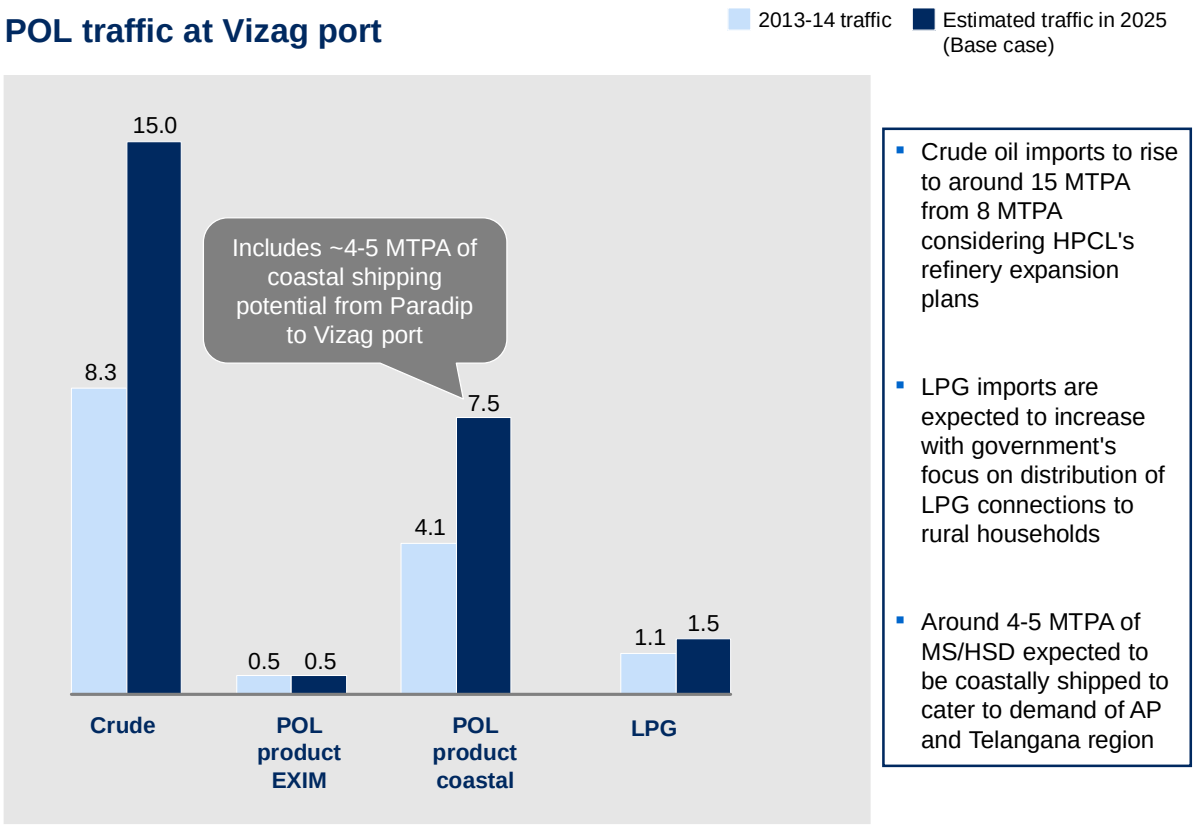
There is a potential for coastal shipping of ~5 MMTPA of MS/HSD from Paradip to Vizag port by 2025



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

Figure 6.1 Coastal Shipping Potential of MS/HSD from Paradip to Vizag by 2025

LPG imports are expected to increase to 1.5 MTPA by 2025 driven by government's focus on distribution of LPG connections to rural households. The split of the current POL traffic and the estimated traffic in 2025 is as shown in **Figure 6.2**.



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

Figure 6.2 Split of Current POL Traffic at Vizag Port

6.2.2 Thermal Coal

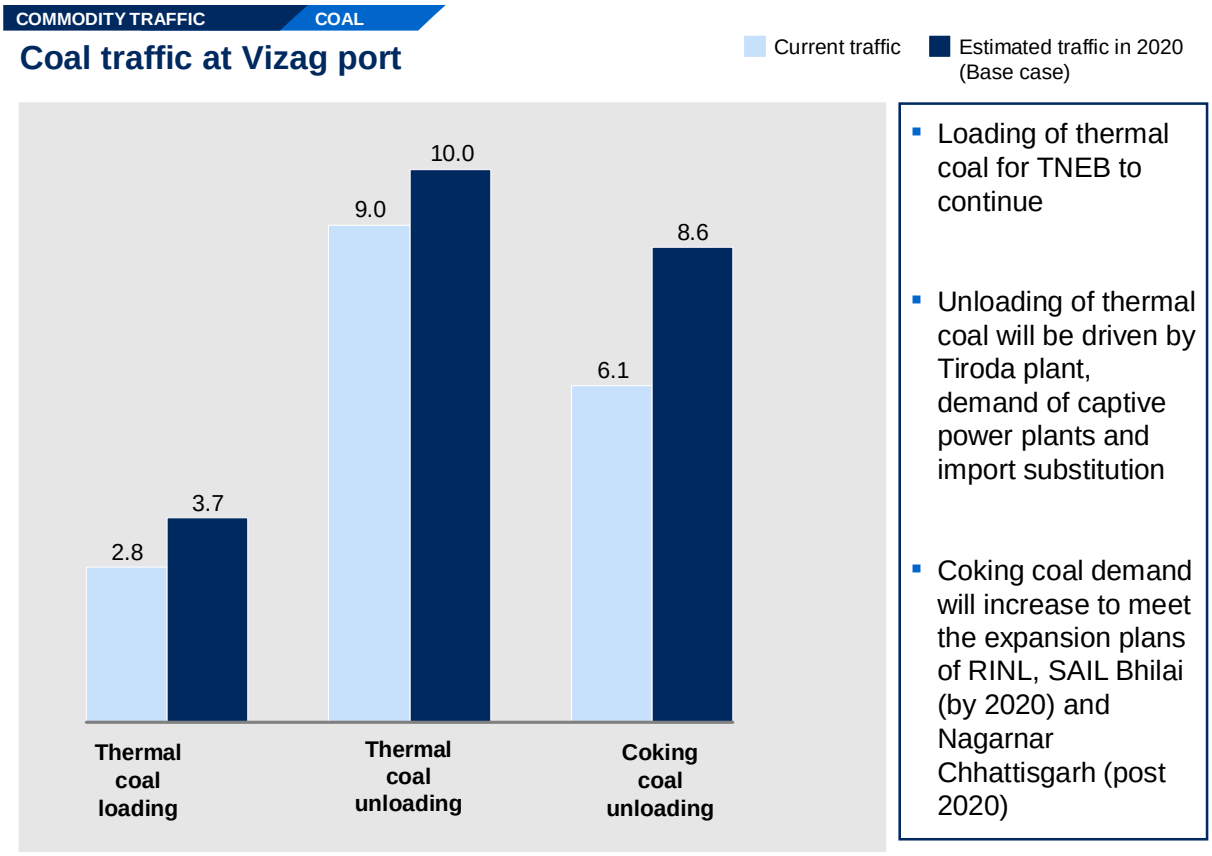
Currently the port unloads 9.3 MTPA of thermal coal out of which approximately 4 MTPA is for power generation in Adani Power Maharashtra Ltd. in Gondia district. Remaining is primarily for the consumption of non-power plants (>50% of the overall imports). Unloading of thermal coal will be driven by Tiroda plant, demand of captive power plants and import substitution.

The port also handles 2.8 MTPA of outbound coal which is coastal shipped to Tamil Nadu. This figure is projected to grow to ~3.7 MTPA by 2020, ~5 MTPA by 2025 and 5-6 MTPA by 2035.

6.2.3 Coking Coal

The port currently handles 6 MTPA of coking coal which is used for steel production in the steel plants of Rashtriya Ispat Nigam Limited (RINL), SAIL Bhilai, Tata Steel Limited, Jindal Power and Steels Limited. Other consumers of coking coal include Uttam Galva Metallics, Jayswal Neco and Bhushan Power and Steel Limited. We project that going forward the volumes of coking coal handled by the port will increase to 8.6 MTPA by 2020, 11-12 MTPA by 2025 and 14.5-16.5 MTPA by 2035. This increase will be driven primarily by expansion in SAIL Bhilai and Nagarnar plants. The increase of coking coal traffic due to expansion of steel plants in the hinterland would also be shared by the competing non-major port of Gangavaram.

The current traffic of thermal coal and coking coal and the estimated traffic in 2020 is as shown in **Figure 6.3**.



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

Figure 6.3 Coal Traffic at Vizag Port

6.2.4 Containers

The port, through the Visakha Container Terminal currently handles ~0.25 MTEUs. Andhra Pradesh and Telangana are the key hinterlands for the port. Other hinterlands include Odisha (primarily Bhubaneshwar and Jharsuguda), Madhya Pradesh, Bihar and Chhattisgarh. Visakhapatnam region itself contributes ~20% to the total container traffic at port as shown in **Figure 6.4** and **Figure 6.5**.

COMMODITY TRAFFIC | CONTAINER

Andhra Pradesh is the primary hinterland of Visakhapatnam port with small traffic from Odisha and MP

Primary hinterland of port

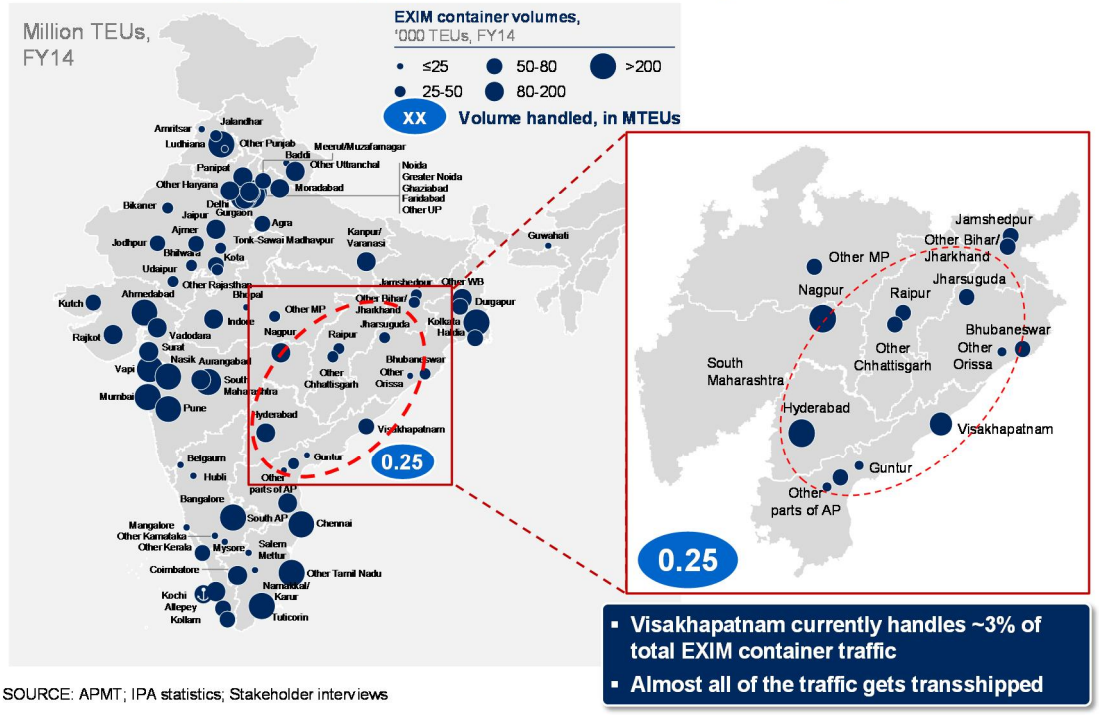
EXIM container volumes, '000 TEUs, FY14	JNPT	Mundra	Chennai	Pipavav	Tuticorin	Haldia	Cochin	Visakha-patnam	Mangalore
NCR+Punjab	936	1,264	0	329	0	0	0	0	0
Maharashtra	2,121	54	0	0	0	0	0	0	0
Tamil Nadu	0	0	1,240	0	484	0	0	0	0
Gujarat	552	262	0	169	0	0	0	0	0
Uttar Pradesh	228	274	0	107	0	0	0	0	0
West Bengal	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; Expert interviews

Figure 6.4 Hinterland to Port Mapping for Containers

COMMODITY TRAFFIC | CONTAINER

EXIM container generating hinterlands for Visakhapatnam port



SOURCE: APMT; IPA statistics; Stakeholder interviews

Figure 6.5 Exim Container Generating Hinterlands for Vizag Port

GDP of Andhra Pradesh, Telangana and Odisha are expected to grow at 9-11% CAGR while Madhya Pradesh, Chhattisgarh and Bihar are expected to grow at 6-8% CAGR. Going forward, the container volume at the port is expected to grow to 0.5 MTEUs by 2020 and 0.6-0.7 MTEUs by 2025. However, development of a port in central AP would attract a significant share of this traffic as shown in **Figure 6.6**.

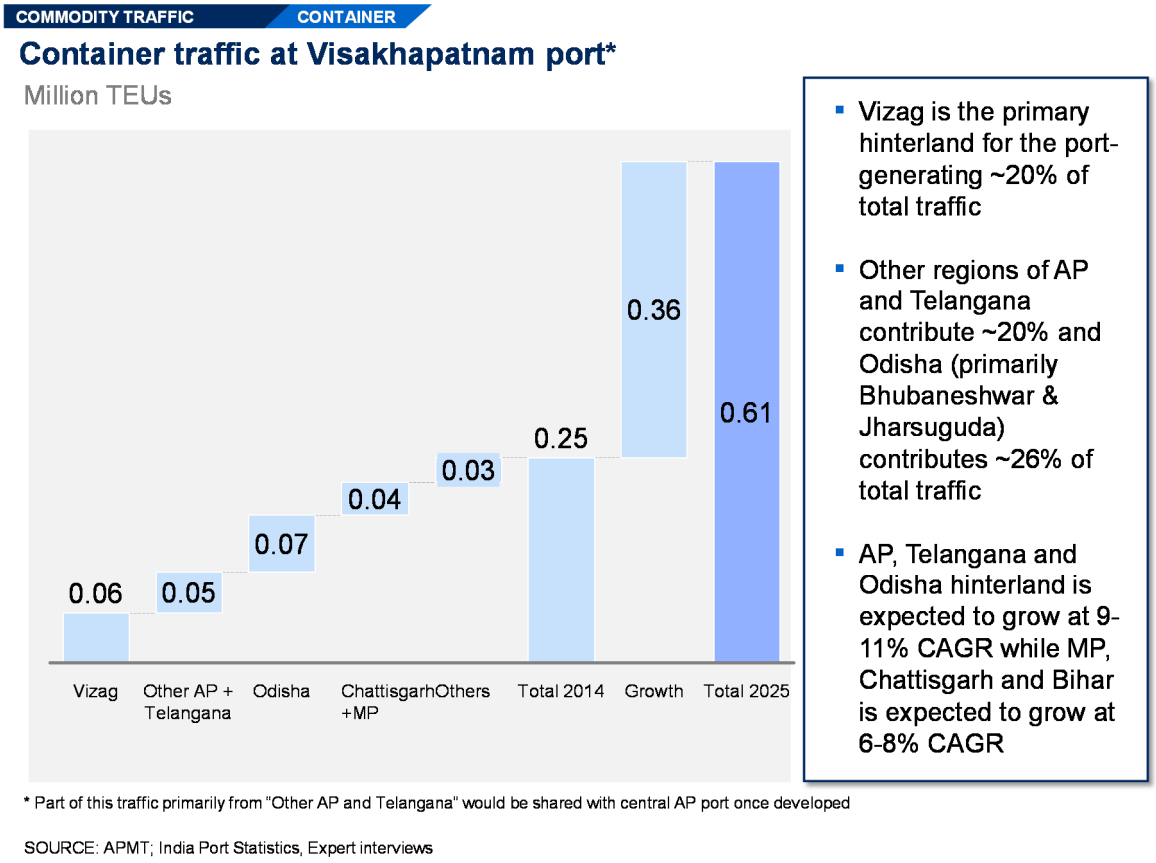


Figure 6.6 Container Traffic at Vizag Port

6.2.5 Iron Ore

The port currently handles ~8 MTPA of iron-ore and pellet exports which is expected to increase to ~12 MTPA by 2020. Depending on how the export volumes pick-up in future, the volume handled by the port will increase to 14-16 MTPA by 2025.

6.2.6 Fertilisers

The port imported 2.6 MTPA of fertilizers and raw materials for fertilizers in FY 15. This comprises of approximately 1.5-1.8 MTPA of finished fertilizer and 1-1.2 MTPA of raw material of fertilizers. The finished fertilizer serves the demand in the hinterlands of Andhra Pradesh, Telangana, Madhya Pradesh and Chhattisgarh. Part of the raw material for fertilizers is utilized in the DAP, NPK, Urea and AS fertilizer plants in Andhra Pradesh itself and a part of it is sent to plants in Uttar Pradesh.

The overall volume of fertilizer and fertilizer raw material is expected to increase to ~4 MTPA by 2020, ~5 MTPA by 2025 and 7-8 MTPA by 2035.

6.2.7 Alumina Powder and Other Ores

Visakhapatnam port also handles alumina power and other ores of approximately 2.6 MTPA currently. This is utilized by customers including NALCO, Sesa Sterlite Ltd., and other metallurgy units. This figure is expected to increase to 2.6 MTPA by 2020 and ~3-4 MTPA by 2025.

6.2.8 Other localized Commodities

Other highly fragmented cargo also makes a sizeable chunk of the total cargo volume handled at Visakhapatnam port. This volume is currently 4.6 MTPA and is expected to increase to ~8 MTPA by 2020 and 10-12 MTPA by 2025.

The overall commodity wise projections for the port are shown in **Table 6.1**.

Table 6.1 Traffic Forecast for Visakhapatnam Port

Units: MMTPA (except Containers)

Vizag Port - Traffic Projections

xx Base Scenario xx Optimistic Scenario

Commodity	2014-15	2020	2025		2035		Remarks
Liquid Cargo							
POL	14.6	18.7	24.5	27.1	30.0	35.5	▪ Mainly Crude imports driven by HPCL Vizag expansion and coastal shipping of product from Paradip refinery
Chemicals	1.0	1.3	1.7	1.8	2.9	3.3	
Dry and Break Bulk Cargo							
Thermal Coal (Loading)	2.8	3.7	4.7	5.2	5.0	5.5	
Thermal Coal (Unloading)	9.3	10.0	11.0	11.5	13.3	15.2	
Coking Coal*	6.1	8.6	11.8	12.6	14.5	16.5	▪ Driven by expansion in SAIL Bhilai by 2020 and Nagarnar Chattisgarh post 2020
Iron Ore	8.3	12	14	16	16	16.5	▪ Mostly exports; likely to remain low.
Steel	1.08	1.5	2.1	2.2	3.7	4.2	
Alumina Powder	1.2	1.6	2.1	2.2	3.5	4.0	
Other Ore	1.4	1.0	1.3	1.4	2.2	2.5	
Food Grains	0.8	0.5	0.7	0.7	1.1	1.3	
Fertilizers	2.6	3.4	4.9	5.1	7.3	8.1	
Containers and other Cargo							
Containers (MnTEU)	0.25	0.49	0.61	0.72	1.02	1.29	▪ Some traffic may shift to central AP port once developed
Others	4.6	7.7	9.96	12.33	12.8	13.33	▪ Highly fragmented,
Total (MMTPA)	**58.2**	**78.6**	**99.5**	**110.8**	**130.3**	**148.6**	

Conversion Factor Used for Containers Projections: 1 TEU = 17.6 Tons

* Conversion factor for coking coal consumption per tonner of steel produced is taken as 0.85. Any incremental traffic due to expansion of existing and new plants has been split between Vizag and Gangavaram in 50:50 ratio

6.2.9 Coastal Shipping Potential

Visakhapatnam is strategically positioned to serve large areas in the hinterland of the country through coastal shipping. Coal, steel and fertilizer can be major commodities to/from Visakhapatnam in case coastal shipping revolution takes place in the country.

- **Fertilizers:** There is a potential for coastal shipping of ~2 MTPA of fertilizer from Andhra Pradesh to West Bengal, Tamil Nadu and Gujarat via Visakhapatnam port by 2025.

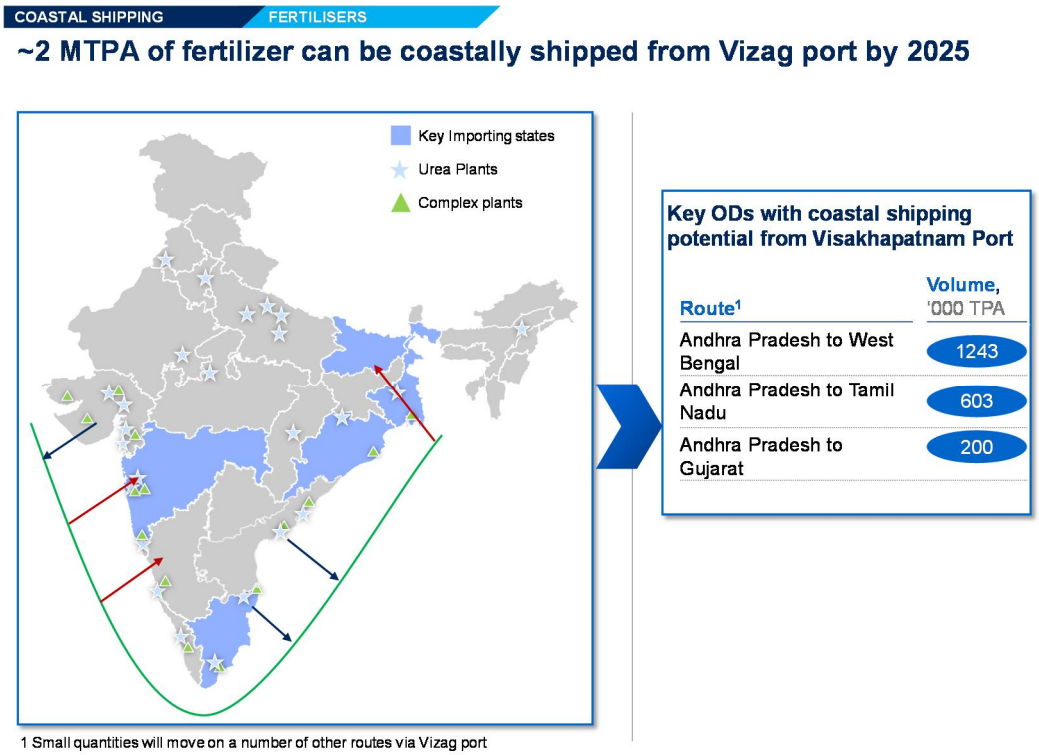


Figure 6.7 Coastal Shipping Potential of Fertilizers from Vizag Port

- **Steel:** ~1.5 MTPA of steel can be coastally shipped from RINL, Visakhapatnam to demand states of Maharashtra, Gujarat and Tamil Nadu by 2025.

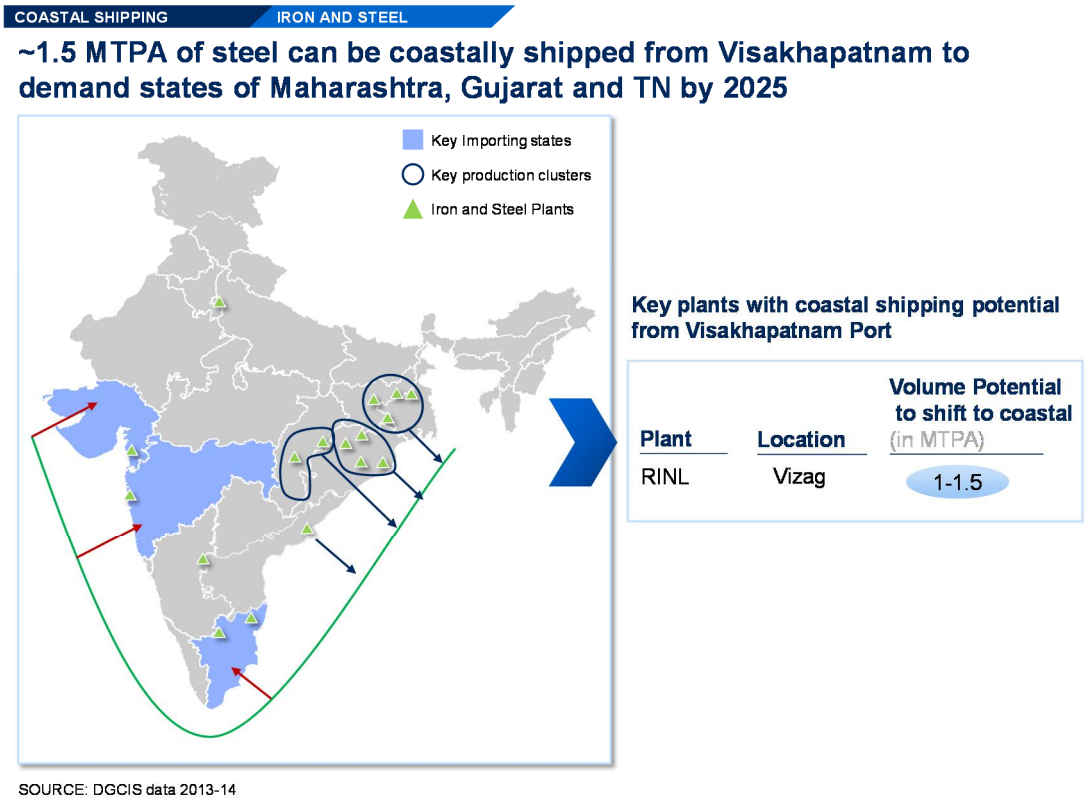


Figure 6.8 Coastal Shipping Potential of Iron and Steel from Vizag Port

The table below summarizes the potential of coastal movement for key commodities.

Table 6.2 Opportunities Possible via Coastal Shipping

Vizag Port – New Opportunities Possible via Coastal Shipping

Units: MMTPA (except Containers)

Commodity	2020	2025	2035
Thermal Coal (Unloading)	0	0	0
Steel (Loading)	1.15	1.54	2.75
Steel (Unloading)	0.08	0.11	0.20
Cement (Loading)	0.03	0.04	0.07
Cement (Unloading)	0.01	0.02	0.03
Fertilizer (Loading)	1.68	2.05	3.03
Fertilizer (Unloading)	0.17	0.21	0.31
Food Grains (Loading)	0.57	0.69	1.02
Food Grains (Unloading)	-	-	-

- Additional Coastal shipping Potential if Machilipatnam is not built and Dr. N Tata Rao and Kothegudem plants in AP and Telangana adopt coastal shipping. Vizag would also have to compete with Kakinada

* 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 REQUIRMENTS

7.1 Port Capacity after On-Going Developments

The capacity of the existing berths and the new berths after on-going developments is presented in **Table 7.1**. This is expected to be the situation by the year 2020.

Table 7.1 Capacity of VPT After New Projects

Berth No.	Type of Commodities	Existing Capacity (MT)	Added Capacity (MT)	Total Future Capacity (MT)
INNER HARBOUR				
EQ-1A	Steam coal and back loading of thermal coal	0.00	7.36	7.36
EQ-1	Steam Coal	6.41		6.41
EQ 2-5	Pet-coke, steel products, food grains, containers	4.62	1.38	6.0
EQ-6	Anthracite Coal, BF slag, steel, thermal Coal, fertilizers, Phosphoric acid	1.73		1.73
EQ-7	Fertilizers and fertilizer raw materials	2.52	3.33	5.85
EQ-8	Urea, magnesite, fertilizer raw materials	12.77		12.77
EQ-9	Steel, General cargo, steam coal, lam coke, feldspar and granite			
EQ-10	Caustic soda, bio diesel, edible oils, chemicals	1.84		1.84
	Total East Quay	**29.89**	**12.07**	**41.96**
WQ-1	Iron ore	6.26		6.26
WQ-2	Iron ore, coking coal, granite and thermal coal			
WQ-3	Coking coal, Steel, thermal coal, soya, pet-coke and iron ore	2.52		2.52
WQ-4	Iron ore, iron ore pellets, steam coal, limestone and steel	1.77		1.77
WQ-5	Alumina, iron ore, granite and caustic soda	3.43		3.43
WQ-6	CP Coke, LAM coke, steel and granite	2.08		2.08
WQN	Manganese ore, gypsum, bauxite, limestone, blast furnace slag, ilmenite sand	0.00	6.39	6.39
	Total West Quay	**16.06**	**6.39**	**22.45**
FB	Fertilizers, raw materials, liquid ammonia and molten Sulphur	1.87		1.87
OR-1,2	POL products	3.68		3.68
	TOTAL INNER HARBOUR	**51.50**	**18.46**	**69.96**
OUTER HARBOUR				
OB-1,2	Iron ore and iron pellets, lightening of cargoes such as fertilizers	12.50	3.70	16.20
VGCB	Coking coal and steam coal	10.18		10.18
OSTT	Crude oil	0.00		0.00
LPG	LPG and POL products	4.38		4.38
SBM	Crude oil	15.0		15.0
VCTPL	Container cargo in MT	6.20	8.10	14.30
	Container cargo in MTEUs	0.35	0.46	0.81
	TOTAL OUTER HARBOUR	**48.26**	**17.30**	**60.06**

7.2 Requirement for Capacity Expansion

Based on the projected traffic, the phase-wise capacity augmentation requirements are provided in **Table 7.2**.

Table 7.2 Requirement of Phase-Wise Capacity Augmentation

Cargo Handled	Current Capacity including Ongoing Projects (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*	24.9	20.0	0	26.2	1.3	32.9	8.0
Coal (Import)	29.4	18.6	0	22.8	0	27.8	0
Coal (Export)	7.4	3.7	0	4.7	0	5.0	0
Iron Ore	22.5	12.0	0	14.0	0	16.0	0
Breakbulk	23.9	12.3	0	16.2	0	23.3	0
Fertilizers	7.7	3.4	0	4.9	0	7.3	0
Containers	14.3	8.6	0	10.7	0	18.0	3.7
TOTAL	**130.0**	**78.6**	**0.8**	**99.5**	**1.3**	**130.3**	**11.7**

* OSTT is not considered in the current and ongoing capacity but OSTT may be considered to handle POL Products (1.5 MTPA capacity)

From the above table, the following conclusions are made mainly with reference to the traffic projections for year 2025:

- For handling all types of coal and coke import the total capacity available at dedicated berths will be about 29.4 MTPA. The berths are EQ 1: VGCB and EQ 8/EQ 9.
- Adequate capacity for coal export is available once EQ1A becomes operational
- Additional capacity will be distributed among WQ berths. Hence these will be able to take care of the projected traffic up to 2020.
- For handling iron and manganese ores, the total capacity available at the dedicated berths of OB 1; OB 2 and WQ 1 and WQ 2 will be 22.5 MTPA. As of now, there will be surplus capacity available.
- For handling fertilisers, Alumina and chemicals sufficient capacity is available through berths EQ 7; WQ 5 and EQ 10.
- For handling containers, with the license for expansion given to VCTPL capacity will be created more than what future traffic has been projected.
- The other berths of EQ and WQ, after the streamlining of cargo with the new berths, will have sufficient capacity to handle the other assorted dry bulk and break bulk cargo.

As regards POL traffic, it can be seen that there is a shortfall of capacity. As projected POL products traffic of 7.5 MTPA could not be handled at the existing OR 1 & OR 2.

However during the master plan horizon significant coal import is projected at the port for which there would be shortfall of capacity. Same is the case with Breakbulk cargo wherein it would be required to upgrade the existing breakbulk berths by way of deepening and providing handling equipment.

The indicated capacity of high productivity berths such as VGCB, AVCTPL (EQ 1) and SVCTPL (EQ1A) could be taken as only name- plate capacities as the actual performance is under-par due to the limitations in the available storage space. There is an urgent need to allocate additional area to these agencies for improving their performance standards. These are discussed in detail hereunder.

7.3 Allocation of Land for Additional Stackyard of VGCB

M/s Vizag General Cargo Berth Pvt Ltd. (VGCB) is the licensee to develop the old general cargo berth (located at Visakhapatnam Outer Harbour) by upgrading it to handle 200,000 DWT coal carriers. It is to handle coking coal and steam coal imports. The upgradation included strengthening the berth to take the loads of a 200,000 DWT Ship. The old 22.2 m wide deck was further extended by 21 m with crane rails. The licensee was allotted a limited space of 129,930 m^2 in the eastern yard for locating the stackyard.

The material handling system comprise 3 grab unloaders, each of 2000 TPH capacity; 2 stacker cum Reclaimer units with capacity of 6000 TPH in stacking mode and 3500 TPH in reclaiming mode; 1 wagon loader of 3500 TPH capacity and interconnecting conveyor system. The upgraded berth was commissioned in April 2013. Its capacity was assessed as 10.18 MTPA and it handled 7 MT during 2014 -15.

The overall layout plan of the terminal is shown in **Figure 7.1**.

Figure 7.1 Terminal Layout of VGCB

The existing stackyard has two outer stockpiles of 600 m length and 37 m width and a central stockpile of 600 length and 70 m width. Owing to the stipulation imposed while getting environmental approval, the stockpile height has to be limited to 10 m only. Consequently, the maximum theoretical capacity of the entire stackyard is 500,000 T for stacking of coking coal, assuming it to be homogeneous and for one customer only. However the practical storage that could be achieved at this stackyard is much less due to the following factors:

- The terminal caters to multiple customers who bring the cargo i.e. coking coal and steam coal, in different grades, requiring separate stockpiles for each customer and for each grade.
- Sometimes even a single cape size ship brings three different grades of materials which have to be stacked in different stockpiles.
- Different stockpiles are also needed for the different material so as to avoid the contamination.
- Due to railway traffic situation and route congestions, railways do not supply rakes to only one location and in same route. Therefore the terminal has to cater to at least 7 to 8 different customers, so that the railways would be able to supply sufficient rakes leaving for diversified destination in different routes

Because of these a number of stockpiles (numbering 16 to 20) are to be provided in the stackyard as against the ideal number of 3 stockpiles: one at the middle and two at the end, used to arrive at the theoretical maximum capacity of the yard.

A broad understanding of the impact of large number of stockpiles in the yard could be had from the **Table 7.3**

Table 7.3 Stockpiles and their Respective Capacities

Scenario No.	Number of Stockpiles	Theoretical Stacking Capacity (T)		
		10 m Height	12 m Height	15 m Height
1.	3; one in the middle and one on either end	5,00,000	5,50,000	6,00,000
2.	6; two in the middle and two on either end	4,70,000	5,20,000	5,60,000
3.	12; Four in the middle and Four on either end	3,60,000	3,90,000	4,10,000

Thus, providing large number of stockpiles results in significant reduction in the capacity of the stackyard. Further, the maximum allowable height of stockpile also has an impact on its capacity. Presently terminal is working at the scenario 3 wherein the maximum allowable storage capacity is only 3,60,000 T and it handled 7 MT last year. Factoring 70% stackyard utilisation, the average dwell time of cargo works out to about 15 days, which is already very tight while considering the dwell time of about 30 days at the similar multi-user terminals at Gangavaram, Dhamra, Karaikal etc.

One of way to increase the storage capacity is to allow higher stacking height of 12 to 15 m. The mitigation measure for environmental impact could be the frequent use of the dust suppression system, covering of the stockpiles and providing wind screens of height 15 m near the periphery of the stackyard. This might increase the stacking capacity approximately by an additional 20%. Another way to manage with the limited storage space is to reduce the dwell time of cargo further by way of faster evacuation. However there are the following constraints for faster evacuation of cargo:

- The evacuation of the coal from stackyard depends on the availability of the rakes, which currently are in short supply. Apart from rakes the route congestion at that point in time on that particular route is also a governing criterion due to which VGCB tries to send rakes to hinterland in different directions so as to avoid choking of the main railway network.
- Even if the adequate rakes were available, the evacuation of the coal is governed by the requirement of the customers whose decisions are based on the plant's daily consumption and availability of storage space at the plant end. It's prevalent and established practice in Indian sub-continent that customers would evacuate cargo based on above criteria and port's stack yard is required to meet their storage needs.
- The wagon loading system provided at the port comprises of two silos of 800 T capacities each. These silos can discharge material into rakes positioned on separate rail tracks. However the feeding to these silos is through one conveyor only and therefore at a given point of time only one silo can be used for rake loading thereby limiting the capacity of wagon loading at an average of 9 rakes per day, which is lower as compared to the average unloading rate at the berth. Therefore adequate space should be available to stack the balance quantity of cargo.

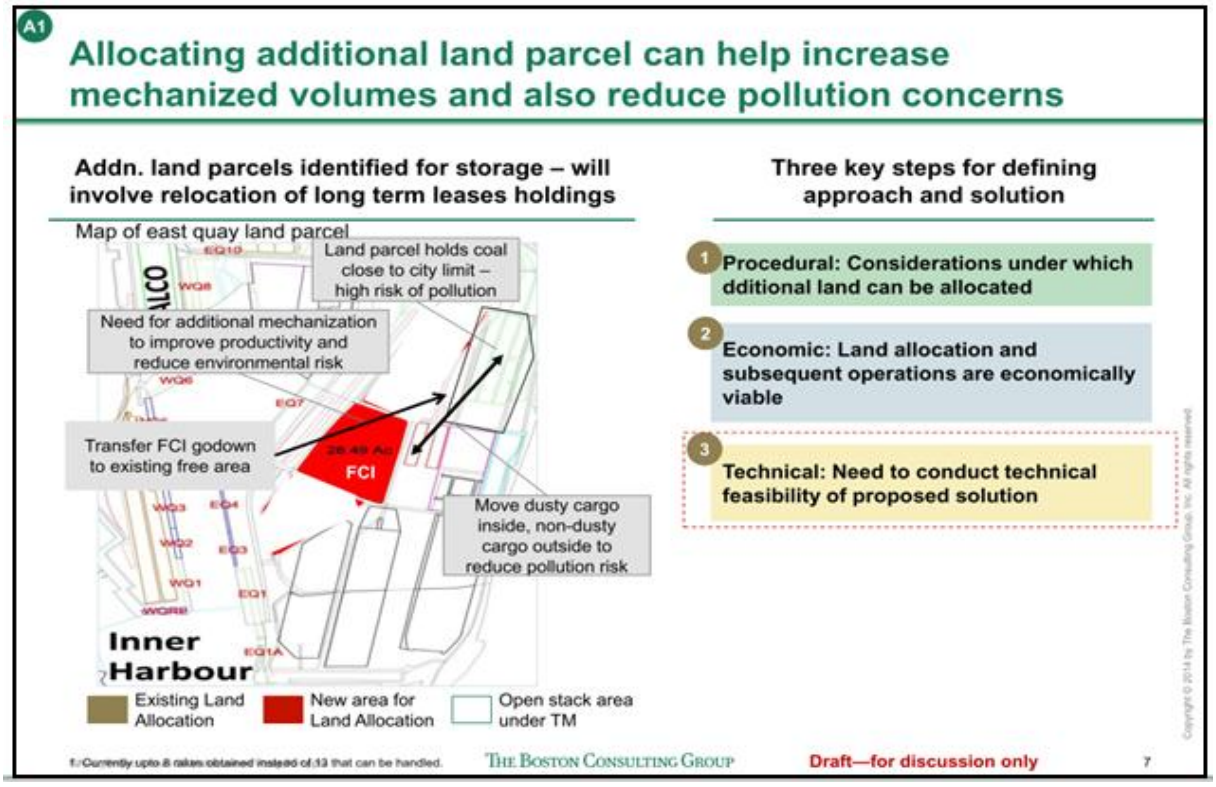
- The ship arrival is generally random in nature. In case another cape size ship arrives after the unloading of an earlier cape size ship, adequate stacking area is not available at the yard. This results in stoppage of ship unloading operations and thus impacts the berth productivity.

The handling system provided at the berth has a rated capacity of 6,000 TPH with an average throughput of about 60,000 TPD. This translates to the berth capacity of about 13 MTPA. The wagon loading system can cater to a maximum of about 10 rakes per day i.e. about 36,000 TPD. This shows that the current stackyard area and the evacuation infrastructure do not match with the berth capacity, which appears to be the main bottleneck of the project. With this existing bottleneck, the project is likely to underperform, leading to revenue loss to Visakhapatnam Port Trust and PPP Project partner.

In view of the above reasons it is considered necessary that additional stacking area be allocated to VGCB terminal. This would enable the terminal to handle higher volumes to match the assessed capacity of the berth.

The possible area for this additional stackyard is towards the east of berths EQ2 to EQ5, where FCI godowns exist. These godowns can be shifted towards the periphery of the port. This will have a dual advantage in that the dirty cargo storage at the port periphery nearer to the habitation will be replaced by cleaner cargo of FCI and at the same time release the much needed additional area for VGCB.

BCG has also suggested movement of existing FCI go downs to the periphery of the port and use of the land parcel near the VGCB terminal for coal storage.



The land identified for allocation to VGCB measures about 16 ha. The details of the additional stackyard and the associated handling system are given below:

- It is suggested to take a tap off point from the transfer tower through which a conveyor, following the route of railway line, would be taken to the northern side of the stackyard.

- The stackyard shall be provided with two sets of stacker cum reclaimers, one on each track, of the same rated capacity as in the existing yard.
- The maximum coal storage capacity of the proposed new stackyard is estimated as 3,50,000 T.
- The conveyor system on each track would be reversible i.e. material travelling in N-S direction while in stacking mode and S-N direction while in reclaiming mode.
- The reclaimed material from new stackyard shall be fed to the existing set of silos. This would enable each of the silos to receive the material from either the existing or proposed stackyard, enabling silo to load two rakes simultaneously. This would result in higher rake handling capacity and thus faster evacuation of cargo which would also add capacity to the terminal.

A schematic drawing showing the location of the additional stockyard, its layout and the route of the conveyor are shown in the **Figure 7.2**.

The estimated CAPEX for the development of new yard is about Rs. 150 crores.

Figure 7.2 Additional Stackyard – Location, Layout & Route of Conveyors

7.4 Allocation of Additional Stackyard to AVCTPL

Vishakhapatnam Port Trust has signed a Concession Agreement for Development of steam Coal import Handling Terminal at East Quay – 1 (EQ1) situated at inner harbour of port of Vishakhapatnam on (DBFOT) basis with M/s Adani Vizag Coal Terminal Pvt Ltd.

The material handling system comprise of Rail Mounted, self-propelled boom type luff-able, Slew-able stacker cum bucket wheel reclaimer 2 no. with rated capacity of Stacking Capacity 3200 TPH (Rated) and Reclaiming Capacity 2500 TPH (Rated).

The licensee was allotted an area of 1,01,200 m² for stacking the coal at the east dumps from where the cargo is further loaded in to the rakes through the stacking system.

The overall layout plan of the terminal is shown in **Figure 7.3**.

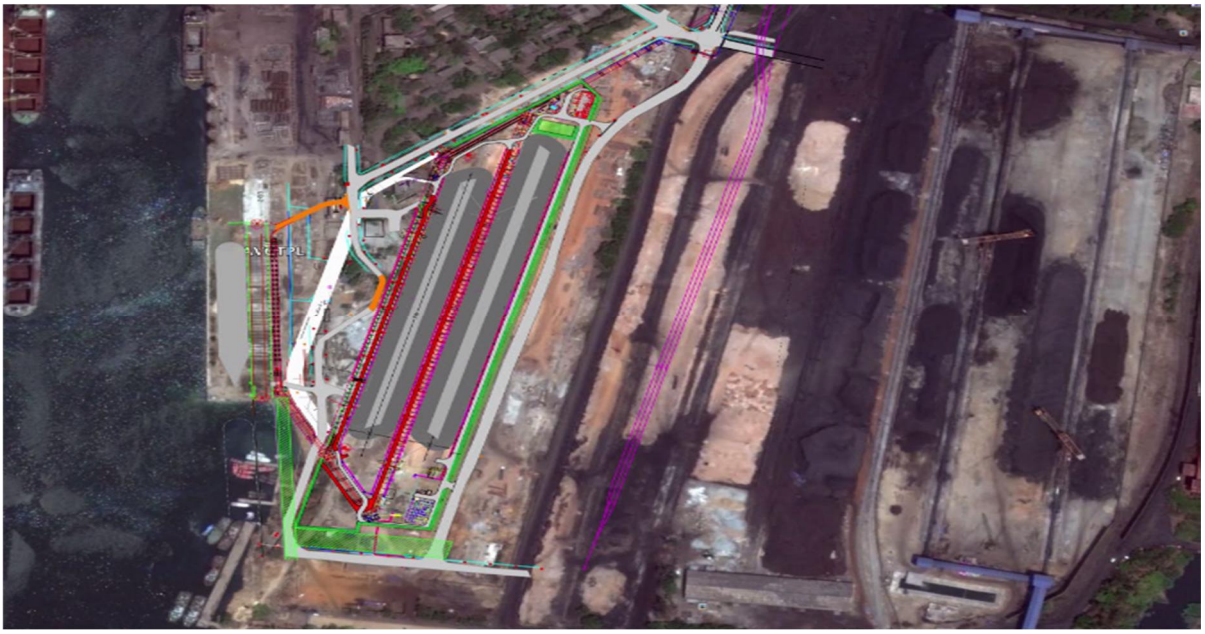


Figure 7.3 AVCTPL Overall Layout

With the trapezoidal shape of land made available with AVCTPL, two linear stockpile of unequal length can only be provided which does not create the effective cargo storage capacity. Owing to the stipulation imposed while getting environmental approval, the stockpile height has to be limited to 10 m only. With the height limitation in these two stockpiles locations the storage capacity is further limited.

Hence there is a requirement of additional land to create a third Stackyard to increase the targeted terminal capacity. It has been identified that land between EQ-1 berth and AVCTPL back up yard could be utilised for the third Stackyard measuring about 2.53 acres. This area can be effectively utilized by the EQ-1 berth operator increasing the cargo storage capacity thereby increasing the terminal capacity which is constrained by storage capacity. The proposed land is indicated accordingly in **Figure 7.4**.

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Figure 7.4 Proposed Allocation of Additional Stackyard

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7.5 Conversion of Temporary Land to Permanent Land for SVCTPL

Vishakhapatnam Port Trust has signed a Concession Agreement for Development of Eastern Quay – 1A (EQ-1A) berth on south side of EQ-1 berth for handling Thermal coal and Steam coal in the inner harbor of Visakhapatnam Port on Design, Build, Finance, Operate and Transfer (DBFOT) basis" with M/s SEW Vizag Coal Terminal Private Limited (SVCTPL).

The material handling system comprise of 2 no. of Rail Mounted stacker cum bucket wheel reclaimer with Stacking Capacity 3000 TPH (Rated) and Reclaiming Capacity 3000 TPH (Rated).

The coal unloaded from rakes by a suitable twin rail wagon tippler system shall be fed on to receiving conveyors which transport it to the coal Stackyard having an area of about 102,513 sqm.

The overall layout plan of the terminal is shown in **Figure 7.5.**

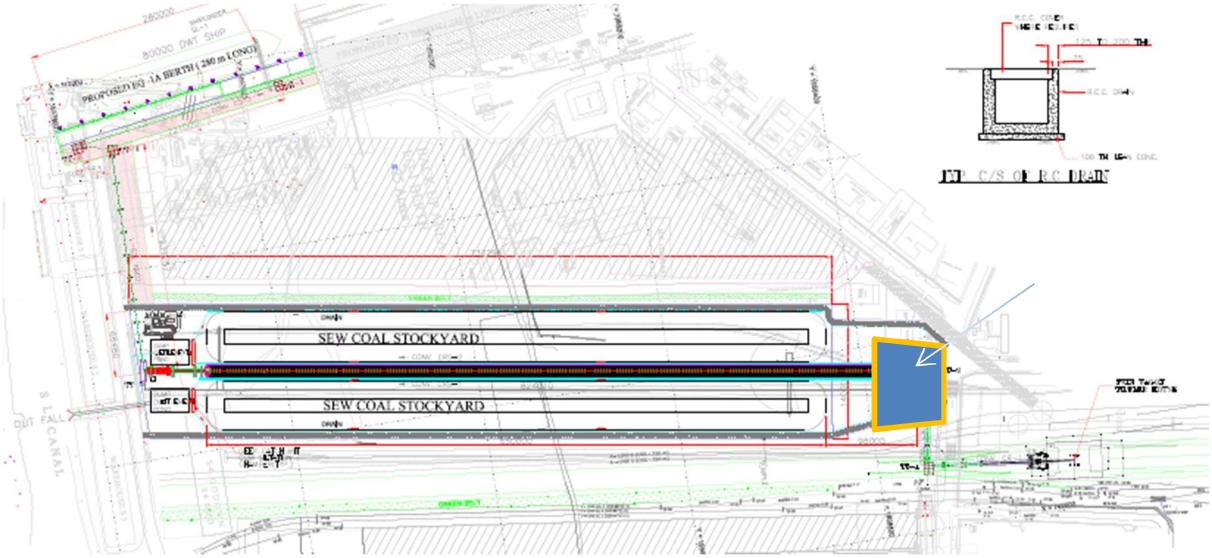


Figure 7.5 SEW Overall Layout

There is a vacant land of 2.82 acres (11,412 sqm) at one end of the stockyard which is outside the area officially handed over to SVCTPL. It is suggested that this Temporary land be converted to Permanent land which can be utilized as the parking for the stacker cum reclaimer cars which in turn would effectively increase the stackyard length and therefore the total stacking capacity of the stackyard.

The proposed conversion of Temporary land to permanent land is indicated in blue colour as in **Figure 7.6**.

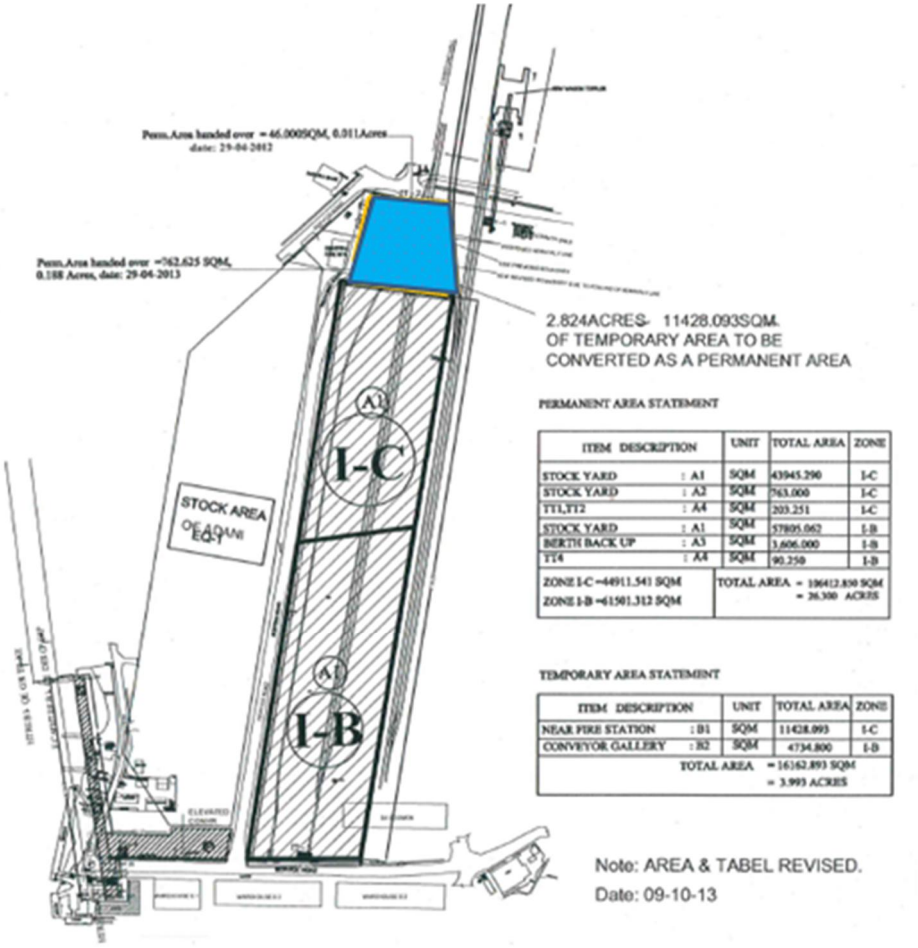


Figure 7.6 Allocation of Temporary Land to Permanent Land

7.6 Stacking Area & Connectivity to Redeveloped EQ 2 – EQ 5 Berths

VPT is upgrading the Inner Harbour so as to handle fully loaded Panamax vessels. The basins are deepened accordingly as well as the berths are being strengthened. Along the East Quay, the port has already commissioned EQ-1 under PPP mode which is capable of handling fully loaded Panamax vessels. For this purpose the old EQ-1 berth along with a portion of EQ-2 berth have been redeveloped into a 280 m long berth. The remaining length of EQ-2 together with EQ-3 and EQ-4 berths and a portion of EQ-5 berth (about 89 m) are proposed to be replaced and realigned to create 2 berths each of 280 m length to cater to fully laden Panamax vessels of 14 m draft. These berths are expected to handle clean cargo such as iron & steel, granite blocks etc.

These berths need appropriate stacking area for transit storage of cargo proposed to be handled. The available stacking area just behind the berths is only 80 m deep and measures around 4.2 Ha (Area 2 as shown in **Figure 7.7**, while about 10 to 12 ha. will be ideally needed for effective operations of these two multipurpose berths. Therefore it is suggested to allocate additional stacking area for these berths. The available area near to the periphery of the Port, near the city, would be preferable to be utilised for storing these clean cargo as compared to using it for any dirty cargo.

The proposed location of stacking area (Area 2) is identified as a plot in between Transit shed of SAIL and the existing rail route of EQ 1 & EQ 1A berths of inner harbour, VGCB & VCTPL of outer harbour. The approximate area of this plot is about 88,000 sqm (8.8 ha.). The location is shown in **Figure 7.7**.

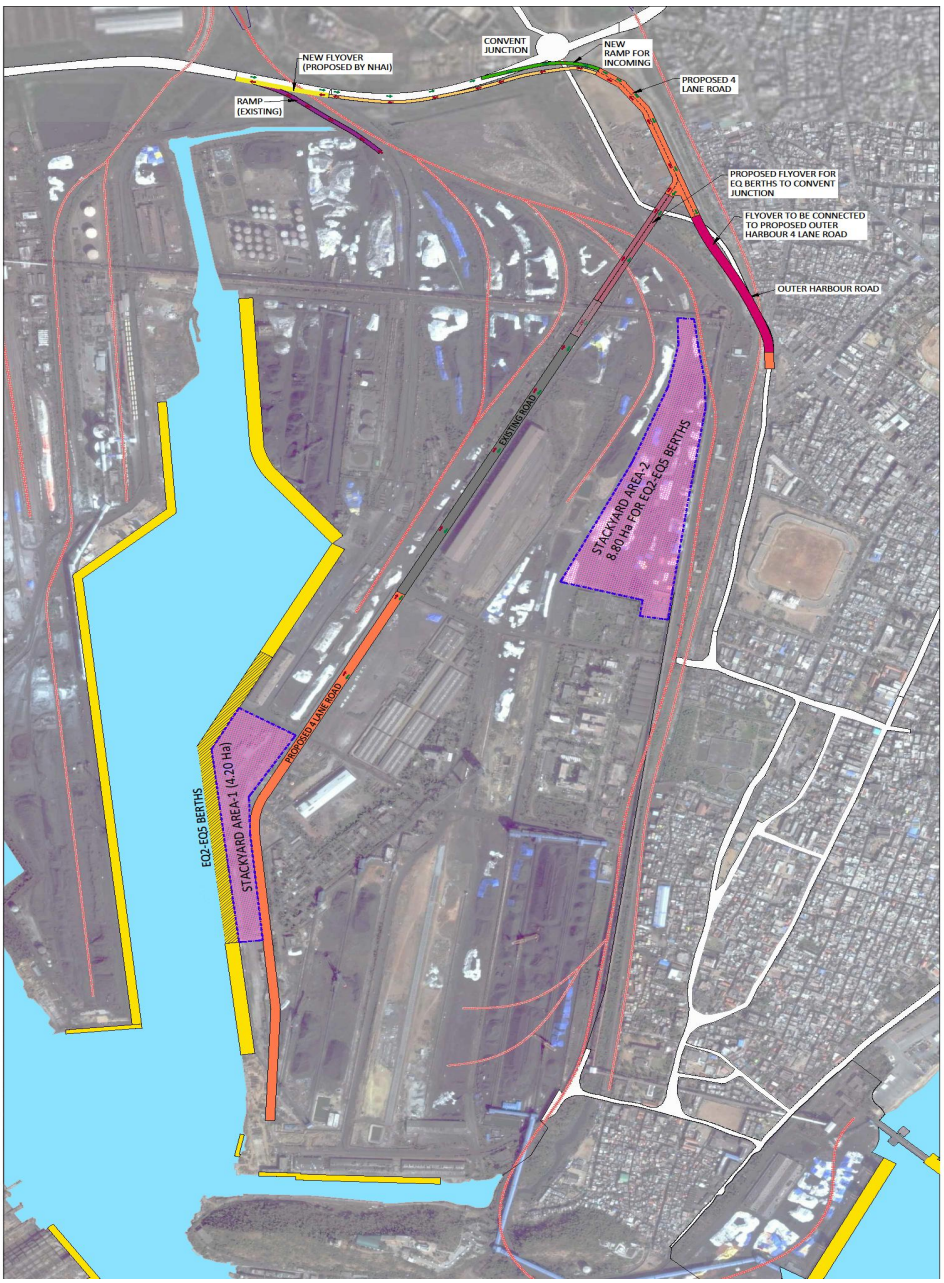


Figure 7.7 Proposed Redeveloped Berths, Stacking Area Location, and Connectivity

The existing and proposed roads and flyovers are also marked in the **Figure 7.7**. The existing 4-lane road adjacent to transit shed is proposed to be extended up to EQ 1A to provide connectivity to the berths EQ 1A and EQ 1 (shown in orange). This proposed road also passes adjacent to the back-up area 1 of the redeveloped berths EQ 2 to EQ 5. Hence the stacking Area 2 is directly connected to berths with the proposed 4–lane road. The stacking area 2 also being adjacent to the existing 4–lane of S4 Road enables expeditious receipt/evacuation of cargo by road.

Regarding rail connectivity, it can be seen that the existing railway lines pass close to stacking area 2 and a siding at the interface could be provided for the rail bound cargo.

7.7 Augmentation of POL Products Handling Facilities

7.7.1 Berthing Facilities

Presently POL products are handled both at the Inner Harbour (IH) as well as at Outer Harbour (OH). At Inner Harbour, they are handled at berths OR I and OR II while at Outer Harbour they are handled at the LPG jetty. The details of these berths are presented in the **Table 7.4**.

Table 7.4 Details of POL Handling Berths

Berth	Cargo Handled	Length (m)	Design Draft (m)
LPG Jetty	LPG & POL	371	14
OR-1	POL	183	10.06
OR-2	POL	183	9.75

7.7.2 Share of Traffic Between IH & OH

The traffic details for the past 4 years were analysed to get the share of IH and OH in handling the total traffic. This information is presented in **Table 7.5**.

Table 7.5 Traffic in POL for the Past 4 Years

Particulars		2014-15	2013-14	2012-13	2011-12
Total Traffic Handled in Million Tonnes		4.54	4.60	5.15	4.99
Total Number of Tankers		341	341	303	331
Traffic Handled at IH	Volume	2.84	2.80	2.67	3.05
	Tankers	253	261	216	235
Traffic Handled at OH	Volume	1.70	1.80	2.48	1.94
	Tankers	88	80	87	96

It could be seen that the OH handles about 40% of the total traffic and the average parcel size is almost twice those handled at IH. This gives an impression that OH handles larger tankers with larger parcel sizes. In order to get the proper perspective, a detailed analysis on the pattern of shipping was carried out.

7.7.3 Traffic Pattern Between IH & OH

A cursory scrutiny of the tanker sizes indicates that on an average about 55% of the tankers are over 45,000 DWT. Hence these groups of tankers were selected for further detailed analysis and the results are presented in **Table 7.6**.

Table 7.6 Performance of Tankers > 45,000 DWT

Traffic	Ship Size		2014-15	2013-14	2012-13	2011-12
Traffic at Outer Harbour	No. of Tankers above 45,000 DWT		53	57	69	68
	Volume handled in million tonnes		1.33	1.54	2.17	1.57
	Ship size in DWT	Maximum	75,013	74,999	76,569	1,15,708
		Minimum	44,970	44,999	44,999	44,995
		Average	53,469	58,495	63,364	56,265
	Parcel size in tonnes	Maximum	50,549	64,035	64,869	41,309
		Minimum	7,176	3,991	12,081	4,000
		Average	25,060	26,934	31,416	23,041
	No. of Tankers with > 30,000 T Parcel		13	14	19	8
Traffic at Inner Harbour	No. of Tankers above 45,000 DWT		58	52	41	47
	Volume handled in million tonnes		1.09	0.85	0.90	1.08
	Ship size in DWT	Maximum	51,763	51,196	52,246	50,076
		Minimum	44,944	44,999	44,999	44,997
		Average	47,351	46,948	47,341	46,592
	Parcel size in tonnes	Maximum	31,443	31,808	33,441	34,604
		Minimum	3,981	1,846	4,004	2,066
		Average	18,852	16,300	22,049	22,935

The following observations are made from **Table 7.6**:

- During the past 4 years the maximum ship size handled at IH was 50,000 to 52,000 DWT and that at OH was about 75,000 DWT.
- During the past 3 years, the maximum parcel size at IH has been 31,000 T to 33,000 T. The maximum parcel size at OH has been 50,500 T to 65,000 T.

- Keeping the bench mark for parcel size as 30,000 T, it is noted that the number of parcels handled at OH greater than 30,000 T has been on an average only 14.
- Even though OH can handle fully loaded Panamax tankers, the actual number of tankers handled with commensurate parcels are only very limited.
- It is to be noted that import of POL products is for marketing purposes and the parcel size is always limited depending on the ullage available and the outflow of the products. Similarly the parcel size of export products is also dependent on the ullage available and the market demand.
- The above table reflects the market situation for these products.

7.7.4 Augmentation of POL Product Handling Facilities

7.7.4.1 Details of the Berths and the Dock Arm

Recently the Port has upgraded the Northern Arm to handle fully loaded Panamax vessels. If such an upgradation has to be carried out at the Western Arm, the efforts and their sequence are examined in this section.

The present layout of the Western Arm, with OR 1 and OR 2 berths is presented in the **Figure 7.8**.

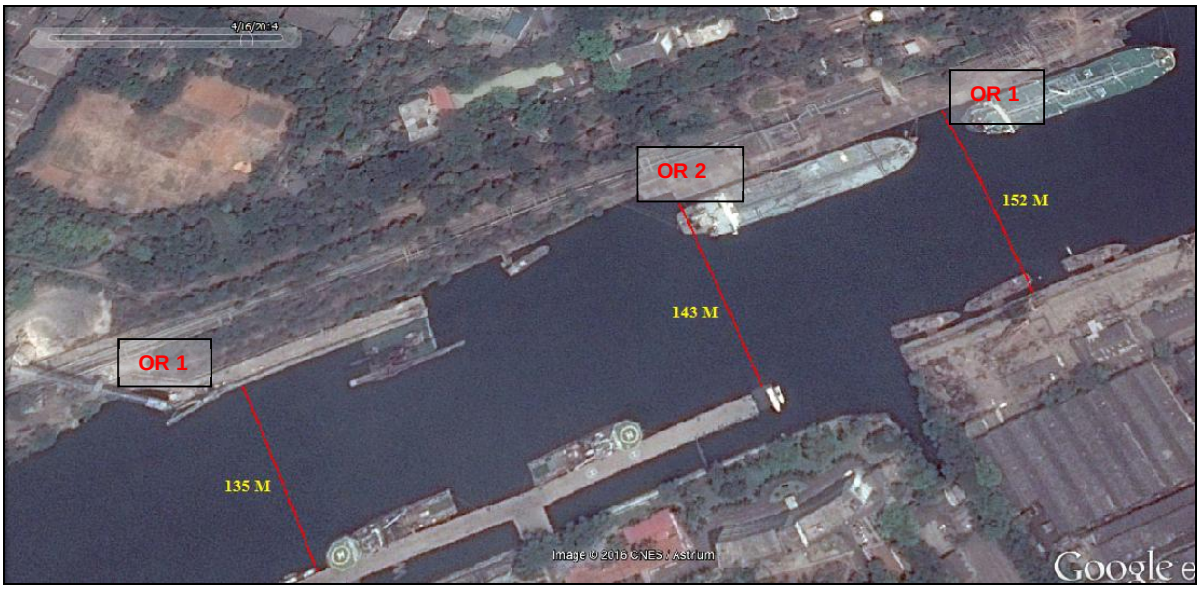


Figure 7.8 Layout of Western Arm

On the northern side are the Fertiliser Berth, OR 1 and OR 2 while on the southern side are the lay-by berths of Hindustan Shipyard. A set of product pipelines run behind OR 1 and OR 2. The existing cross section of OR 1 & OR 2 is presented in **Figure 7.9**.

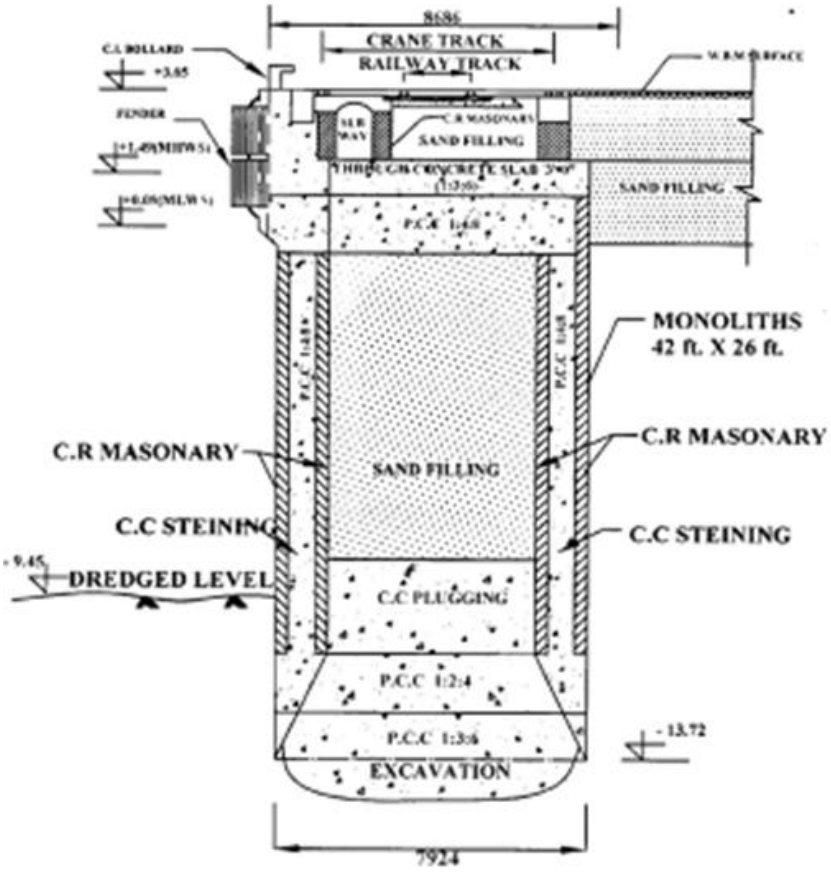


Figure 7.9 Cross Section of OR 1 & OR 2

7.7.5 Possible Options of Augmentation

7.7.5.1 Scheme 1 - Additional Length of OR 1 and OR 2 without Deepening

The suggested option is to extend the existing berths on either side to create additional berthing facilities. It is to be noted that the berthing line of the Fertiliser berth and that of OR 1 & OR 2 are not in the same alignment. The berthing face of OR 1 & OR 2 is set back with reference to the berthing face of Fertiliser berth. Hence it is not possible to make a continuous quay with the fertilizer berth.

OR 1 and OR 2 are each 183 m long. When big tankers call at these berths, it happens that the tankers have to have overhang beyond the berths and the mooring ropes have to be taken ashore at either ends. Hence it is suggested that OR 1 be extended by about 75 m on the eastern side and OR 2 be extended towards fertilizer berth to fill the gap of about 187 m to make the total length of the berths as 553 m. This would enable berthing of two big tankers comfortably within the berth and also enable berthing of 3 MR tankers (about 50,000 DWT) with LOA of about 180 m.

With these measures, the status quo at IH will be maintained without any widening or deepening of the Western Arm, but with a benefit of one additional berth, which would help in significantly reducing the pre-berthing detention. The IH berths will handle most of the POL traffic including the future increase consequent to the refinery expansion.

As indicated earlier, only the limited number of larger parcels could continue to be handled at the OH. This arrangement will release the pressure on the LPG berth which will significantly reduce and make available spare capacity for meeting the future increased traffic in LPG.

The suggested measures are shown in **Figure 7.10**.

Figure 7.10 Suggested Additional Berth Length Adjacent to OR 1 and OR 2

7.7.5.2 Scheme 2 - Additional Length of OR 1 and OR 2 without Deepening

This option is similar to option 1 in terms of getting the additional berth length. However it is proposed in this option that the entire quay length (existing and proposed) shall be upgraded to handle fully loaded panamax ships of draft 14.5 m. Initially the fertilizer berth shall be strengthened and along with newly built berth of 187 m length shall be deepened. Berths OR 1 and OR 2 shall be subsequently dismantled, reconstructed and deepened.

7.7.5.3 Scheme 3 - Deepening of Western Arm and Upgradation of OR 1 and OR 2

The following aspects have to be borne in mind before deciding to upgrade the OR 1 and OR 2 to enable handling of fully loaded Panamax size vessels:

1. At present vessels having beam of 32 m and even above up to 36 m are being handled at these berths and therefore it is envisaged that width of the dock arm is adequate to handle as the required width is governed by the beam and not by the draft of the ships.
2. The existing monoliths are designed for the dredged level of -9.5 m CD and therefore they cannot withstand deepening to -16.0 m CD in the front.

3. If these monoliths are to be retained, a new berth in front of these would need to be built resulting in the reduction of the dock basin width.
4. The best way would be to remove the superstructure and monoliths and a new berth is built at their location. The berth need not be shore connected but dolphin type to enable cost and time saving.

Therefore in case it is decided to upgrade OR 1 and OR 2 to enable handling of deeper draft ships, the efforts and their sequence are as follows:

- OR 1 has to be decommissioned and the pipeline ends have to be closed with flanges.
- The existing monoliths have to be dismantled and a new berthing structure has to be constructed.
- A new set of pipelines have to be laid behind the new berth and running parallel to the existing set of pipelines till a common tap off point.
- After commissioning the new OR 1, OR 2 has to be decommissioned and reconstructed.
- This reconstruction could be extended to the gap between the Fertiliser berth and OR 2 to get additional berthing length.
- OR 2 have to be connected to the new set of pipelines already laid with OR 1.

In this process, it has to be noted that one berth has to be decommissioned. As explained earlier, the POL traffic is handled by 3 berths – OR 1 & OR 2 and LPG berth. While the IH harbour berths handle, on an average 1.4 MTPA each, LPG berth handles on an average 1.9 MTPA. All the berths are occupied to the optimum extent. If one berth is to be decommissioned, there is no alternate berth to handle its share of traffic. OSTT may not be of much help as the only pipeline connection to it is for handling crude oil. For handling products, a new set of pipelines have to be laid, that too, partly submarine and partly on land. It is difficult to get the ROW for the new set of pipelines from OSTT to the respective tankage terminals far away.

7.7.5.4 Scheme 4 - Upgradation of OR 1 for Handling Deeper Draft Ships with Additional Quay Length

In this option as a first step the gap between the fertilizer berth and OR 2 shall be filled by building a new berth of 187 m length.

Once the additional berth length is commissioned, the reconstruction of berth OR 1 would be taken up. In addition, the OR 1 will also be extended towards east by 75 m to make the total berth length of 258 m, which would be adequate to handle the Panamax size ship. The berthing line of the reconstructed berth OR 1 would be kept at the same location i.e. same as that of OR 2. This would enable a continuous quay length of 628 m for handling of POL products.

In this scheme only one berth would be available for handling of deeper draft ships and remaining one/two berth for handling the smaller parcels as in the present case.

7.7.6 Recommended Scheme of Augmentation

There is definitely a need for additional berthing facilities for handling POL traffic so that the high occupancy of OR 1, OR 2 and LPG berths could be reduced.

Based on the past traffic trend it is observed that the number of larger parcel sizes are very limited. These higher parcels can continue to be handled at the LPG berth in OH. It is therefore suggested that Scheme 1 could be adopted for implementation in which only the additional berth length of 250 m would be added to OR 1 and OR 2. These berths would however continue to handle the smaller parcel sizes as being handled in the present case.

However in case it is still desired that the deeper draft ships with POL products are to be handled at IH, it is recommended to adopt Scheme 3 in which only berth OR 1 shall be upgraded to handle deeper draft ships, which are likely to be in very limited numbers. Apart from that additional quay length of 250 m would be built adjacent to OR 1 and OR 2 berths.

7.7.7 Capacity for Handling Liquid Products After Augmentation

The capacity for handling liquid products after the aforesaid augmentation schemes are executed and commissioned is presented hereunder. This will be the situation by 2020 and will remain the same thereafter.

S. No.	Cargo	Berth	Capacity (MTPA)
1.	Crude oil	SPM	15.00
2.	POL products	OR 1, OR 2, OR 3 & LPG berths (3 x 1.7 + 1.5)	6.50
3.	LPG	LPG berth	1.50
4.	Chemicals	EQ 10	1.85
	Total		**24.85**

It is to be noted that presently OSTT is equipped to handle only crude oil and is in a damaged condition due to Hudhud cyclone. The entire crude traffic will henceforth be handled at the SPM only. As and when OSTT gets restored and as the POL product traffic picks up, the port may examine laying product pipelines from OSTT to shore.

8.0 RAIL AND ROAD - INTERNAL NETWORK AND EXTERNAL CONNECTIVITY

8.1 General

For the efficient performance of a port, the effective internal network of road and rail as well as external connectivity to the national highway and trunk railway routes are essential to ensure faster receipt and evacuation of cargo. Accordingly, the existing situation at Visakhapatnam Port and their proposals are described in the following sub sections.

8.2 Internal Road Network

The total road network within the Port limits is about 85 km of which about 23.5 km is available within the operational area connecting the entire stacking areas for free movement of vehicles.

National Highway No. 5, which is part of the "Golden Quadrilateral" skirts Visakhapatnam Port in an arc with the closest at about 12 km distance. On the southern side it connects to Tamil Nadu, Kerala, Karnataka, East & West Godavari Districts of Andhra Pradesh. On the northern side it connects to Odisha, Madhya Pradesh, Bihar, Uttar Pradesh, Jharkhand and West Bengal. For the northern connectivity, the traffic from/to Visakhapatnam Port has to pass through the Convent Junction and for southern connectivity; the traffic has to pass through the Dockyard Junction. The Convent Junction is connected to NH-5 through (1) Gyanapuram Road as well as (2) Tadchettapalem Road. The Dockyard Junction is connected to NH-5 through (3) Industrial Bypass as well (4) New Gajuwaka Road. These are shown in the following **Figure 8.1** & **Figure 8.2**.

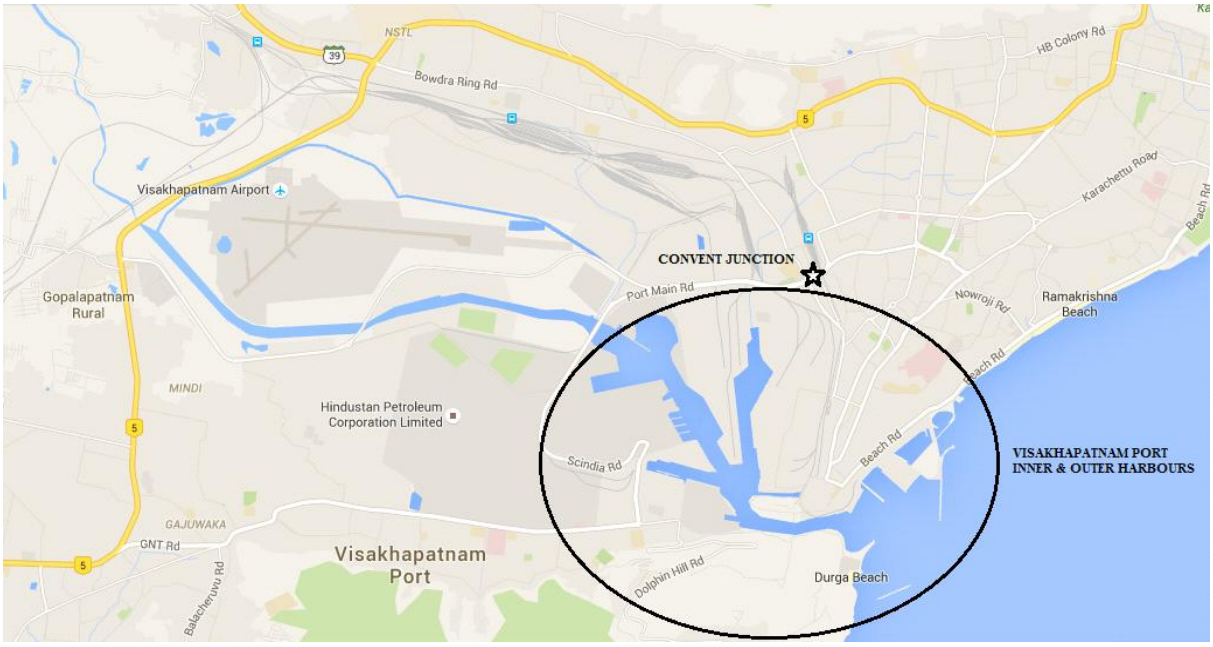


Figure 8.1 Visakhapatnam Port and National Highway No. 5

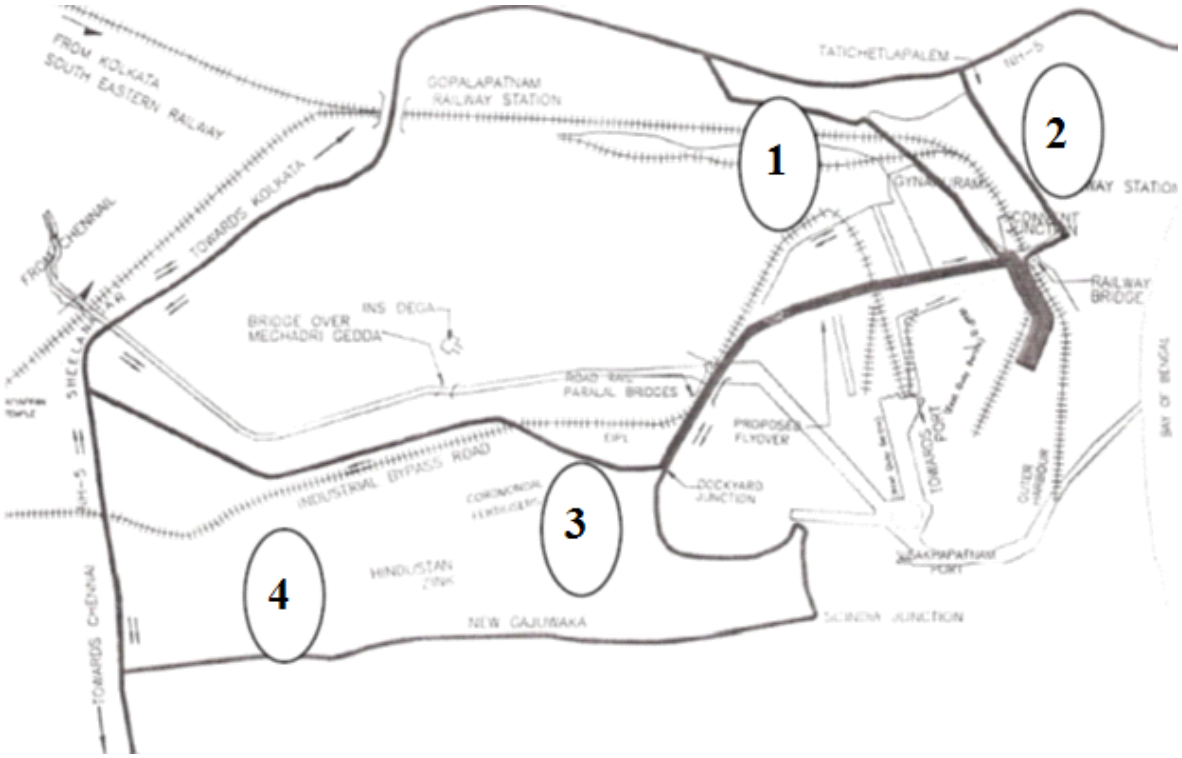


Figure 8.2 Port Connectivity to National Highway No. 5

In the port, all the dry bulk, break bulk, containers and a major portion of liquid bulk are handled at the Northern arm and the Outer Harbour while some POL products are handled at the Western Arm. Hence as could be seen in the **Figure 8.1**, all these dry bulk, break bulk and containers that move through road have to access NH-5 only through the Convent Junction.

In view of this, the road connectivity is looked at from two perspectives – internal connectivity of the port leading to the Convent Junction and the external connectivity from the Convent Junction up to NH-5. The following paragraphs describe the existing situation and the proposals for upgrading the connectivity.

8.3 Internal Connectivity – Present Situation

The total road network within the Port limits is about 85 km of which about 23.5 km is available within the operational area connecting the entire stacking areas for free movement of vehicles.

8.3.1 East Quay Berths

8.3.1.1 EQ 1A to EQ 7 Berths

The present connectivity of these berths is shown in the following **Figure 8.3**.

Figure 8.3 Connectivity of EQ 1A to EQ 7 Berths

EQ 1A and EQ 1 are connected to the Convent Junction through the road just behind the berths, the existing 2 lane service road which travels adjacent to the stackyards of these berths to reach H8 junction. The H8 junction is connected to the Convent Junction through the 3 lane Outer Harbour road which passes through Ambedkar Junction. There is connectivity through the service road which travels in between the stackyards of these berths to touch the north gate. From there it moves via existing 4 lane road located behind SAIL transit shed to reach Port connectivity through Ambedkar junction and Convent junction.

EQ 2 to EQ 7 berths are connected to the Convent junction through the service road behind the berths leading to the North Gate junction and thereafter through the 4 lane EQ 7 road passing through Ambedkar junction.

Before Ambedkar Junction, there is a bottleneck of railway crossing, hampering traffic movement. There is a requirement of development of FOB and an exclusive 4- lane road from Tirupathi Raju Environmental Park up to Convent Junction, within Port boundary.

8.3.1.2 EQ 8 to EQ 10 Berths

EQ 8 to EQ 10 berths are connected to port connectivity road (linking the Convent junction with NH-5) through the 6 lane S4 road and the Ramp B located in front of VSPL main gate as shown in the **Figure 8.4**. If this route is congested, there is an alternative connectivity via the 6 lane S4 road reaching the 4 lane EQ 7 road and thereafter the Convent junction through Ambedkar Junction.

Figure 8.4 Connectivity of EQ 8 to EQ 10 Berths

8.3.2 West Quay Berths

The present situation of WQ berths connectivity is shown in the **Figure 8.5** hereunder.

Figure 8.5 Connectivity of WQ Berths

The WQ berths are connected to Convent Junction by two routes. The first route is through WQ 5 Gate and along the existing 2 lane road in between the OHC yard and NALCO plant with a left turn at Essar junction to join the port connectivity road linking Convent junction with NH-5. The second route is through WQ 5 Gate and along the existing 2 lane road behind the (under constructions) berths WQ 7 & WQ 8, joining the 6 lane S4 road leading to the Ramp B and joining the same port connectivity road. Incidentally the first route serves the OHC yard of Essar also.

8.3.3 Stack Yards at Kancharapalem, on East Side of ESSAR

The stackyards at Kancharapalem, on east side of ESSAR is connected to Port Connectivity road for inward movement of cargo towards STP pond area and for outward movement, the road connectivity is via road on the north side of ESSAR, leading up to Y-junction and from there on connected to Port Connectivity road. These stackyards are adequately connected through road. However, there are constraints for these users to go to eastern dock.

8.3.4 Outer Harbour Berths

The present situation of Outer Harbour berths connectivity is shown in the **Figure 8.6**.

Figure 8.6 Connectivity of Outer Harbour Berths

The connectivity of outer harbour berths VGCB and VCTPL is through the 3 lane Outer Harbour road starting from the Fisheries Harbour and proceeding to the Convent junction through Ambedkar junction. Incidentally this also serves as the connectivity to the Fishing Harbour.

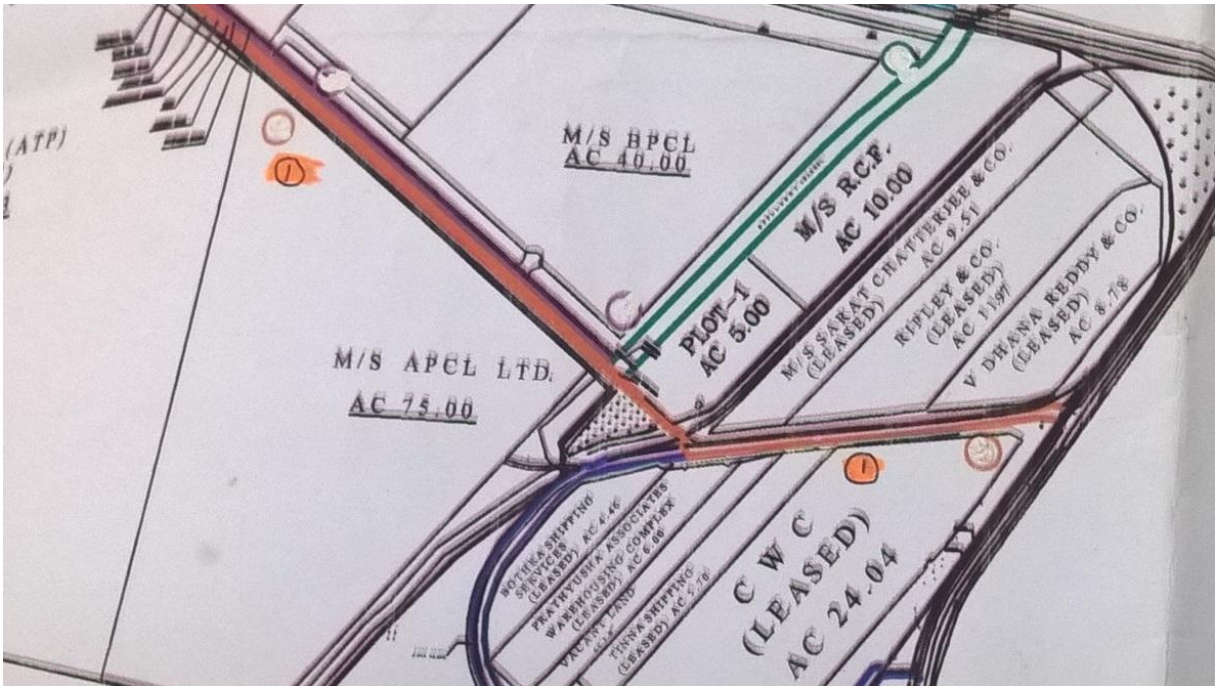
8.4 Internal Connectivity – Works Being Undertaken

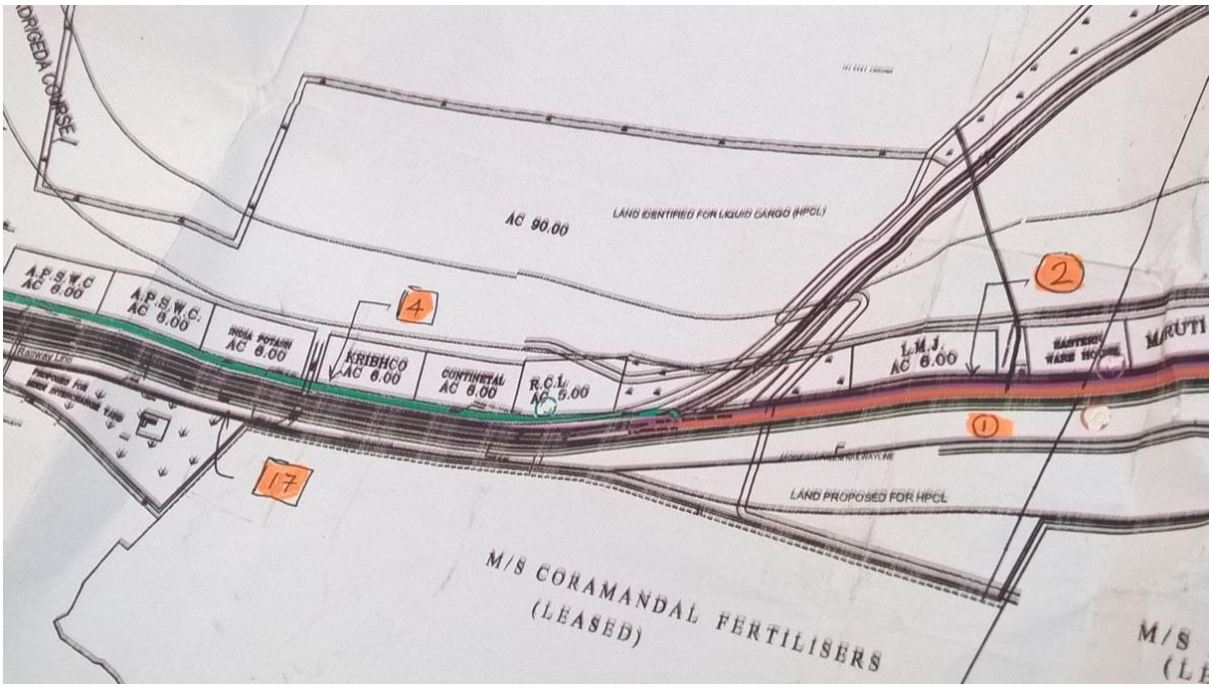
The following road development is proposed and executed by the VPT. It is proposed to be done through output performance of road contract for a period of 5 years:

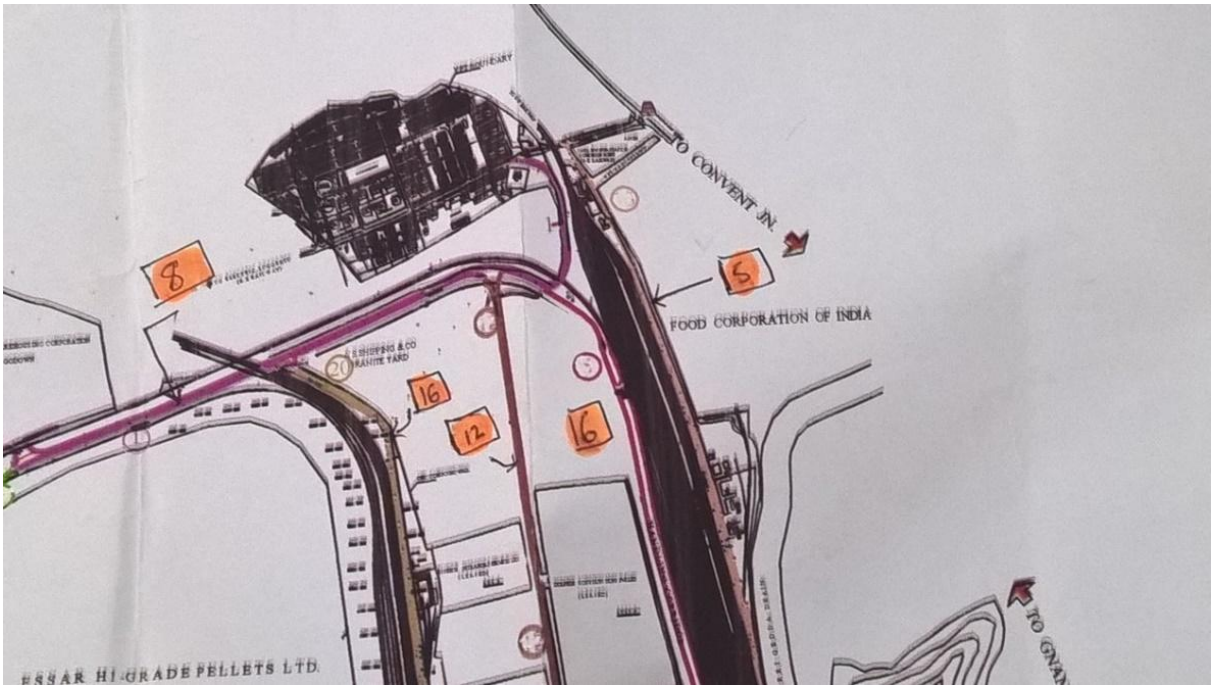
Table 8.1 Details of Proposed Roads by VPT

S. No.	Name of Road	Type of Surface		Length (m)	Breadth (m)
		BT	CC		
Western Sector					
1.	IBP Road from CWC junction to PCR junction (South Side)	BT		500	15
				2550	9
2.	IBP Road from CWC junction to PCR junction(North Side)	BT		2500	7.5
3.	Resurfacing of Road from JP L/C to single span bridge (OPP EIPL)	BT		1350	7.5
4.	Road from PCR Circle to container Yard at Sheela Nagar	BT		2300	7
R&D Yard					
5.	Road from South Gate to North Gate of R&D yard	BT		1150	6
6.	Road along L – 15 Corridor	BT		1100	15
7.	Road from Convent junction to NCFOB approach	BT		500	9
8.	Road from CWC to SS Nagar	BT		1270	7.5
9.	Road from CWC junction to SV Patel Bridge	BT		1300	7.5
OHC Area					
10.	NCFOB	BT		725	7.3
R&D Yard					
11.	NCFOB to South Gate of R&D		CC block	410	7.5
12.	NCFOB to SS Nagar (K R Sons Junction)		CC block	300	10
				1200	16
13.	West of Ambedkar Bridge to Y junction		CC Block	1500	9
OHC Area					
14.	Roads from WOB to ESSAR		CC Block	2300	9.5
15.	Service road and siding along JP-1 and JP-2		CC Block	1500	26
16.	Ambedkar FOB		CC Surface	405	7.5

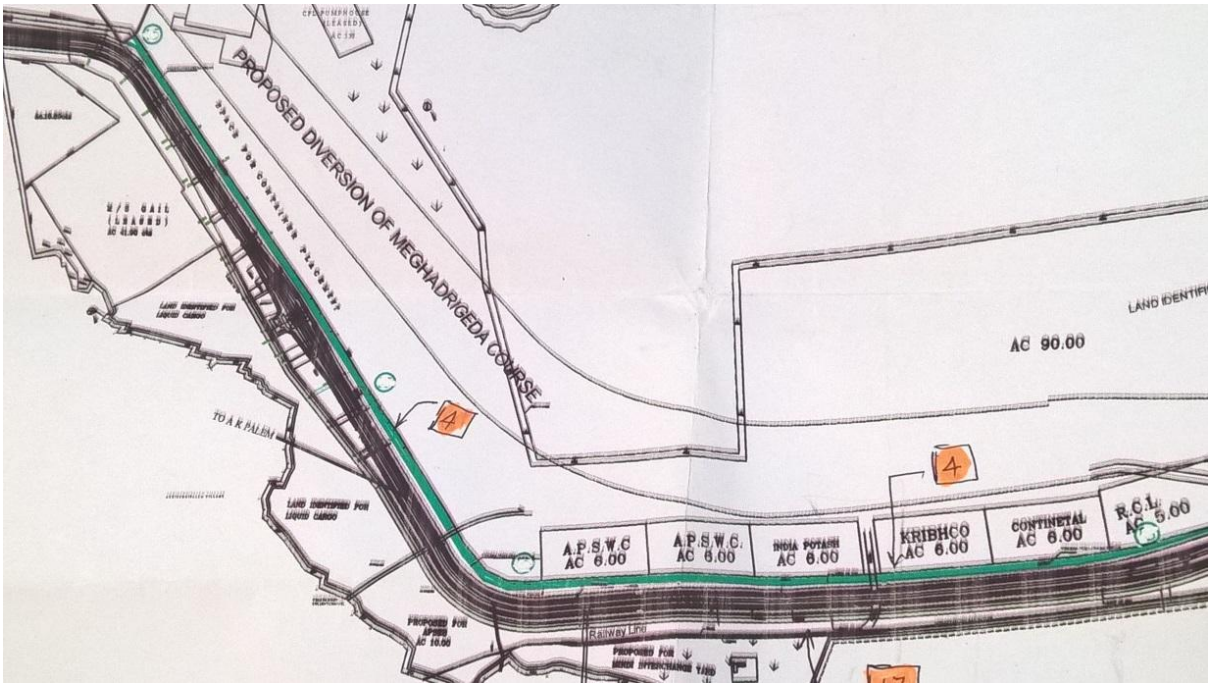
The locations are given below as per the Sl. No. of the road works.






TO CONVENT JN.
FOOD CORPORATION OF INDIA
ESSAR HI-GRADE PELLETS LTD.
8
5
16
12
16


ESSAR HI-GRADE PELLETS LTD.
AC110.00
ONGC
(LEASED)
TO GNANAPURAM
GAILI HILL
13
14
11
7
9
TOCL
IMC LTD


PROPOSED DIVERSION OF MEGHADRIGEDA COURSE
AC 90.00
A.P.S.W.C AC 6.00
A.P.S.W.C. AC 6.00
INDIA POTASH AC 6.00
KRIBHCO AC 6.00
CONTINETAL AC 6.00
R.C.I. AC 5.00
Railway Line

8.5 Internal Connectivity – AECOM Proposals

During the site visit AECOM identified the following critical junctions which will require immediate attention.

- Ambedkar Junction
- S4 Road Junction
- WQ5 Gate Junction
- Nalco Junction
- K R Sons Junction

8.5.1 Ambedkar Junction

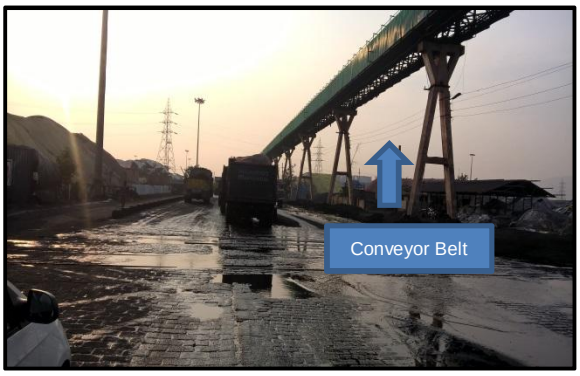
8.5.1.1 Existing Situation

8.5.1.2 AECOM Proposal

- The rotary has to be designed properly taking care of all the arms of the same.
- Regulations has to be enforced for the errant vehicles
- The roads around the rotary should have 7.0 m wide road through out with proper channelization

8.5.2 S4 Road

8.5.2.1 Existing Situation



Presently the road is having 4 lane configurations. The foundation of the conveyor belt works as a median. The road is about 3 km in length but it has 3 railway line crossing. The railway lines are active and have frequent wagon movement which in turn results major traffic congestion. The road condition is extremely poor. Presently although the roads have 4 lane configuration, traffic uses the road as individual 2 lane road.

8.5.2.2 AECOM Proposal

- The road needs to be used as divided 4 lane road with strict traffic regulation.
- It is proposed to have good quality cement concrete pavement for better traffic movement
- It is proposed to use traffic light system / uses of the flagman for the traffic comes from the loading / unloading yard to reduce the conflict with the through traffic

8.5.3 WQ5 Junction

8.5.3.1 Existing Situation




Presently, junction is having 3 legs and the railway line passes thru the junction. The uncontrolled vehicular movement leads to major traffic bottleneck during peak hours

8.5.4 AECOM Proposal

- The junction is proposed to be developed as properly designed roundabout. Blinkers may be installed for the safety of the night traffic movement
- The road in between WQ5 and Nalco junction is proposed to be developed with divided 4 lane configuration

8.5.5 Nalco Junction and K R Sons Junction

8.5.5.1 Existing Situation

8.5.5.2 AECOM Proposal – Option A

It is proposed to have a divided 4 lane road in between Nalco junction and K R Sons Junction.

8.5.5.3 AECOM Proposal – Option B

It is also proposed to have integrated development plan for the three junctions namely WQ5 junction, Nalco junction and K R Sons junction.

It is observed major traffic congestion occurs when the wagon comes at the yard which in turn increases the movement of Truck traffic.

Therefore it is proposed to have a grade separated 2 lane road from WQ5 junction to K R Sons junction (**Figure 8.7**). This arrangement will reduce the traffic congestion as it will reduce the conflict to great extent. It is also proposed to have a dedicated road from the K R Sons Junction to the National Highway which will increase the efficiency of evacuation.

Figure 8.7 Proposed 2 Lane Road from WQ5 Junction to K R Sons Junction

8.5.6 Road Proposal from Fishing Village to Convent Junction

From the fishing village it is proposed to have a 4 lane road. There are some critical issues along this road which were discussed during the site visit of AECOM. It is proposed the maximum using of existing road so that the cost of construction may be minimised.

Existing road from fishing harbour to Convent Junction stretches for about 5.75 km.

The **critical location 1** mentioned may not have the required width. The boundary wall may need to be shifted to accommodate the road configuration

The proposed road passes through another critical area as mentioned in **critica**l **Location 2.** The conveyor belt does not allow the proper 4 lane configuration. There is a hillock at one side. The existing road width will be used for 2 lane and other 2 lane is proposed to be through hillock cutting. The geological property of the rock need to be analysed during detailed design stage. If the hillock cutting made the rock unstable, in that case the road has to be taken through a tunnel. The length of the tunnel will be about 400m. The actual length may be determined during the detailed study.

Another recommendation is to provide a 2 lane elevated corridor along with a 2 lane road at concurrent locations before they connect to the 4 lane road beyond critical locations 2 and 3. Necessary ramp at both ends shall be provided. Also Truck parking for Incoming vehicles need to be allotted to avoid Parking at roadside during peak hours.

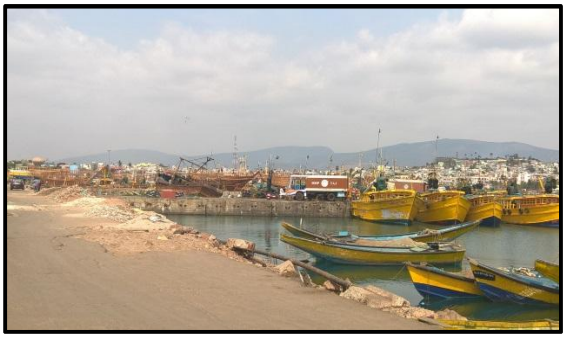
Critical location 3 comes on the alignment as given in the photographs. Pipe line passes along the canal makes the location critical for road widening. It is proposed to have the elevated road (2 lane) along the canal and the existing road will be used for the other 2 lane road.

The Critical Location 1, 2 & 3 are shown in **Figure 8.8**.

Figure 8.8 Outer Harbour Road with Critical Locations for Widening (4 Lane Road Proposal)

After the canal, there is no such critical location till it reaches the Convent junction. VPT initiated action for the development of Fly Over Bridge connecting existing road from EQ up-to the road connecting Port Connectivity Junction (Convent Junction).

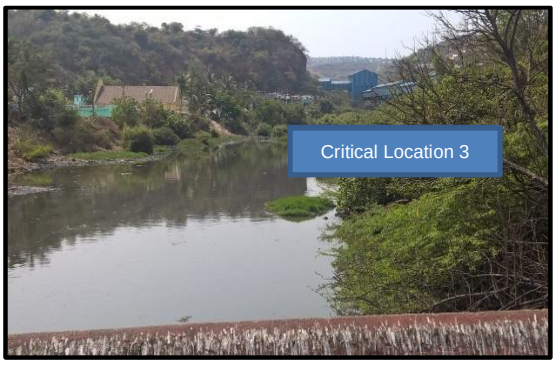

Fishing Village
Existing Road




Road Widening in
Progress


Critical Location 1


MF OFFICE
AOB
DCI
DC OFFICE
CUSTOMS


Critical Location 3

Before Ambedkar Junction, there is a bottleneck of Railway crossing, hampering traffic movement, requiring a fly over bridge with necessary diversion and shall be connected to the outer harbour and existing 4-lane road of Eastern sector road with proper ramp below the S-4 conveyor. These shall be connected to the new Fly over proposed by NHAI and from there it shall be connected to the Port connectivity Road.

New ramp exclusively for incoming vehicles shall be provided from Port connectivity road (near Convent junction) to Outer harbour and eastern Sector. The location of Fly over with new Ramp is shown in **Figure 8.9**. Capacity calculation considering projected road traffic is indicated in **Table 8.2**.

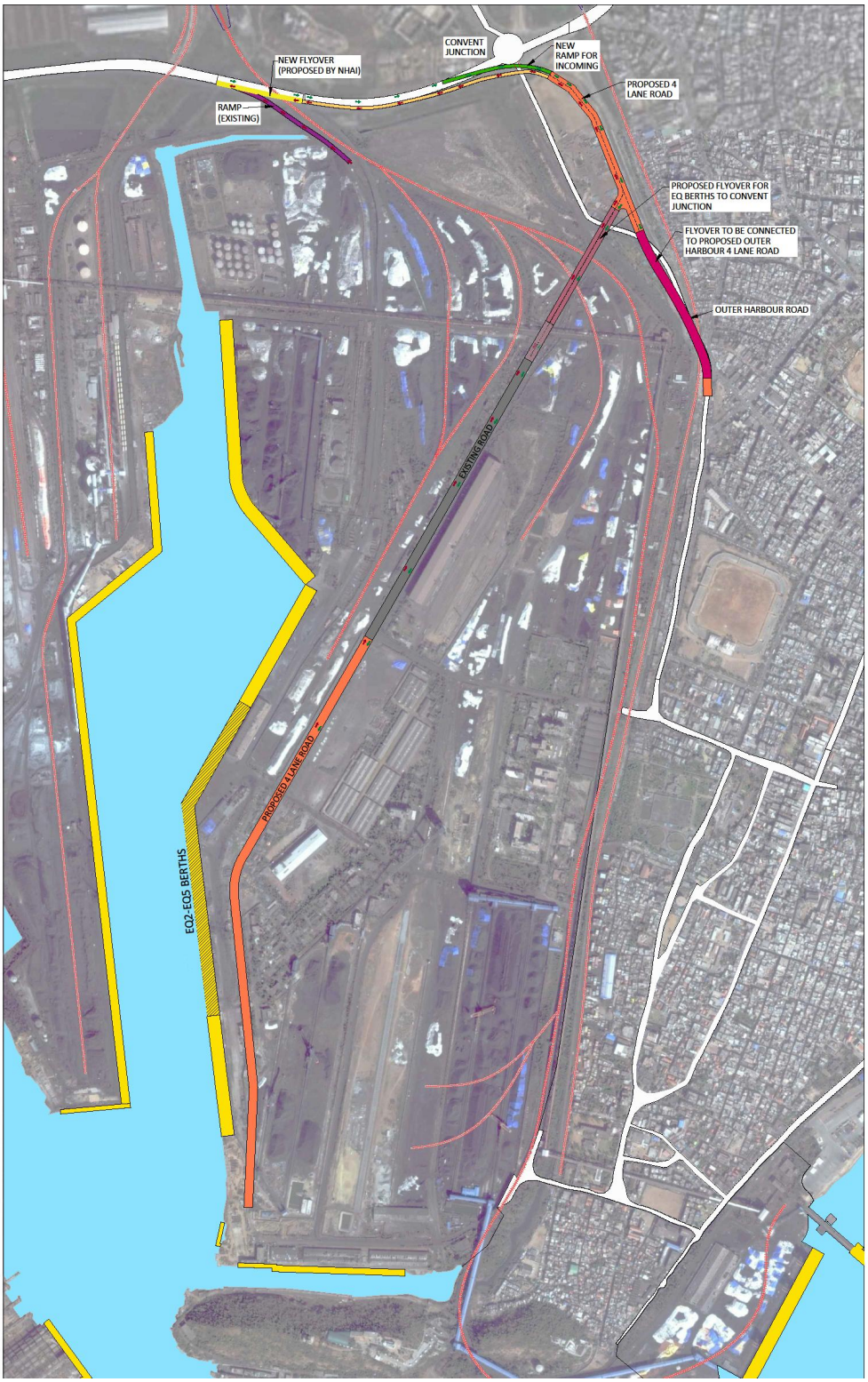


Figure 8.9 Proposed Fly Over Near Ambedkar Junction to Connect Convent Junction

Table 8.2 Capacity Calculation Considering Projected Road Traffic

VISAKHAPATNAM PORT TRUST

Requirements for Road Modifications

S. No.	Road Details	Cargo Originating Center	Cargo Capacity MTPA	Cargo Proportion			Capacity of Truck (T)	Based on Projected Capacity							Proposed Road /Fly over	Recommendation	Remarks
				By Rail (%)	By Road (%)	By Conveyor / Transhipment (%)		No. of Trucks from Terminal (per annum)	Proportion of trucks on the road under consideration	Trucks per hour both ways	Peaking Factor	PCU Factor	PCUs per Hour on the proposed road	Total PCUs per Hour			
1	Existing Capacity																
	From Outer Harbour	VCTPL	8	20%	70%	10%	15	373,333	100%	106.67	50%	4.5	720	851			Presently 3 lane Configuration
		VGCB	10.18	90%	10%	0%	15	67,867	100%	19	50%	4.5	131				
	Projected Capacity																
	From Outer Harbour	VCTPL	20	20%	70%	10%	15	933,333	100%	266.67	50%	4.5	1,800	1,931	4 lane undivided carriageway (Capacity 2400 pcu per hour)	From Outer harbour to Convent Junction upgrade 3 lane to 4 lane road with necessary elevated corridor	Critical locations shown in the Fig 4.2
		VGCB	10.18	90%	10%	0%	15	67,867	100%	19	50%	4.5	131				
2	Existing Capacity																
	I) From Eastern Sector (via Existing EQ7 Road)	EQ1A	7.36	90%	10%	0%	15	49,067	1	14	1	4.5	95	431			Existing 4 lane road upto old Ambedkar Junction
		EQ1	6.4	90%	10%	0%	15	42,667	100%	12	50%	4.5	82				
		EQ2-5	4.14	60%	40%	0%	15	110,400	100%	32	50%	4.5	213				
		EQ6	3.22	90%	10%	0%	15	21,467	100%	6	50%	4.5	41				
		EQ7															
	II) From Eastern Sector	EQ 8	1.88	90%	10%	0%	15	12,533	100%	4	50%	4.5	24	426			Presently Cargo is moving via RAMP B
		EQ9	3.68	60%	40%	0%	15	98,133	100%	28	50%	4.5	189				
		EQ10	1.84	0%	90%	10%	15	110,400	100%	32	50%	4.5	213				
	Projected Capacity																
	I) From Eastern Sector (via Existing EQ7 Road)	EQ1A	7.36	90%	10%	0%	15	49,067	1	14	1	4.5	95	583	4 lane undivided (Capacity 2400 pcu per hour)	From EQ1A to New Proposed 4 lane road back side of EQ1A to EQ 5 Berths. Required Fly over to avoid Railway Crossing near Old Ambedkar Jn to connect the Port Connectivity Road	
		EQ1	6.4	90%	10%	0%	15	42,667	100%	12	50%	4.5	82				
		EQ2-5	6.4	60%	40%	0%	15	170,667	100%	49	50%	4.5	329				
		EQ6	6	90%	10%	0%	15	40,000	100%	11	50%	4.5	77				
		EQ7															
	II) From Eastern Sector	EQ 8	4	90%	10%	0%	15	26,667	100%	8	50%	4.5	51	470			Presently Cargo is moving via RAMP B and during Peak hours via EQ7 to Convent Jn. Need to be rearranged.
		EQ9	4	60%	40%	0%	15	106,667	100%	30	50%	4.5	206				
		EQ10	1.84	0%	90%	10%	15	110,400	100%	32	50%	4.5	213				

The existing 4 lane road shown shall be extended up to EQ 1A to provide connectivity to the berths EQ 1A and EQ 1. This proposed road also passes adjacent to the back-up area redeveloped berths EQ 2 to EQ 5. In this way their stacking area will be directly connected with the proposed 4–lane road. The location of the proposed 4-lane road is shown in **Figure 8.10**

Figure 8.10 Proposed Road Connectivity of Visakhapatnam Port

8.6 External Connectivity – Present Situation

The port is connected to NH-5 through Port Connectivity road, GNT road, Thatichetlapalem road, and Industrial by-pass Road. There has been a significant improvement in the quality of road infrastructure over the last few years. Out of these, the most important is the Port Connectivity Road linking the Convent junction with the NH.

VPT has constructed this road connecting the port with NH-5 which essentially links the port with its hinterland. The project stretch comprises a total distance of 12.47 km connecting the Convent Junction (near port gate) to NH-5 near Ayyappan temple with about 4.85 km of flyovers and ramps. This has been in operation for almost 10 years.

8.7 External Connectivity – New Proposal

8.7.1 Proposed Road Connectivity from Sheela Nagar Junction to Anakapalle-Sabbavaram/Pendurthi-Anandapuram Road Under Phase-III

VPT is initiating action for the development of adequate road connectivity from Visakhapatnam Port – Connectivity from Sheela Nagar Junction to Anakapalle-Sabbavaram/Pendurthi-Anandapuram road under Phase-III i.e., NH-16 (Former NH-5) through SPV between VPT and NHAI.

The Port Cargo travelling via NH-5 from the point of Port Connectivity Junction reaches at Ayyappan Temple Junction at Sheela Nagar, can travel either towards North or South, based on the destination. From the point of Port Connectivity Road meeting NH-5, up-to the point of crossing the Visakhapatnam city, there is congestion due to city traffic interacting with the Cargo movement. Hence NHAI has proposed to upgrade the existing by-pass road between Anakapalle Junction up-to Anandapuram Junction into a National Highway, which bypasses the city traffic, and VPT needs to synchronize its port connectivity with this bypass road of NHAI.

This connectivity from Port Connectivity Junction with NH-5 at Ayyappan Temple Junction at Sheelanagar, up-to the subject bypass road at Sabbavaram Junction, reduces a travel distance of about 25 km on either side of travel, along with reduction of the city congestion enabling free cargo movement, which needs to be taken up on priority. Consultancy services for preparation of detailed project report entrusted to M/s. Aarvee Associates Architects Engineers & Consultants Pvt Ltd by NHAI on 15.01.2016. The location of the proposed road connectivity is shown in **Figure 8.11** and **Figure 8.12** hereunder.

Figure 8.11 Proposed Road Connectivity of Visakhapatnam Port

Figure 8.12 Proposed Road Connectivity of Visakhapatnam Port

8.7.2 Proposed Road Connectivity from RCL to Mindi Yard to NH-16

VPT initiated action for the development of adequate road connectivity from Visakhapatnam Port to NH-16 (former NH-5) i.e. Phase II works - Widening of existing 2-lane Port Connectivity Road to 4-lane. The present road connects NH-16 (former NH-5) at Sheela Nagar to Port connectivity road junction, for inward as well as outward movements of cargo. Presently the existing connectivity from Western Sector starting from IBP Junction up-to RCL Junction is only a two lane. This stretch from Western Sector starting from IBP Junction up-to RCL Junction needs to be converted into a four lane to facilitate safe, efficient and smooth movement of traffic on project road and link roads in the Port area. The scheme proposed to be taken up by the VPT and NHAI on EPC basis. The work already awarded by NHAI on 22.01.2016 to the Contractor and the Cost of Rs. 76.94 Cr and will be commencing soon. The Ministry released Rs. 20.00 Crore under the Sagarmala Project on 09.01.2016. The location of the proposed road connectivity is shown in **Figure 8.13.**

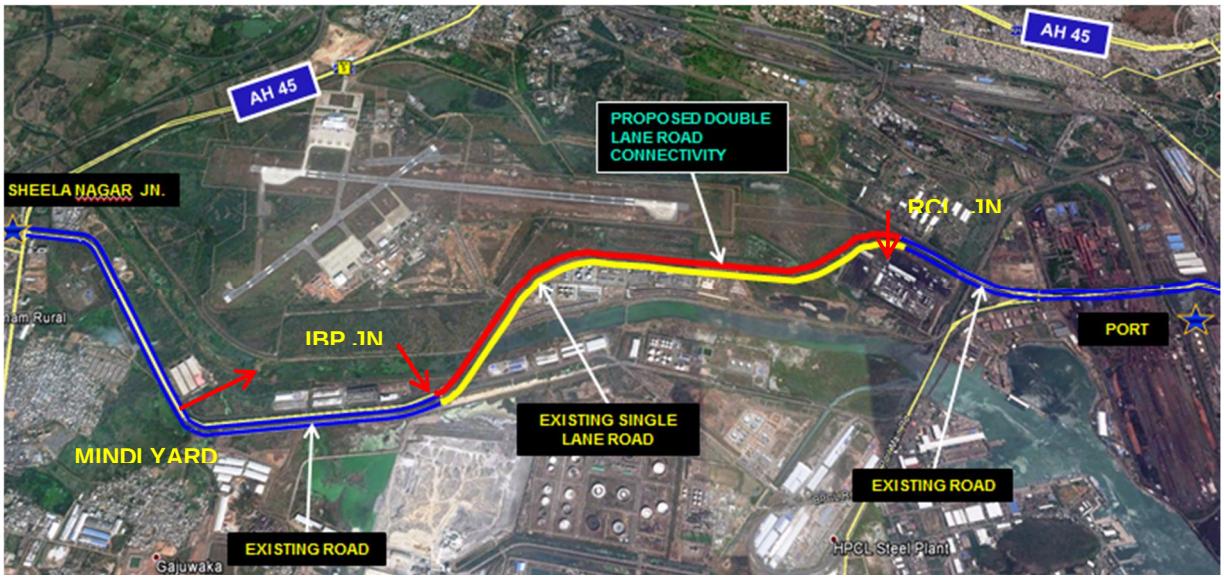


Figure 8.13 Proposed Road Connectivity of Visakhapatnam Port

8.8 Port Internal Rail Network and External Connectivity

8.8.1 Internal Rail Network

8.8.1.1 Overview

The Visakhapatnam Port has a vast railway network consists about 176.678 ETKM approximately including Private sidings. The existing B.G Track in Port 83.718Km and 214Nos Points & Crossings (i.e.21.40ETKM). The total track is being maintained by VPT is 105.118 ETKM and Private sidings of 71.56 ETKM and renders terminal services for the traffic carried by the Indian Railway to and from hinterland. The VPT railway system has two gate ways for carrying cargos i.e., one Marshalling yard to R&D yard for handling various general cargos and other from Ore Exchange Yard to OHC for handling iron ore. VPT Railway network has two Sectors i.e. Eastern Sector and Western Sector, which are under the jurisdiction of four subdivisions for development and maintenances. In the Eastern Sector there are 2 yards i.e. (i) North Holding Yard & East Yard (ii) R & D Yard and in Western Sector there are 2 yards i.e. (i) OHC Yard and (ii) Western Sector Yard. Maximum part of the OHC / lines are owned, maintained and operated by the M/s. ESSAR Vizag Terminal Ltd.

The key-plan of VPT railway layout is shown in **Figure 8.14**.

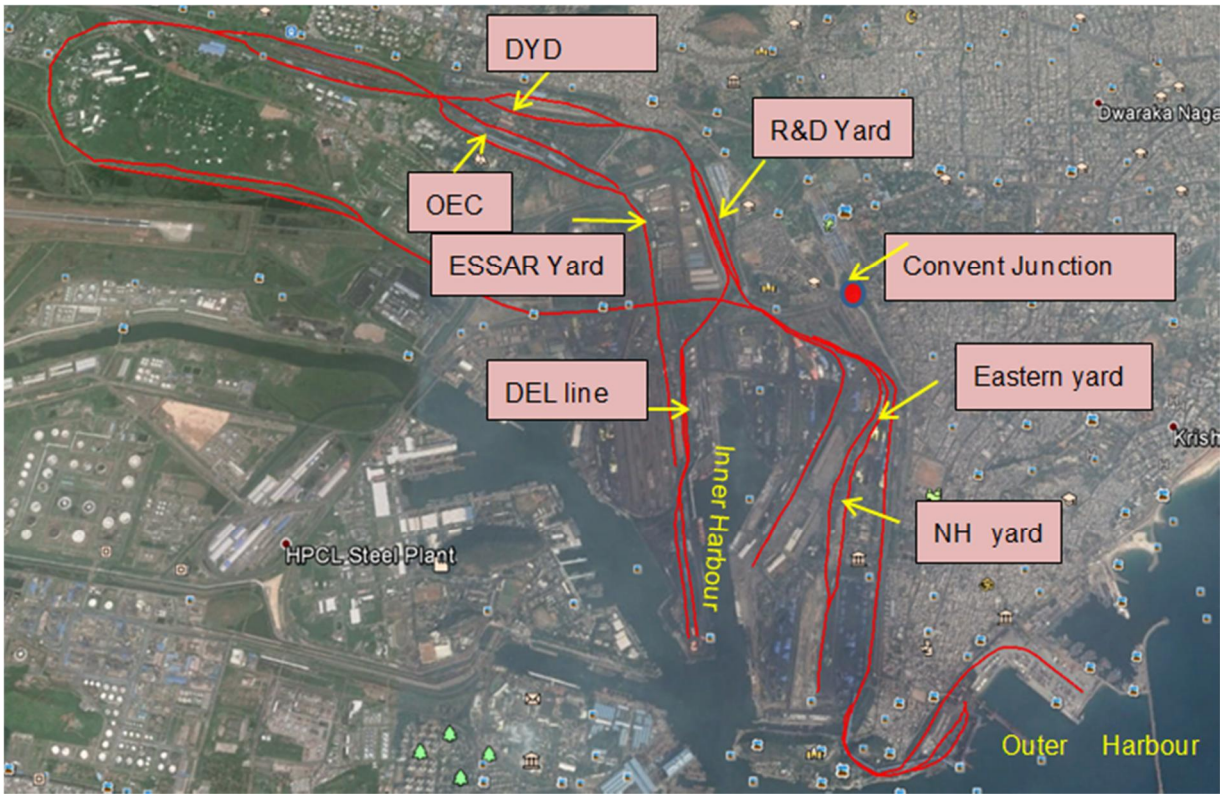


Figure 8.14 Key Plan of VPT Railway Layout

8.8.1.1.1 North Holding Yard (NH Yard) & Eastern Yard

Total track length of East yard and NH yard is 29.591 ETKM there are 31 lines and 53 points and crossings. The railway track structure is modified according to the latest developments in loading / unloading operations and serving lines to various terminals i.e., M/s. VGCBL, M/s. Adani Ltd., M/s. SEW, M/s. VCTPL, M/s. SAIL, M/s. FCI–F siding etc.

8.8.1.1.2 R&D Yard

The Reception & Dispatch yard (R&D yard) and west ore berth lines of Visakhapatnam Ports were commissioned during the year 1969-72. The R & D yard with adjacent Spur lines, DE lines and W.O.B lines are maintained by R & D Sub-division with a total 39.359 ETKM of track length, which consists 82 points & crossings, 21 B.G Railway lines in R & D yard, 2 Spur lines in TNEB complex, 10 lines in W.O.B including DE lines and 1 siding in between R&D yard and OHC. In R&D yard there are 19 lines with signalling and Electrical traction. Remaining lines including DE lines are without Electrical tractions. The trains are being handling to and from R & D Yard to marshalling yard by E. Co. Railways with Railway locos from R & D yard to various sidings by VPT locos.

8.8.1.1.3 Western Sector

Western Sector yard of Visakhapatnam Port has the multiple railway connectivity to various sidings, yards and Ports operational with 28.520 ETKM. It consists of 26 B.G Railway lines & 40Nos of Points & Crossings. Railway tracks in the Western Sector yard were laid for serving the different types of cargo such as fertilizers, food grains, POL products of Central Warehousing Corporation, M/s. H.P.C.L, Oil terminal of Indian Oil Corporation, M/s. Coramandal Fertilizers, M/s. F.C.I, M/s. Zinc, M/s. HZL, M/s. Sarat Chatterjee etc.

8.8.1.1.4 Ore Exchange Yard (OEC)

The iron ore handling system consists of the Ore Exchange Yard operated by the Railways and the Ore Handling Complex, operated by the Port.

The Ore Exchange yard consists of 12 lines of which line nos. 1 to 5 are reception lines and line no. 6 is engine run round line. These are fully wired. Line No. 7 is provided with full wiring and is used as dispatch line only to K.K.line. Line nos. 8 and 12 are dispatch lines provided with top wiring. Line Nos. 9 & 11 are used for conducting P.M.E. (C&W) and these lines have only top wiring. Line no.10 is C&W Material trolley line with top wiring. Additional lines are provided for repairing sick wagons.

In the Ore Handling Complex, there are ten pre-tippler and ten post tippler lines. A train after being brought from the ore Exchange Yard is split into two equal parts and the wagons are uncoupled. They are then brought to the tipplers by VPT Locos for tippling. After tippling, the empty wagons are gathered in the post tippler lines and returned to the Ore Exchange Yard for onward dispatch to the loading points.

In addition, there are three lines for manual unloading of iron ore rakes.

The movements between the Ore Exchange Yard and Ore handling Complex are shunt movements controlled by J. Cabin of the Railways and Dumper cabin of the Port.

8.8.1.2 Present Situation of Railway Lines

8.8.1.2.1 EQ1 & EQ1A Berths

M/s. Adani Railway Lines: The existing Railway lines of M/s. Adani Vizag Coal Terminal Ltd., are used for carrying and handling of Cargo at EQ1 berth of M/s. AVCTL. The existing Railway lines of VPT are used by M/s. AVCTL for the transportation of cargo handling at EQ1.

M/s. SEW Railway lines: The existing Railway line of VPT will be used by M/s. SEW for the transportation of cargo handling at EQ1A and they will lay 2 railway on pre tipper and post tipper.

The rail network connecting from EQ1&EQ1A stacking yard is shown in **Figure 8.15**.

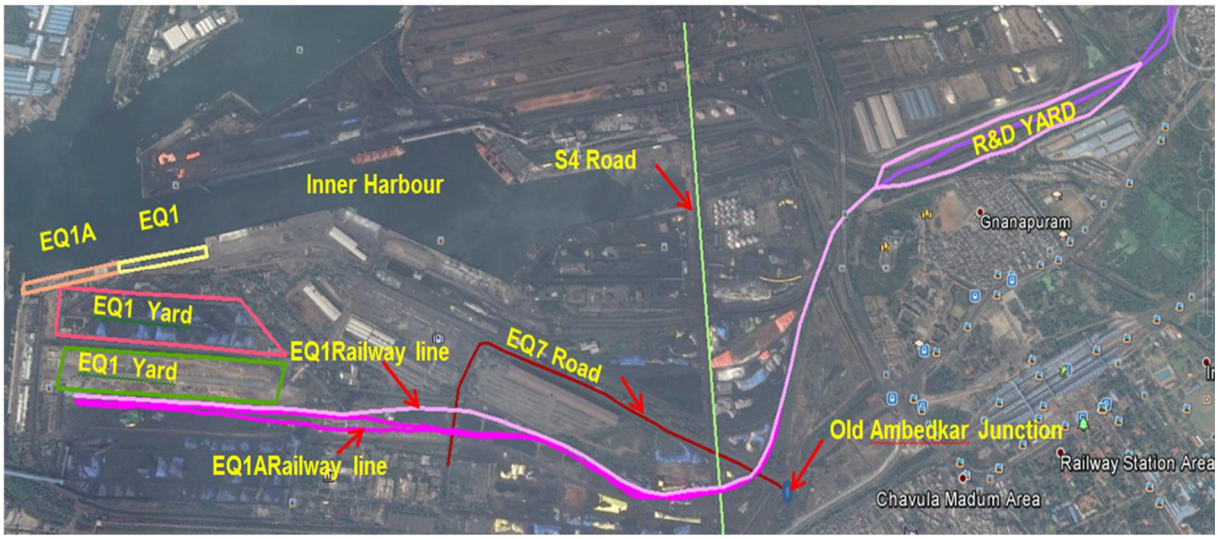


Figure 8.15 Railway Connectivity of EQ1A & EQ1 Berths Stacking Yard

8.8.1.2.2 EQ2 to EQ10 Berths

The Existing Railway lines of NH yard are located behind EQ2 to EQ5 berths and run through crossing the S4 road to connect to R&D Yard. From there it is connected to the DYD yard to connect main Line.

8.8.1.2.3 EQ7 Berth Railway Line

It is located adjacent to the M/s Godavari Fertiliser Chemical Ltd. mainly carrying finished fertilisers. From there it is crossing the S4 road and it connects to main railway line via R&D yard and DYD yard.

8.8.1.2.4 EQ8 & EQ9 Berth Railway Line (M/s. VSPL Railway Lines)

The Railway lines of M/s. VSPL are used for the carrying cargo of M/s. VSPL, handling at EQ8 & EQ9 berths. These lines are directly connected to the R&D yard.

The Rail network connecting from the concern stacking yard is shown in **Figure 8.16**.

Figure 8.16 Railway Connectivity of EQ2 & EQ10 Berths Stacking Yard

8.8.1.2.5 VCTPL Berth (M/s. VCTPL Railway Lines)

The existing Railway lines are used for carrying container cargo of M/s. VCTPL. These lines connect to the R&D yard via NH yard.

8.8.1.2.6 VGCB Berth (M/s. VGCB Railway Lines)

M/s. VGCB connecting of two lines 10 & 11. The existing Railway lines are used for carrying cargo of M/s. VGCB, these lines directly connect to R&D yard via NH Yard and further connect to marshalling yard and then connect to the main line. The Rail network connecting from the concerned stacking yards are shown in **Figure 8.17**.

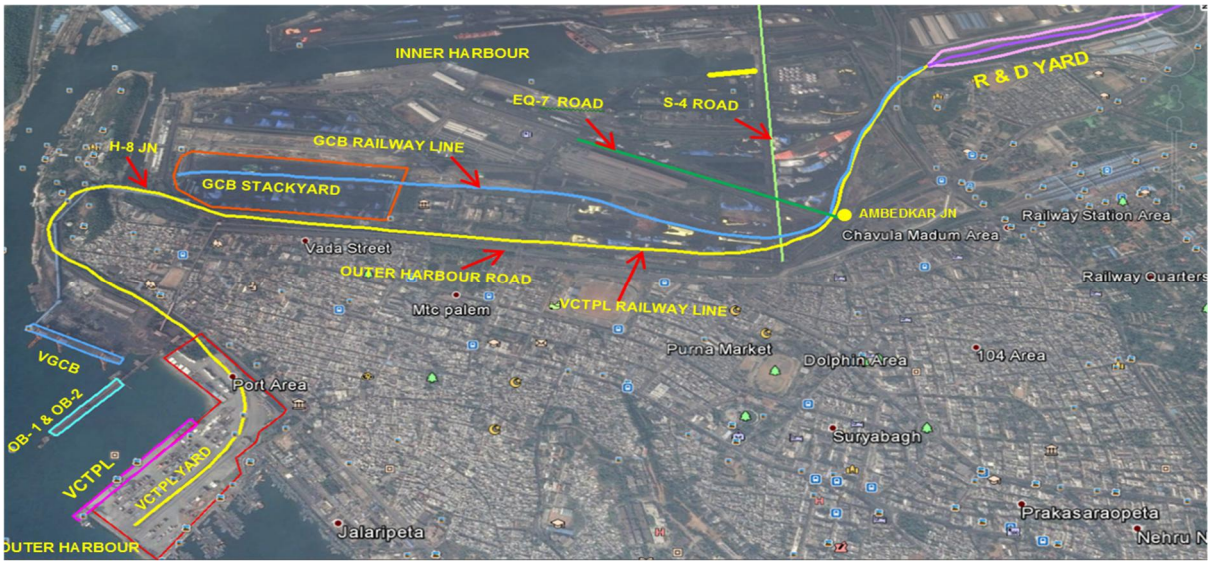


Figure 8.17 Railway Connectivity of VCTPL & VGCB Stacking Yard

8.8.1.2.7 West Ore Berth & DE Line

The existing W.O.B lines are used for the handling of coal cargo at WQ1 to WQ5. 6 lines in W.O.B and 4 lines DEL lines as holding yard. These lines connect to R&D Yard via DE lines.

8.8.1.2.8 M/s. EVTL Railway Lines

Existing Railway lines of M/s. EVTL (formerly OHC of VPT) are used for carrying & tippling of iron ore at tipplers. M/s. EVTL Railway lines operational with 21.650 EQTKM. It consists of 24 B.G Railway lines & 72 no. of Points & Crossings. Railway tracks these lines are directly connected to the Ore Exchange Yard of E. Co. Railways.

The Rail network connecting from the concerned stacking yards are shown in **Figure 8.18**.

Figure 8.18 Railway Connectivity of VCTPL & VGCB Stacking Yard

8.8.1.3 Rationalisation of VPT Rail network

A) Existing track length of VPT &Private siding

S. No.	Description of Yard / Siding	Total Length (m)	Total Length (km)	Gradient
	R&D YARD & WOB			
1.	Line No. 1D	711.39	0.711	
2.	Line No. 1C	754.80	0.755	
3.	Line No. 1B	762.20	0.762	
4.	Line No. 1A	757.63	0.758	
5.	BVR SIDING	100.00	0.100	
6.	Line No.1	744.51	0.745	
7.	Line No.2	827.25	0.827	
8.	Line No.3	887.81	0.888	
9.	Line No.4	886.87	0.887	
10.	Line No.5	960.75	0.961	
11.	Line No.6	960.23	0.960	
12.	Line No.7	882.93	0.883	1 IN 400
13.	Line No.8	757.44	0.757	
14.	Line No.9	756.10	0.756	
15.	Line No.10	708.63	0.709	
16.	Line No.11	720.00	0.720	
17.	Line No.12	715.50	0.716	
18.	Line No.13	668.72	0.669	
19.	Line No.14	583.12	0.583	
20.	Line No.15	548.10	0.548	
21.	Line No.16	695.00	0.695	
22.	Line No.17	697.00	0.697	
23.	Line No.17A	1160.00	1.160	
24.	Link Line	385.05	0.385	
25.	R&D Western Sector Line	700.00	0.700	
	Connecting Lines			
26.	16-17 connecting line at N-W cabin	212.30	0.212	
27.	OEC Line	286.30	0.286	
28.	S/ Neck Line at N-W Cabin	135.60	0.136	
29.	Route X from pt 68 up to girder bridge	180.00	0.180	

S. No.	Description of Yard / Siding	Total Length (m)	Total Length (km)	Gradient
30.	Route Y from IP 50 up to girder bridge	175.00	0.175	
31.	Line No 8 from SHP-1 To SHP-3	145.00	0.145	
32.	Line No 9 from SHP-2 To SHP-3	258.00	0.258	
33.	8&9 Dismantled tracks for loco, BVG siding	180.00	0.180	
34.	Shunting neck line leading diamond crossing	152.00	0.152	
35.	17A to dead end line at Dumper cabin	102.00	0.102	
36.	North Cabin in Between tracks	244.00	0.244	
37.	North West Cabin in Between tracks	278.80	0.279	
38.	South Cabin in Between tracks	319.00	0.319	
39.	South West Cabin in Between tracks	75.00	0.075	
40.	DEL-1	668.72	0.669	1 IN 800
41.	DEL-2	720.00	0.720	
42.	DEL-3	716.00	0.716	
43.	DEL-4	636.00	0.636	
44.	WOB MAIN LINE	1049.00	1.049	
45.	WOB LOOPLINE	994.00	0.994	
46.	AVR NEW MAIN LINE	1040.00	1.040	
47.	AVR NEW LOOPLINE (engine escape line)	1010.00	1.010	
48.	AVR LINE-1	430.00	0.430	
49.	AVR LINE-2	320.00	0.320	
50.	Spur - I	413.00	0.413	
51.	Spur - 2	430.00	0.430	
52.	INBETWEEN TRACKS (WOBON LINE TRACKS)	1112.00	1.112	
		Total	**30.613**	
	Oil loop line			1 in 1000
1.	Oil loop line	3710.00	3.710	
2.	Essar manual unloading line no.1	700.00	0.700	
3.	Essar manual unloading line no.2	700.00	0.700	
		Total	**5.110**	
	NH Yard & East Yard			
1.	CHANNEL LINE	800.00	0.800	1 in 400
2.	SHED LINE	695.00	0.695	
3.	NEW SHED LINE	760.00	0.760	

S. No.	Description of Yard / Siding	Total Length (m)	Total Length (km)	Gradient
4.	VCTPL DIRECT LINE	760.00	0.760	
5.	GCB OLD LINE	1800.00	1.800	
6.	GCB NEW LINE	1800.00	1.800	
7.	R - 9	560.00	0.560	
8.	R - 10	600.00	0.600	
9.	R- 6 MAIN LINE	1500.00	1.500	
10.	R - 6 LOOP LINE	2000.00	2.000	
11.	LINE NO - 7	460.00	0.460	
12.	LINE NO - 8	720.00	0.720	
13.	LINE NO - 9	762.00	0.762	
14.	LINE NO - 10	810.00	0.810	
15.	LINE NO - 15	770.00	0.770	
16.	LINE NO - 16	740.00	0.740	
17.	LINE NO-17	406.00	0.406	
18.	R -12	678.00	0.678	
19.	R-11 MAIN LINE	790.00	0.790	
20.	R-11 LOOP LINE	490.00	0.490	
20.	R-13	600.00	0.600	
21.	R-14	585.00	0.585	
22.	R-15	588.00	0.588	
23.	ROUTE-Z	860.00	0.860	
24.	R-4	700.00	0.700	
25..	N.S.DUMP	510.00	0.510	
26.	ROUTE-X	900.00	0.900	
27.	ROUTE-Y	1100.00	1.100	
28.	SHUNTING NECK	470.00	0.470	
29.	B G LOCO SHED LINE-1	80.00	0.080	
30.	B G LOCO SHED LINE-2	90.00	0.090	
31.	B G LOCO SHED LINE-3	340.00	0.340	
	Connecting Lines			
1.	Between R-6 main line point & R-9& R-10 lines point	57.00	0.057	
2.	Between Shunting neck line point & R-1 lines point	130.00	0.130	
3.	Between Line no.7 point & Route-y lines point	55.00	0.055	

S. No.	Description of Yard / Siding	Total Length (m)	Total Length (km)	Gradient
4.	Between Shunting neck Line point & L/no.15&16 point	115.00	0.115	
		Total	**25.081**	
	Western Sector			
1.	NAD Curve	400.00	0.400	
2.	Western sector Main line NPB	1040.00	1.040	
3.	Western sector Loop line NPB	855.00	0.855	
4.	Parallel bridge	325.00	0.325	
5.	Western sector Main line SPB	1600.00	1.600	
6.	Western sector Loop line SPB	1500.00	1.500	
7.	JP Main line	4850.00	4.850	
8.	Single span bridge	30.00	0.030	
9.	JPL -1	800.00	0.800	
10.	JPL -2	800.00	0.800	
11.	JPL -3	800.00	0.800	
12.	JPL -4	800.00	0.800	
13.	Mindi loop line	720.00	0.720	
14.	Bulb line	1775.00	1.775	1 in 800
15.	Bulb line holding line no.1	487.00	0.487	
16.	Bulb line holding line no.2	900.00	0.900	
17.	New CWC Line	864.00	0.864	
18.	Old CWC Line	600.00	0.600	
19.	Right off way curve	197.00	0.197	
20.	CISF Quarters curve	300.00	0.300	
21.	HPCL holding line no.1	831.00	0.831	
22.	HPCL holding line no.2	784.00	0.784	
23.	HPCL holding line no.3	808.00	0.808	
24.	IOC holding line no. 1	770.00	0.770	
25.	IOC holding line no. 2	732.00	0.732	
26.	Esso Line	517.00	0.517	
27.	Link line	435.00	0.435	
		Total	**24.520**	

B) Detailed lengths of V.P.T Railway Lines to be dismantled.

S. No.	Details of dismantling lines	Track (m)	P&C	EQTKM
	R&D / WOB	Nil		
	OHC	Nil		
	NH Yard / East Yard			
1.	R-11 Main line	790	1	0.89
2.	R-11 loop line	470	0	0.47
3.	Line no.10	810	2	1.01
4.	Channel line	800	2	1.00
5.	Shed line	695	1	0.80
6.	R-13	600	1	0.7
7.	R-14	585	1	0.69
	Total	**4750**	**8**	**5.56**
	Western Sector			
1.	Bulb line 1	487	1	0.59
2.	Esso Line	517	1	0.62
		1004	**2**	**1.21**
	Total			**6.77**

C) Abstract of V.P.T Track Lengths After Dismantling Unused Lines

S. No.	Description of YARD	Track lengths (km)	Points & Crossings	Equated Track length (km)
1.	R & D Yard	30.613	82 no.	38.813
2.	Oil loop	5.100	11 no.	6.21
3.	NH Yard & East Yard	20.331	42 no.	24.531
4.	Western Sector	23.52	38 no.	27.32
	Total VPT Track	**79.564**	**183 no.**	**97.864**
	Total Pvt Sidings	**58.36**	**197 no.**	**78.059**
	Total Track Lengths	**138**	**380 no.**	**176**

8.8.1.4 Proposal for Extension of Line No. 11 to 15 to Full Length at R&D Yard

To reduce the congestion of movements from NALCO, WQ1 to 4 terminals of Western Yard, VPT has initiated action to Extension of Line no.11 to 15 to full length at R&D Yard. On behalf of VPT, IPRCL has been issued letter of award on 27th Aug 2015 to M/s. RITES Ltd. For providing consultancy services for making DPR for extension of line no. 11 to 15 to full length at R&D yard of VPT and the same is in progress.

The Cost of the Project is Rs. 30.0 Crore. The target date of Completion is December 2017.

The proposed location is shown in **Figure 8.19**.

8.8.1.5 Proposed 3rd Line from Line from R&D Yard to East Yard at AKP Level Crossing

Congestion in Eastern yard & Outer Harbour is due to movements from EQ1, VCTPL, VGCB and to reduce this constraint VPT has initiated action to develop the 3rd line from line from R&D yard to East yard. In Principle Approval given for DPR by Railways Codal Chargeds paid to E.Co Railways. On behalf of VPT M/s IPRCL has been awarded letter of award on 21st August 2015 for Project Management Consultancy for "providing connection of dead end line at north of dead end line at north of R&D yard to Eastern grid (Third line) from E.Co. Railways for VPT and same are in progress. This works includes dead end line at north cabin and IE line of R&D yard.

The Cost of the Project is about Rs. 9.28 cr and the project duration is about 15-24 months. The Project Target date of Completion is December 2016.

The proposed location is shown in **Figure 8.19**.

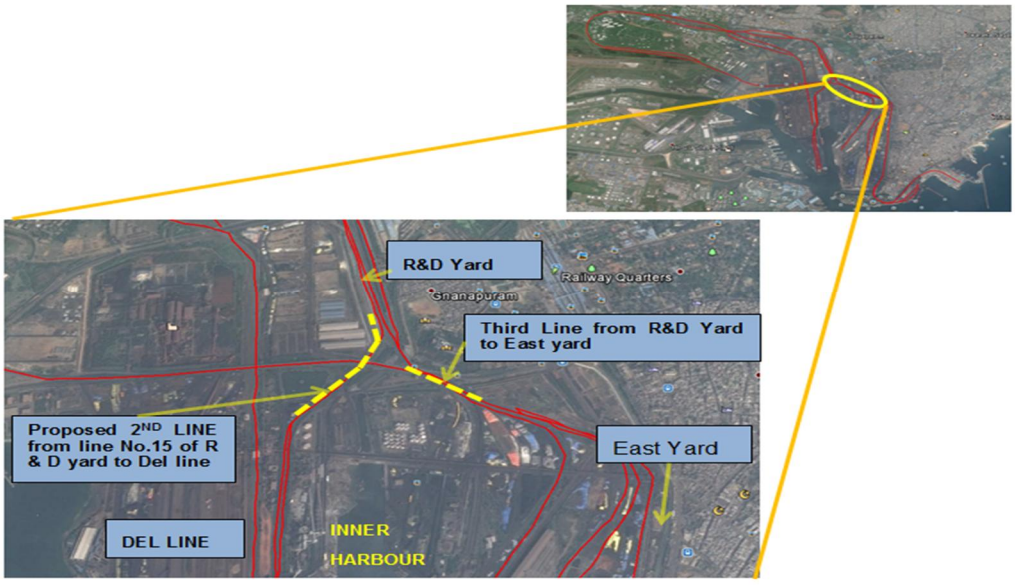


Figure 8.19 Proposed Internal Rail Connectivities

8.8.1.6 Proposed 3rd Line at 14 Lever Goomty of NH Yard

VPT has initiated action to develop the 3rd line at 14 Lever Goomty of NH yard to reduce the congestion in rail network from Eastern Yard, Outer Harbour and NH Yard. This work is to be entrusted to the East Coast Railways. Work Order issued to M/s. RITES Ltd vide Lr.No.PD-24015/56/2015-PD-IV(Pt-II), Dt.27-08-2015 by IPRCL for providing consultancy services for making DPR. Inception report was submitted by M/s RITES on 22.09.2015. The proposed location is shown in **Figure 8.20**.

Figure 8.20 Proposed Internal Rail Connectivities

In addition to the proposed 3rd line at 14 Lever Goomty of NH yard following works are also entrusted to Rites to prepare the DPR for Additional Line No. 1E on the Eastern Side of the R&D Yard. Work order issued for Rs.4,59,85,245/- to M/s JD Constructions, VSKP for Civil and M/s. NCTC, Kolkata for P. Way for Rs.4,62,98,310/- on 31.12.2015 and work is in progress

8.8.1.7 Panel Cabin at Revamped East Yard

Cost estimate for construction of Panel Cabin at Revamped East Yard has already submitted to VPT by M/s. RITES and the same has been forwarded to E.Co. Rlys for examination and remarks.

The Cost of the Project is about Rs. 11.0 Cr .The target date of Completion of the project is December 2016

8.8.1.8 Proposed Electrification Works

VPT has initiated action to develop the electrification works to improve the rail network inside the Port.

A) Electrification of East Yard Revamped Lines. 23.489TKM

Electrification from AKP-East Yard for 4.698TKM and from East Yard for 18.783 amounting to 23.481 TKM is to be taken up as deposit work on urgent basis. Detailed estimates have been furnished to VPT for 11.245 TKM for an amount for Rs.6.84 Cr. For balance length consent has been obtained from PPP operators for Infrastructure cess. Block estimate submitted to E.Co. Railways for

Rs.19,58,84,353/- and informed to deposit 2% charges Rs.39,17,687/-. Work Order issued to M/s. RITES Ltd., vide Lr.No.PD-24015/56/2015-PD-IV(Pt-II), Dt.27.08.2015 by IPRCL providing consultancy services for making DPR.

The total cost of the Project is Rs. 19.58 cr and target date of Completion is December 2016.The amount of Rs 6.80 Cr deposited to Eco. Railway.

The proposed Phase 1 electrification works is shown in **Figure 8.21** hereunder:

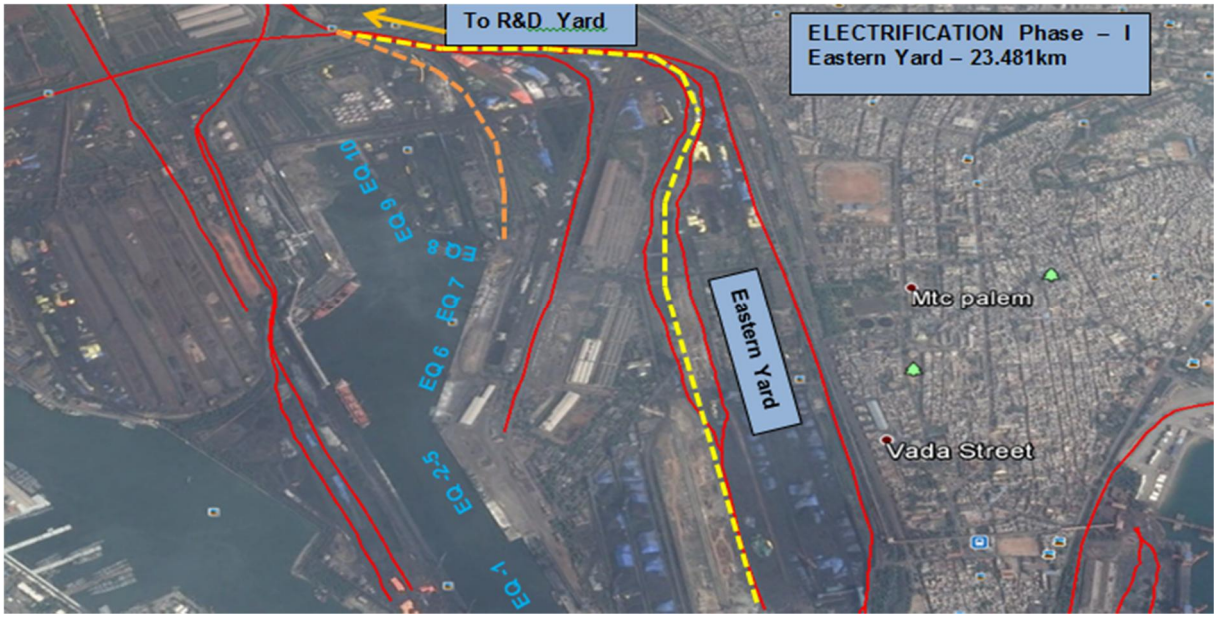


Figure 8.21 Proposed Phase 1 Electrification Works

B) Electrification of VPT Railway Lines 45.143 TKM

Work order issued to M/s. RITES Ltd, Vide Lr.No.PD-24015/56/2015- PD-IV(Pt-II), dt.27-08-2015 for preparation of DPR by Rites and draft DPR was submitted by M/s Rites on 28.10.2015

Providing consultancy services for the above project is given to IPRCL.

The cost of the project is Rs. 30 cr and the date of Completion is December 2017

The remaining Phases of Electrification works is shown in the **Table 8.3**.

Table 8.3 Proposed Electrification Works – Phase-Wise

PHASE NO.	YARD	LENGTH	TOTAL
PHASE-I	I. a) N.H. YARD (AKP TO EAST YARD) b) AKP to connecting point of PPP c) G.C.B. MECH d) EQ-IA SIDING Ph-I e) EQ-1A SIDING Ph-II d) EQ-1 SIDING	2870m 4698m 6547m 6540m 1696m 4000m	7.568TKM 18.783TKM
PHASE-II	a) R&D YARD b) N.H. YARD	4378m 6615m	10.993TKM
PHASE-III	a) D.E. LINES b) OHC LINES	2979m 10753m	13.732TKM
PHASE-IV	WESTERN SECTOR	11390m	11.390TKM
	TOTAL LENGTH:	62466m	62.466TKM

8.8.1.9 S&T Works at R&D Yard, "B" Cabin, 14 Lever Goompty, Dumper Cabin and Service Building

VPT has given IPRCL the order for providing consultancy services for the above work. The Project Cost is about 35.74 Cr. Completion of the Project is by December 2017. DPR submitted by M/s Rites on 30.11.2015.

8.8.1.10 Proposed Signalling Works

VPT has initiated action to develop the signalling works to improve the rail network inside the Port. The works at RRI cabin R&D yard and the Panel Cabin at 14 Lever are under progress by East Coast Railways. The estimate is submitted by RITES for the RRI cabin at East yard and consent obtained from PPP operators for infrastructure cess. The various signalling works in progress are shown in the **Figure 8.22** hereunder:

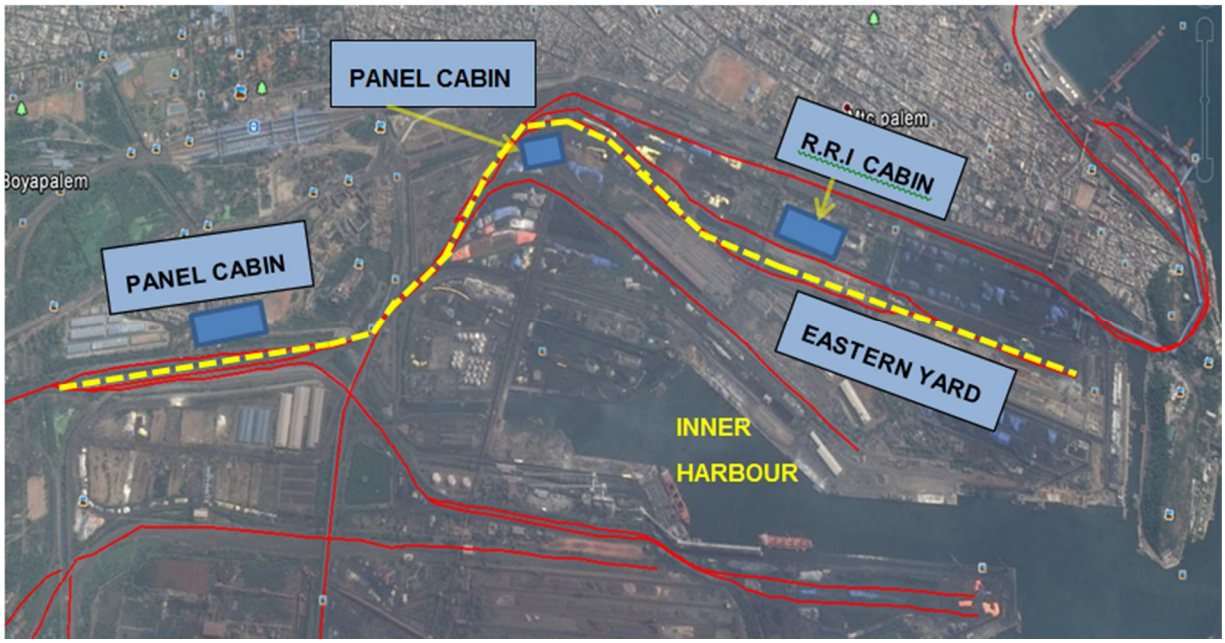


Figure 8.22 Proposed Signalling Works

8.8.1.11 Siding-Wise Rake Loading

The details on number of rakes handled at each of the siding available at VPT are given in **Table 8.4**.

Table 8.4 Table Showing Siding-Wise Rake Loading

Sdg Wise No. of Rakes Loaded & Avg Per Day					
Sl No	Siding	2014-15		2015-16 (upto 22.03.2016)	
		Rakes	Avg. per day	Rakes	Avg. per day
1	Bulb Line	5	0.0	14	0.0
2	Coal Berth	108	0.3	134	0.4
3	Complex I/II	19	0.1	66	0.2
4	East Yard	13	0.0	61	0.2
5	Essar I / II	267	0.7	227	0.6
6	GCB	80	0.2	18	0.1
7	JPL I	59	0.2	35	0.1
8	JPL II	59	0.2	51	0.1
9	JPL III	178	0.5	125	0.4
10	MY	176	0.5	115	0.3
11	NCWC	161	0.4	156	0.4
12	NHY Lines	74	0.2	79	0.2
13	NSD (NHY L 17)	7	0.0	7	0.0
14	OHP 1A,1B	34	0.1	89	0.2
15	R 12-15	178	0.5	146	0.4
16	R 4-10	147	0.4	127	0.4
17	R&D-L 15	6	0.0	23	0.1
18	R&D-L 17	36	0.1	94	0.3
19	R&D-L 17A	9	0.0	13	0.0
20	Route-X	0	0.0	36	0.1
21	FCI	1	0.0	0	0.0
Private Sidings :					
21	CFL	445	1.2	401	1.1
22	HPCL	435	1.2	567	1.6
23	VSPL 9	280	0.8	323	0.9
24	IOCL	269	0.7	292	0.8
25	GFCL	109	0.3	136	0.4
26	NALCO	103	0.3	99	0.3
27	VCTPL	70	0.2	71	0.2
Private Sidings (Mechanical Loading):					
28	VGCB	1630	4.5	1596	4.5
29	VSPL 8	423	1.2	443	1.2
30	AVCTPL	222	0.6	195	0.5
Grand Total		**5603**	**15.4**	**5739**	**16.1**

Considering that each siding served by mechanised means can handled 4 to 5 rakes per day and that using manual labour can also handle about 2 to 3 rakes per day, the utilisation of current rail sidings is very low as most sidings handled less than one rake per day. It is therefore important that a detailed study be carried out to arrive at the sidings that are redundant and should be removed to make way for additional storage and circulation space.

Apart from the above, new rail lines/upgradation to existing lines shall be provided with the following objectives:

1. To make sidings full rake length (siding length of about 750 m) so as to reduce time.
2. There shall not be any crossover along the track
3. Wagon system to be mechanised

8.8.2 External Rail Network

8.8.2.1 Overview

Visakhapatnam Port is connected to trunk line directly through the Walt air Railway Marshalling Yard to the Chennai-Howrah main line of East Coast consisting 1643km of double line rail link. The distance from Visakhapatnam to Chennai is around 761km and from Visakhapatnam to Howrah is around 882km. The rail-borne traffic at Visakhapatnam Port is 32.8 MTPA out of 56.1 MTPA, which was about 58.5% of the total traffic handled at the Port during the year 2013-2014. VPT is well connected to the hinterland through rail network. Apart from coal which is completely moved by rail, fertilisers, limestone and food grains are the other dry bulk commodities being moved by rail. Rail transport is primarily used for low value commodities for which transport costs are an important component of the delivered price. However, apart from coal, most other commodities are beginning to shift to roads owing to the shortage of rail capacity in many sectors. Iron ore exports have experienced a large shift to roads, on account of the rapid increase in exports and the capacity crunch being faced by the railways. Container traffic is also moving away from rail transport. The average interchange between the Port and Railways at Ore Exchange Complex (OEC) is ~12 per day. The average interchange between the Port and Railways at Reception and Dispatch yard (R&D Yard) is ~20 per day. The external rail connectivity of Visakhapatnam Port to rail trunk routes is shown in the **Figure 8.23** hereunder.

Figure 8.23 External Rail Connectivity of Visakhapatnam Port

The main constraints in rail network are:

i) Inadequate investment in capacity & proper rail sidings
ii) Handover time from East Coast Railway to Port Railway authorities
iii) Poor quality of service and slow response to various segments of growing freight demand
iv) Lack of availability of wagons
v) Container freight response especially from CONCOR who enjoys monopoly in rail container transport
vi) Rail bottlenecks in hinterland.

The trains handled at the sidings of western sector are traveling an additional distance of 10 km per train with the existing arrangements and the queuing up at the Diamond crossing leads to increase in turn round time and detention of rolling stock by about 3 to 4 hours per rake. It is eminent to develop

i) Direct connection from Mindi at western sector to East Coast Railways/ South Central railways
ii) A direct connection between OEC and Western Sector jointing at NAD Curve from East Coast Railways

iii) To reduce constraint of twin single lines at R&D yard, third line is proposed by extending the dead end line of East Coast Railways iv) Bulb line from DYD to Western sector and OEC.

The above connectivity's reduce congestion at R&D yard due to many PPP projects in Eastern Sector through which about 40 additional trains are to be handled.

8.8.2.2 Proposed direct connection from Mindi at Western Sector to East Coast Railways/South Central Railways

VPT has initiated action to develop a connection from Mindi at Western sector to the East Coast Railways/South Central railways. The trains handled at the sidings of western sector are traveling an additional distance of 10 km per train with the existing arrangements and the queuing up at the Diamond crossing leads to increase in turn round time and detention of rolling stock by about 3 to 4 hours per rake. The direct connection works from Mindi to East Coast railways and South Central railways will be done in 2 phases. Currently the revised DPR needs to be submitted by M/s. RITES, after approval of methodology by the VPT. The location of the proposed rail connectivity is shown in **Figure 8.24** hereunder.

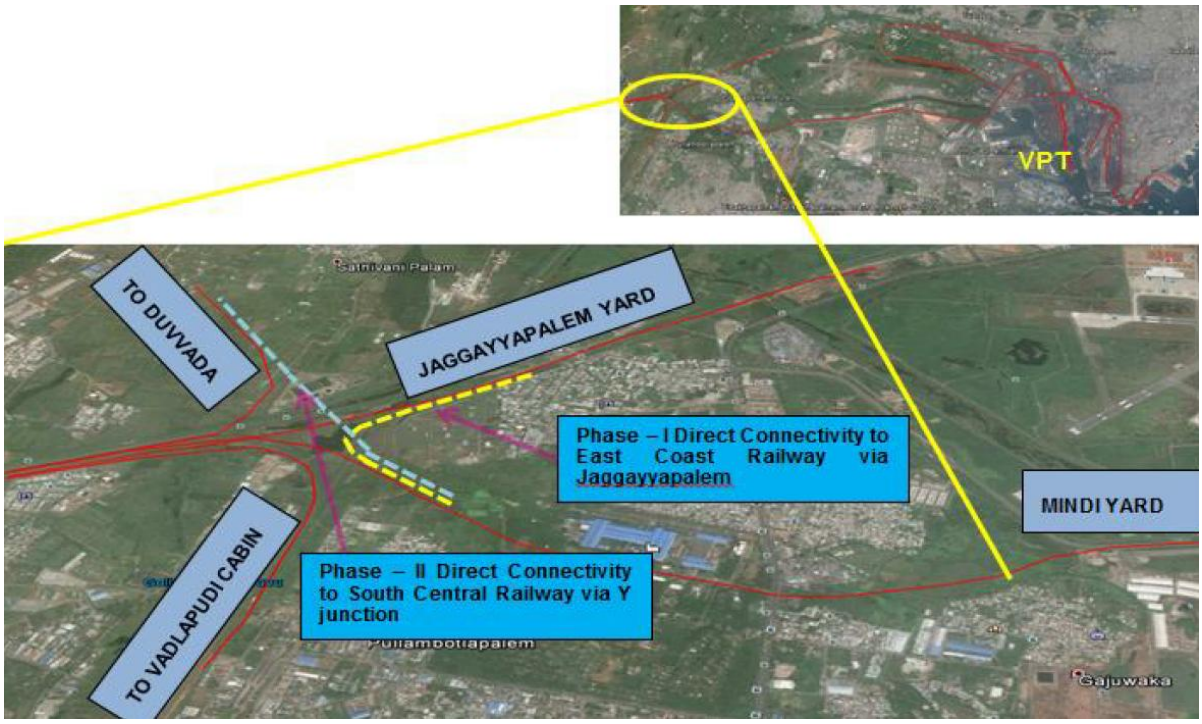


Figure 8.24 Proposed Railway Connection from Mindi to East Coast Railways and South Central Railways

8.8.2.3 Proposed Direct Connection Between OEC and Western Sector Jointing at NAD Curve

VPT has initiated action to develop a connection between OEC and Western Sector jointing at NAD curve. The trains handled at the sidings of western sector are traveling an additional distance of 10 km per train with the existing arrangements and the queuing up at the Diamond crossing leads to increase in turn round time and detention of rolling stock by about 3 to 4 hours per rake. The Revised DPR submitted by Rites to E. Co. Railways. Work has been taken up through IPRCL and it is in progress.

The Cost of the Project is about 16.75 Cr and the duration is about 15-24 months. The target date of completion is December 2016.

Figure 8.25 Proposed Works in Western Sector

8.8.2.4 Bulb Line from DYD to Western Sector and OEC by East Coast Railways

East Coast railway has initiated action to develop bulb line from DYD sector and OEC for engine reversal and this line can also be used for handling western sector without coming to R&D yard .The work has been completed.

8.8.2.5 *Proposed Third Line from R&D Yard to DYD Connecting Dead End Line at North of R&D Yard to Eastern Grid*

VPT has initiated action to develop third line from R & D yard to DYD connecting dead end line at North of R & D yard to Eastern grid to reduce the constraint of twin single lines at R&D. The rrevised DPR for the project has been submitted by M/s. RITES to East Coast Railway. In principle approval has been given for DPR by Railways. Codal Charges paid to E.Co. Railways. Work Order for PMC issued to M/s. IPRCL Ltd., vide Lr.No.PD-24015/56/2015-PD-IV(Pt-II), Dt.17/21-08-2015 and the work is in progress.

The Cost of the Project is about Rs. 9.28 cr. and the duration is about 15-24 months (will be decided mutually based on volume/ size of works). The target date of completion is by December 2016.

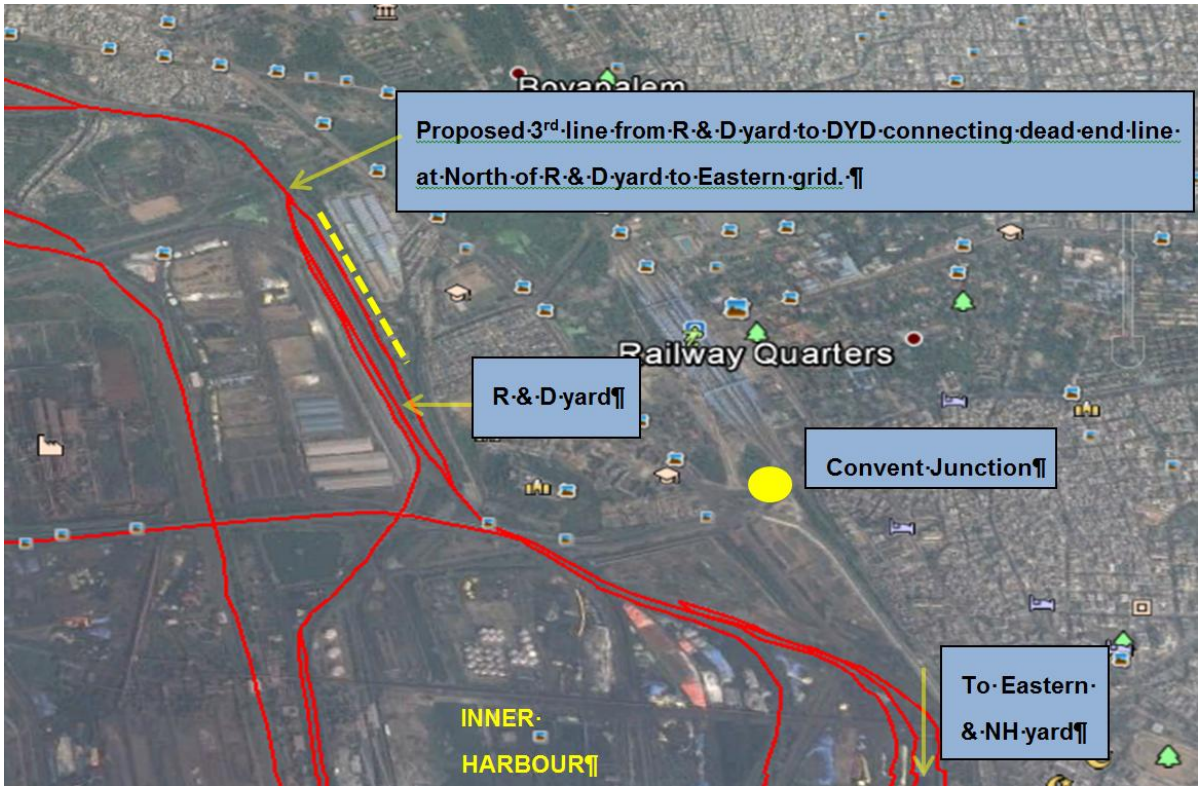


Figure 8.26 Proposed Works in Western Sector

8.8.2.6 *Direct Connectivity to Mindi Yard from E.Co. Rlys/SC Rlys*

VPT initiated to provide direct rail connectivity to Mindi Yard. This shall reduce travel distance by 10 km and time 3 hr. The total Cost of the Project is about 270.73 Cr. These are divided in 3 Phases. Cost for Phase 1 is about Rs. 19.73 Cr, Phase 2 Rs. 112 cr. and Phase 3 about Rs. 139 cr.

Time period for the entire project shall be 15-24 months (will be decided mutually based on volume/size of works) and date of Completion will be by December 2017.

Revised DPR based on E.Co.Rlys remarks has to be submitted by M/s. RITES. . Work order has been issued to M/s. RITES Ltd., vide Lr.No.PD-24015/56/2015-PD-IV(Pt-II), dt.17/21-08-2015 by IPRCL for PMC.

9.0 SCOPE FOR FUTURE CAPACITY EXPANSION

9.1 Upgradation of WQ 2 to 5 Berths

At present there is not adequate traffic to justify the investment in upgradation of berths WQ 2 to 5 so that fully loaded Panamax ships could be handled. However the future projections for breakbulk cargo beyond year 2025 justify the upgradation of these berths to increase their capacity.

9.2 Proposed Outer Harbour

VPT has plans to develop an outer to outer harbour towards the south side of the south breakwater. The proposed facility is basically to meet the demand of Navy who would like to have deeper berths for its vessels. The layout plan of the current proposal to develop the outer harbour is shown in **Figure 9.1**.

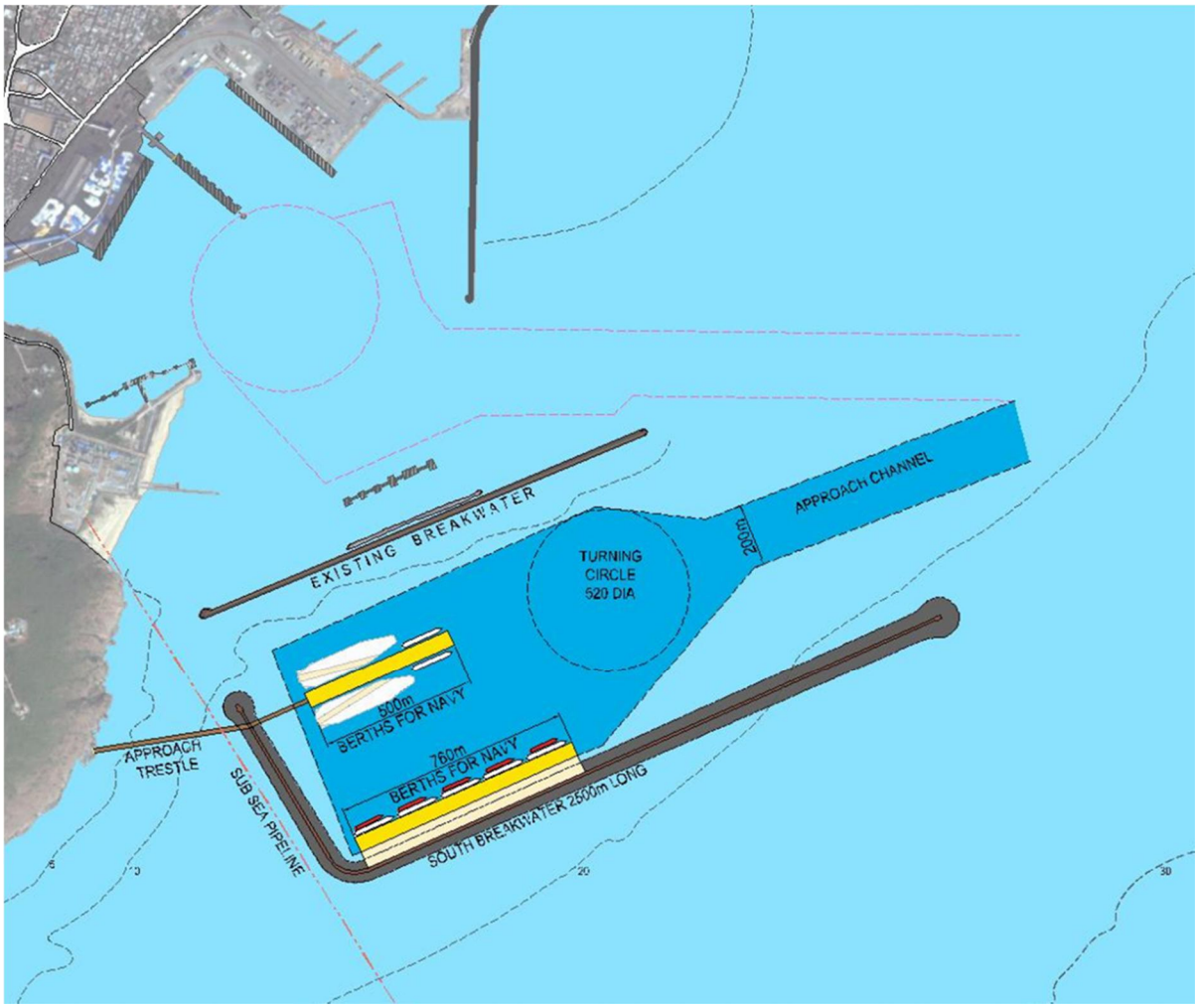


Figure 9.1 Proposed Outer Harbour - Layout Plan Alternative 1

The current proposal of proposed outer harbour comprises of the following:

1. One 2500 m long offshore breakwater south of the south breakwater
2. One 500 m long finger jetty with two sides berthing for navy vessel. This jetty would be connected to shore by mean of an approach trestle.
3. One 760 m long quay on the lee of the proposed breakwater for berthing of small crafts of navy.

It could be seen from **Figure 9.2** that the breakwater has been planned such that it stays clear of the submarine pipeline from SPM.

However it is noticed that the proposed layout is exposed to waves from NE direction and would result in significant downtime during the NE monsoon period. Further this layout does not offer any benefit to VPT. Considering these aspects another alternative layout has been developed as shown in **Figure 9.2**.

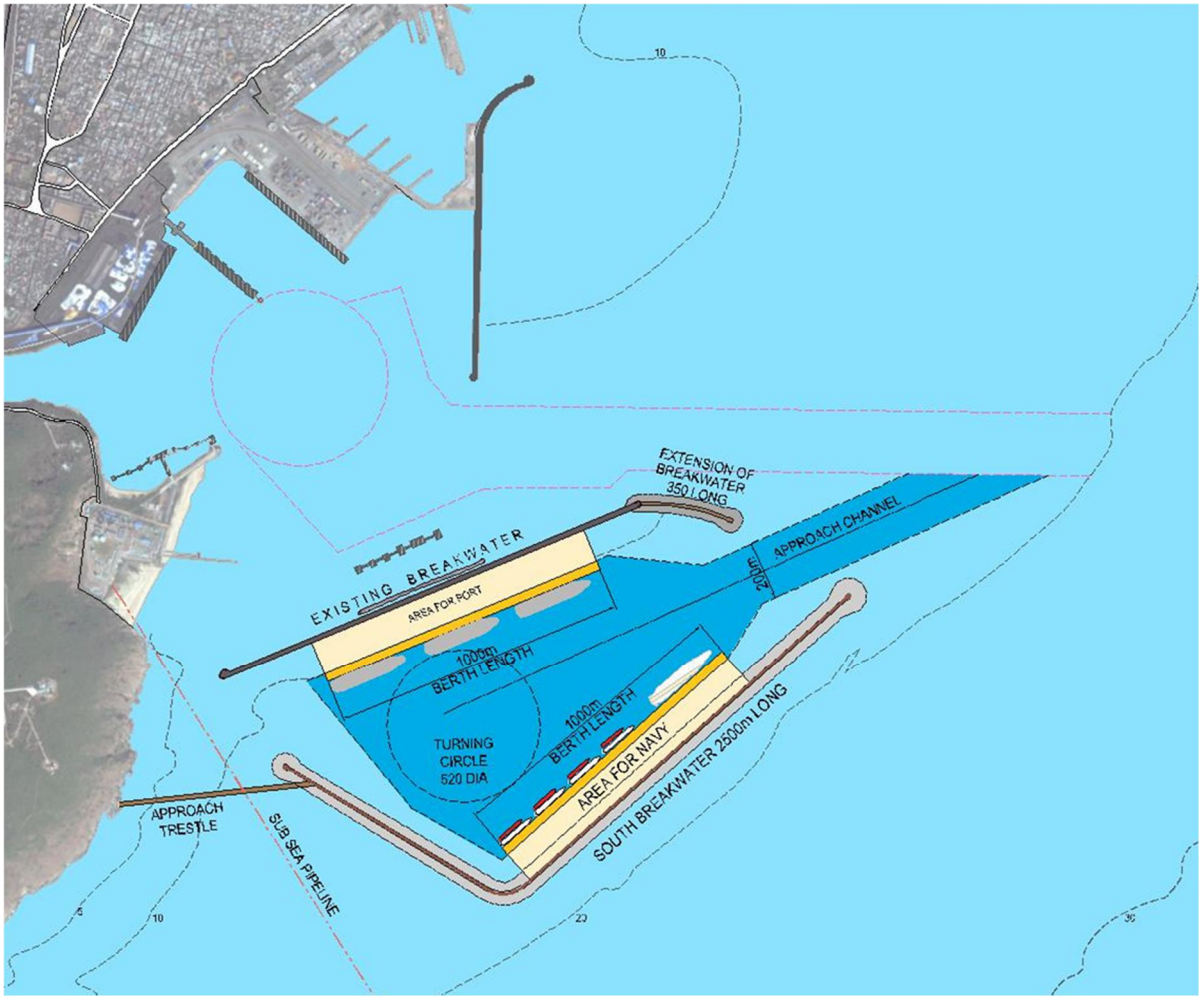


Figure 9.2 Proposed Outer Harbour - Layout Plan Alternative 2

In this layout additional berths for port shall be on the south of the existing south breakwater and that for navy shall be on the lee of the proposed new breakwater. However, considering the fact that there is no backup space for storage of cargo adjacent to the proposed harbour, the berths proposed for the port could be used only for handling the liquid cargo.

The breakwater orientation has been planned such that it would provide a tranquil harbour basin for round the year operations. This layout could be refined further during implementation stage to provide additional berths and backup area for Navy.

9.3 Concept of Satellite Port

It is evident that the available waterfront within the port limits is fully exhausted and there is no further scope for expansion. However as per traffic projections there is significant potential for import of coal in the region. As regards the outer harbour scheme, it could be seen that there will not be any back up area for cargo operations as also the evacuation of cargo will be almost impossible.

Under such circumstances, the port should identify nearby minor ports under the State Port Directorate for adoption and development as a satellite port. Visakhapatnam port can consider a suitable port location along the Andhra coast for this purpose.

10.0 SHELF OF NEW PROJECTS AND PHASING

As part of the Vizag port 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.

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.

10.1 Ongoing Projects

The details of the projects which have already been awarded and development is ongoing are given in **Table 10.1**.

Table 10.1 Ongoing Projects

S. No.	Project Name	Capacity Addition (MTPA)	Investment Required (Crores)	Mode of Implementation
1.	Development of New Berth EQ-1 A Berth	7.64	320	PPP
2.	Conversion of existing berths EQ 2, EQ 3, EQ 4 and part of EQ 5 into two numbers of berths	1.38	600	Port's funds
3.	Mechanization of existing berth EQ 7 to handle finished fertilizers	5.0	217	PPP
4.	New Container Terminal Adjacent to the Existing Container Terminal	8.0	550	PPP
5.	Iron Ore Handling - Phase 1 Upgradation of OB 1 & 2	15.0	800	PPP
6.	Iron Ore Handling - Phase 2 - Mechanisation of WQ 1	8.0	400	PPP
7.	WQ N (WQ-7 and WQ-8)	5.0	250	PPP
8.	Providing a direct connection between OEC and Western Sector jointing at NAD Curve from E.Co. Rlys.	-	16.75	Port's funds
9.	Connection of dead end line at North of R&D yard to Eastern Grid (Third line) from E.Co. Rlys.	-	9.28	Port's funds
10.	a)Additional line No. 1E on the eastern side of the R&D Yard; b)Providing 3rd line near AKP level crossing of R&D Yard; c) Providing 3rd line near 14 Lever Goompty of NH Yard.	-	29.43	Port's funds

S. No.	Project Name	Capacity Addition (MTPA)	Investment Required (Crores)	Mode of Implementation
11.	Electrification of east yard revamped lines. 23.489 TKM	-	19.58	Port's funds
12.	Direct connectivity to Mindi Yard from E.Co. Rlys/SC Rlys (This will reduce the travel distance of 10 km, & saving of 3 hrs time)- In 3 Phases – Ph 1 (Rs. 19.73 cr.), Phase 2 (Rs. 112 cr.), Phase 3 (Rs. 139 cr.)	-	270.73	Port's funds
13.	Extension of lines No.11 to 15 to full length at R&D yard	-	30	Port's funds
14.	Electrification of VPT railway lines 45.143 TKM	-	30	Port's funds
15.	Providing consultancy services for making DPR for S&T works at R&D Yard, "B" Cabin, 14 Lever Goompty, dumper cabin and service building for VPT	-	35.74	Port's funds
16.	Proposed Road Connectivity from Sheela Nagar Junction to Anakapalle-Sabbavaram/ Pendurthi-Anandapuram Road Under Phase 3	-	505.02	Port's funds
17.	Proposed Road Connectivity from RCL to Mindi Yard to NH-16	-	76.95	Port's funds
18.	Development of fly over bridge connecting existing road from EQ up to the road connecting junction (Convent Junction)	-	90.0	Port's funds

The port layout after completion of ongoing projects shall be as shown in **Figure 10.1** and **Figure 10.2**.

Figure 10.1 Layout of Inner Harbour Alongwith Ongoing Developments

Figure 10.2 Layout of Outer Harbour alongwith Ongoing Developments

10.2 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 10.2**.

Table 10.2 Projects to be Completed by Year 2020

S. No.	Project Name	Capacity Addition (MTPA)	Investment Required (Crores)	Mode of Implementation
1.	Additional Oil Jetty (OR 3) along with OR 1 and OR 2	1.0	100	Port's funds
2.	Additional Stackyard for VGCB	5.0	150	PPP
3.	Road Connectivity From Outer Harbour To Port Connectivity Junction (B)	-	500	Port's funds

The port layout after completion of projects mentioned above shall be as shown in **Figure 10.3**.

Figure 10.3 Layout Plan of Inner Harbour 2020

10.3 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 10.3**.

Table 10.3 Projects to be Completed by Year 2030

S. No.	Project Name	Capacity Addition (MTPA)	Investment Required (Crores)	Mode of Implementation
1.	Upgrading Berth WQ 2-5 to handle fully loaded Panamax ships	2.0	600	PPP

The port layout after completion of mentioned above shall be as shown in **Figure 10.4**.

Figure 10.4 Layout Plan of Inner Harbour 2030

Appendix 1 - **BCG Benchmarking Study for Vishakhapatnam Port**

6 Visakhapatnam Port Deep-dive

6.1 Port overview

Visakhapatnam port (VPT) is located on the east coast of India in the state of Andhra Pradesh, located between Chennai and Kolkata. It is the only major port of Andhra Pradesh. VPT has 24 berths, with 5 under private concession of which Adani, VSPL, Vedanta have concessions to operate coal berths, and DP World has concession to operate a container terminal. The layout of the VPT port:

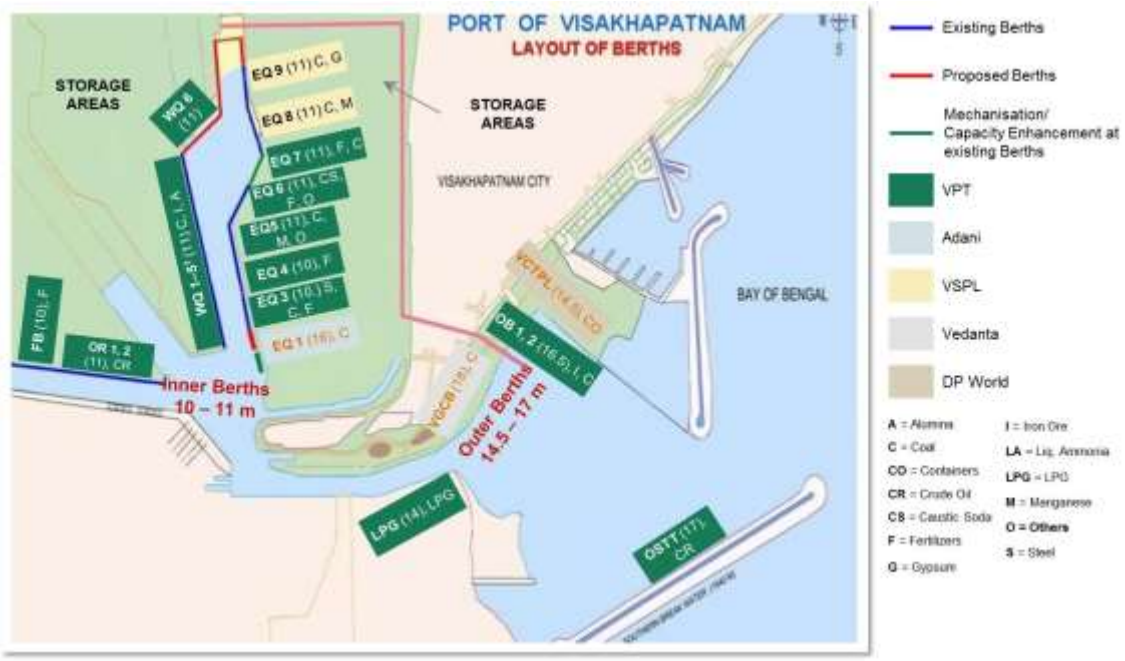


Figure 186: Berths at Visakhapatnam port

Cargo volumes have declined by 15% over the last 5 years, which has impacted the revenue of the port. The operating margin is also under pressure—primarily due to expenses increasing steadily by ~8%.

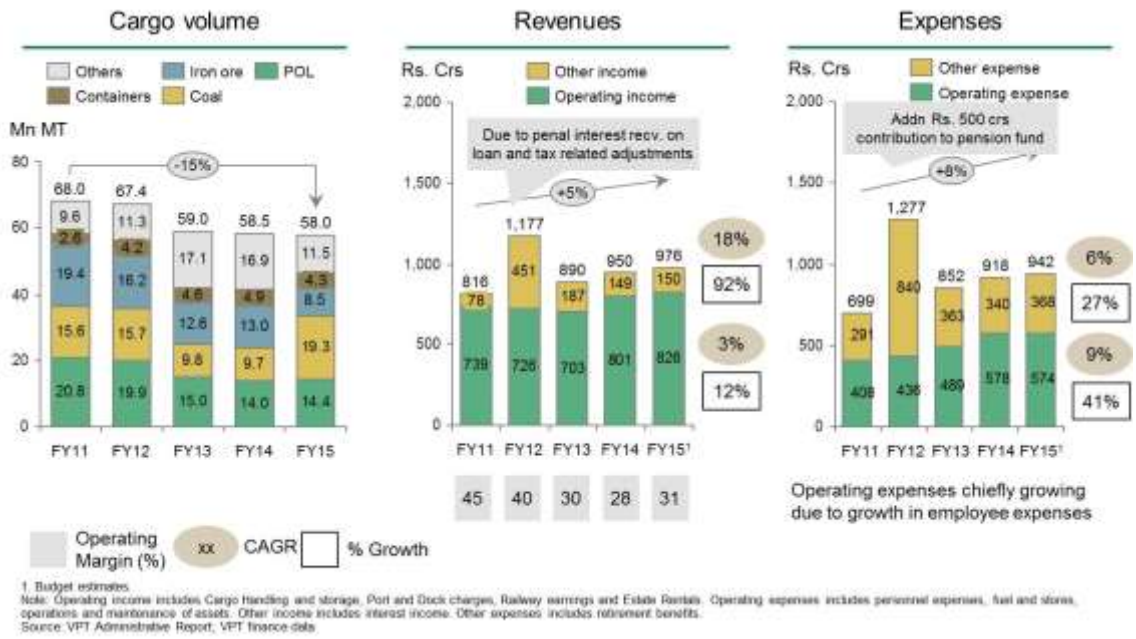


Figure 187: Cargo volumes, revenue and expenses

Most berths at VPT either face a problem of low capacity utilization or low occupancy. Existing berths are in a position to handle up to 100 million MT.

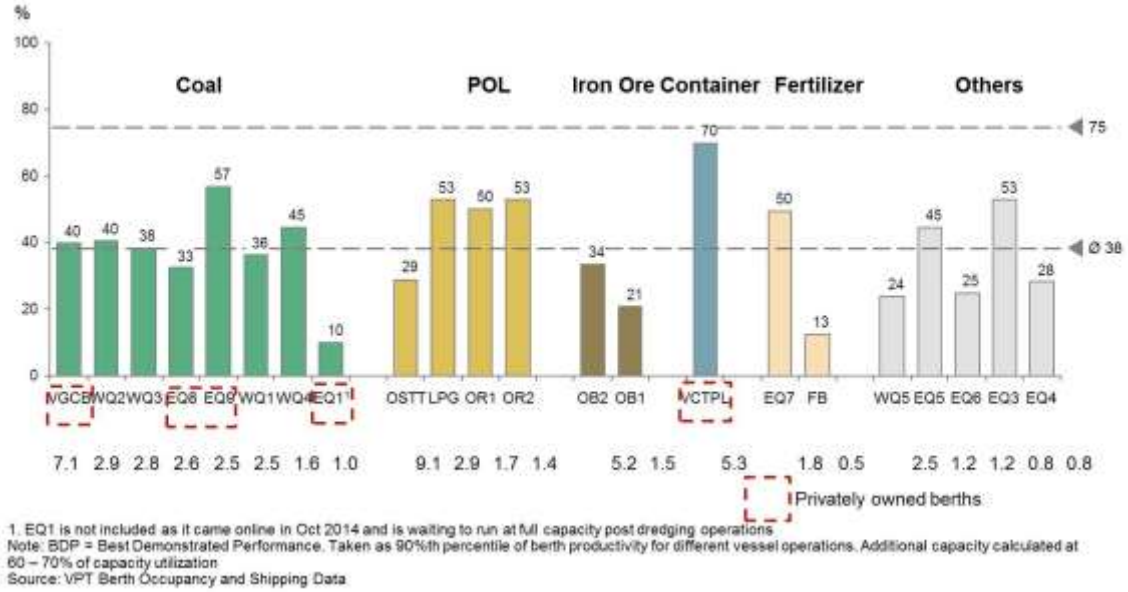


Figure 188: Capacity utilization of all the berths at VPT (calculated using BDP)

Three major cargos handled at VPT include coal, POL and iron ore. Competition is driving volume pressure across all 3 commodities. Coal cargo has been under threat due to the emergence of Gangavaram port (less than 30 kms from VPT). POL is also under threat because of volumes shifting to Paradip. Another major hit has been iron ore—volumes have decreased after the ban on iron ore exports from the country.

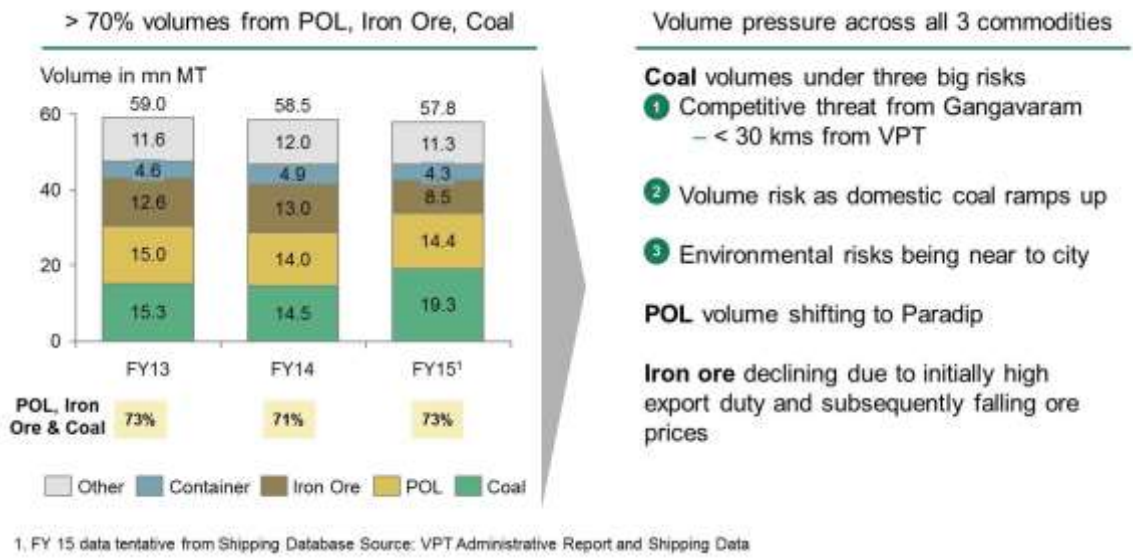


Figure 189: Volumes at VPT

6.2 Key findings and initiatives from deep-dive

A brief of the current port capacity and berth allocation is given below:

- Berths VGCB, EQ1 and EQ1A are already under PPP – BOT and are fully mechanized with VGCB and EQ1 being used to handle import coal, and EQ1A being developed to handle export coal. VGCB is PPP-BOT with Vedanta, EQ1 with Adani, and EQ1A with SEW.
- Ore Berths 1 and 2, which are currently owned by VPT, have been contracted to Essar to develop them as iron ore handling berths with fully mechanized capabilities.
- OSTT berth, which had suffered extensive damage during Cyclone Hudhud, is being redeveloped by VPT to handle POL cargo.
- LPG berth is currently owned by VPT and handles cargo through its network of pipelines.
- VCTPL 1+2 are container terminals that are currently operated by Visakha Container Terminal under PPT – BOT.
- One half of EQ2 (the other half is being used to increase berth length of EQ1), EQ3, 4, 5 are being planned to be deconstructed and 2 deeper draughts (14.0 m) berths are being developed in the medium term (3-year horizon). After berth reconstruction, 2 x 100 MT HMCs will be used to operate each of the 2 new berths.
- EQ6 berth currently does not have any shore cranes. Hence, current 20 MT shore cranes are being planned to get transferred from adjoining EQ7 berth.
- EQ7 berth has been contracted out to ABG to be developed as a dedicated fertilizer handling berth. The berth draught will be increased from the current 11.0 m to 14.0 m.
- EQ8 and EQ9 are 2 other general cargo berths being operated by Vizag Seaport Limited with a draught of 14.5 m. They currently use 2 HMCs of 100MT for operations.
- WQ1 berth is currently being planned to be given to Essar after berths OB1 and OB2 have reached capacity, and will be mechanized for iron ore export.
- WQ2 and 3 have draught of 12.5 m and will operate as General Cargo berths using 2 HMCs of 50 MT and 100 MT.

- WQ4 berth with draughts of 11.0 m will continue to operate as General cargo berth using ship cranes for operations.
- WQ5 is currently semi-mechanized to handle alumina and caustic soda with a draught of 11.0 m. This is also not expected to change.
- OR1 and OR2 berths currently have a berth draught of 11.0 m and handle POL products. Their draughts will be increased to 14.0 m and new pipelines will be added in line with growth in POL products at HPCL refineries. Also, this additional pipeline development will render the current dedicated Fertilizer berth (FB) as defunct.
- WQ6 is already mechanized by ABG and will be used to handle general cargo products.
- WQ7 and WQ8 will have dredging operations for increasing berth draughts and will be used to handle general cargo. They will have a draught of 14.0 m.
- EQ10 is being planned to be developed by IMC under PPP – BOT and will also handle General Cargo.
- SPM will continue to operate in the future as it is operating today.

Thus, VPT already has plans to emerge as a highly mechanized port with multiple dedicated berths as well as general cargo berths under PPP-BOT operations.

	Current Status (or operational under 1 year)						
Berth	**Mech / Conv**	**Player**	**Draft**	**Cargo**	**Volume Handled (14-15)**	**Potential Capacity**	**Berth equipment**
VGCB	Mech	VGCB	18.0	Coking Coal + Steam Coal	6,889,086	10,000,000	Conveyor mech.
Ore berth 1 (OB1)	Semi Mech	VPT	16.5	Iron Ore + Coal (Lighterage)	1,344,197	2,523,721	Floating crane
Ore berth 2 (OB2)	Mech	VPT	16.5	Iron Ore	5,007,435	*10,000,000*	Ship Loader + Conveyor
OSTT	Mech	VPT	17.0	POL	3,425,101	*10,000,000*	Pipeline
LPG	Mech	VPT	14.0	LPG	2,847,964	5,780,314	Pipeline
VCTPL1 + 2	Mech	DP World	15.0	Containers	3,979,266	7,010,926	
AVCTPL (EQ1)	Mech	Adani	16.0	Steam Coal	972,147	7,000,000	Conveyor mech.
EQ3	Conv	VPT	10.0	General Cargo	784,998	2,141,814	Electric cranes 10 / 15 MT
EQ4	Conv	VPT	10.0	General Cargo	803,672	2,141,814	Electric cranes 10 / 15 MT
EQ5	Conv	VPT	11.0	General Cargo	1,178,824	2,141,814	Electric cranes 10 / 15 MT
EQ6	Conv	VPT	11.0	General Cargo + Caustic Soda + Phosphoric Acid (Pipeline)	1,193,557	2,472,840	Electric cranes 10 / 15 MT
EQ7	Conv	VPT	11.0	Fertilizers	1,806,316	1,863,233	Electric cranes 20 MT
EQ8	Semi Mech	VSPL	11.0	General Cargo	2,467,884	4,531,336	100 MT HMC, Conveyor
EQ9	Semi Mech	VSPL	11.0	General Cargo	2,293,593	4,531,336	100 MT HMC, Conveyor
WQ1	Conv	VPT	12.5	General Cargo	2,341,058	4,651,718	2 50 HMC between 3 berths, Ship Cranes
WQ2	Conv	VPT	12.5	General Cargo	2,716,472	4,651,718	
WQ3	Conv	VPT	12.5	General Cargo	2,602,368	4,651,718	
WQ4	Conv	VPT	11.0	General Cargo	1,581,754	3,655,793	Ship Cranes
WQ5	Semi Mech	VPT	11.0	Alumina + Caustica Soda (Pipeline)	2,489,314	3,873,323	Ship Crane + Conveyor
FB	Mech	Captive berth for CFL	10.0	Fertilizers	504,357	2,936,667	
OR1	Mech	VPT	11.0	POL	1,619,916	3,469,639	Pipeline
OR2	Mech	VPT	11.0	POL	1,424,884	3,090,288	Pipeline
SPM	Mech	VPT	-	POL	5,510,484	*10,000,000*	Pipeline
EQ1A	*Mech*	*SEW*	-	*Thermal Coal*		7,000,000	*Conveyor mech.*
WQ6	*Mech*	*ABG*	-	*General Cargo*	*2,113*		

Figure 190: Existing berth details (FY15 end) with cargo handling capacity at VPT

In addition, VPT receives the following revenue share from the different PPP-BOT berths operating currently:

- Vedanta General Cargo Berth – 38.1%
- Adani Steam Coal Terminal – 40.0%
- Vizag Sea Port Limited (VSPL) – 17.5%

VPT currently faces stiff competition from Gangavaram port, located 13 kms away. In the same period from 2010–11 to 2014–15, volumes at Gangavaram have increased from ~14 Mn MT to ~21 Mn MT, largely driven by an increase in coal cargo from ~10 Mn MT to ~16 Mn MT. Market share at VPT for coal handling has, therefore, come down from ~60% in 2010–11 to <50% in 2014–15. Coal has been a key driver of cargo at VPT and any loss in market share of coal handling needs to be addressed immediately.

With these facts in view, it is critical to create and attract additional demand at VPT to improve overall operations. Also, there is potential to improve financial performance of the port by driving higher cargo volume share for coal (both coking and steam coal imports) through existing mechanized terminals rather than conventional operations. Hence, our effort has focused on demand creation and generating additional revenues from existing operations and cargo demand by improving overall port throughput.

	Future Status (5 Years)				
Berth	**Mech / Conv**	**Player**	**Draft**	**Cargo**	**Berth equipment**
VGCB	Mech	VGCB	18.0	Coking Coal + Steam Coal	Conveyor mech.
Ore berth 1 (OB1)	Semi Mech	Essar	17.0	Iron Ore	Conveyor mech.
Ore berth 2 (OB2)	Mech	Essar	17.0	Iron Ore	Conveyor mech.
OSTT	Mech	VPT	17.0	POL	Pipeline
LPG	Mech	VPT	14.0	LPG	Pipeline
VCTPL1 + 2	Mech	DP World	15.0	Containers	
AVCTPL (EQ1)	Mech	Adani	16.0	Steam Coal	Conveyor mech.
EQ3	Conv	VPT	14.0	General Cargo	2 Semi Mech (100 MT HMC)
EQ4	Conv	VPT	14.0	General Cargo	2 Semi Mech (100 MT HMC)
EQ5					
EQ6	Conv	VPT	11.0	General Cargo	20 MT HMC from EQ-7
EQ7	Mech	ABG	14.0	Fertilizers	
EQ8	Semi Mech	VSPL	14.5	General Cargo	100 MT HMC, Conveyor
EQ9	Semi Mech	VSPL	14.5	General Cargo	100 MT HMC, Conveyor
WQ1	Mech	Essar	14.0	Iron Ore	Conveyor mech.
WQ2	Conv	VPT	12.5	General Cargo	2 50 MT / 100 MT HMC across 2 berths
WQ3	Conv	VPT	12.5	General Cargo	
WQ4	Conv	VPT	11.0	General Cargo	Ship Cranes
WQ5	Semi Mech	VPT	11.0	Alumina + Caustica Soda (Pipeline)	Ship Crane + Conveyor
FB	-	-	-	Fertilizers	Pipeline
OR1	Mech	VPT	14.0	POL	Pipeline
OR2	Mech	VPT	14.0	POL	Pipeline
SPM	Mech	VPT	-	POL	Pipeline
EQ1A	*Mech*	*SEW*	*14.0*	*Thermal Coal*	*Conveyor mech.*
WQ6	*Mech*	*ABG*	*14.0*	*General Cargo*	
WQ7, WQ8	*Mech*		14.0	*General Cargo*	Pipeline
EQ10	*Mech*	*IMC*	16.0	*General Cargo*	

Figure 191: Future berth development plan (FY20-end) at VPT

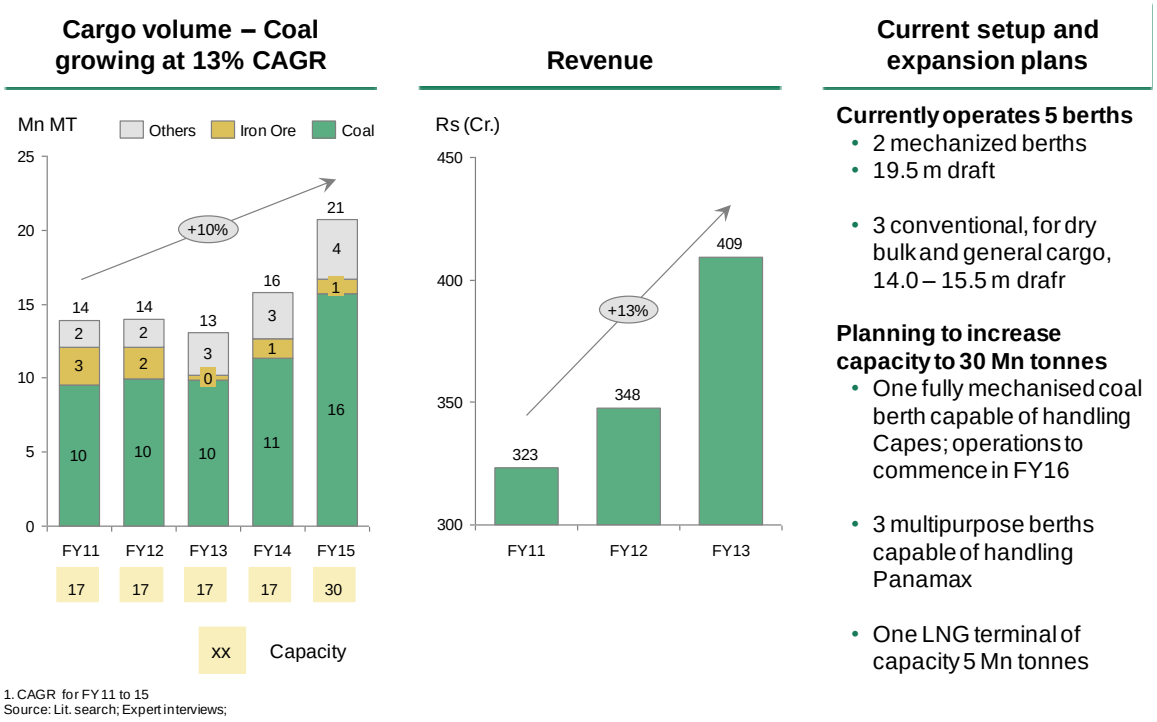


Figure 192: Gangavaram has been growing at 10% YoY, and is arguably adding capacity

6.2.1 VPT Berths (conventional operations)

Low capacity utilization at VPT berths is a key concern area. In addition, VPT also faces the constraints of capacity on railway lines connecting the port to the hinterland. Also, it has been losing customers and volumes to Gangavaram. Thus, VPT needs to approach the issue of demand generation and retention with a very high priority.

VPT currently has 4 main railway lines connecting it to the different areas within the hinterland:

- RV line (Raipur – Vizianagram): This line connects VPT / GVM to the hinterland in Chattisgarh, Madhya Pradesh, Western Odisha. Here, VPT typically has a share of 62% of rakes going from VPT and GVM out of a total number of ~14 rakes. This line is constrained and is a key bottleneck for increasing port volumes.
- South Central line (Visakhapatnam – Vijaywada): This line connects Visakhapatnam to Vijaywada and is also used for traffic all the way through Telangana and Eastern Maharashtra. Out of an average of 2 rakes here, VPT has a share of ~23%. Gangavaram port has been effectively targeting customers along this line as it can absorb additional rakes.
- Main line (Visakhapatnam – Kharagpur): This line connects Visakhapatnam to Kharagpur and is also used for traffic around Coastal Odisha, West Bengal and other areas of North East India. Out of an average 1 rake here, VPT has almost 72% of volume share.
- Local line: This connects Visakhapatnam to the local hinterland. Out of ~2.2 rakes here, VPT has a share of ~44%.

B1 Medium Term: Increase in rakes on constrained line

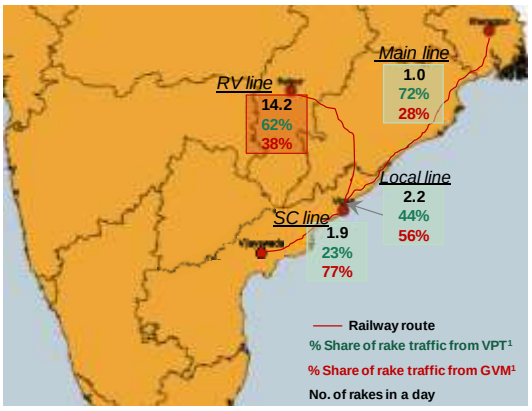
Increase in rakes after doubling of existing lines and completion of electrification works

- Need to work with Railways ministry to push for earlier completion of ongoing work

Engage with BRM office of E. Co. Railways to push for additional rake allocation

Complete electrification works for specific sidings to improve overall turnaround time for rakes and attract additional rakes to VPT

B2 Short Term: Targeting customers on non-constrained lines



Source: Average over 18 days from May 1 to May 18, 2015

Figure 193: VPT faces severe rake constraint in its immediate hinterland along RV line

As is evident, Gangavaram Port has been strategically targeting customers along the South Central Railway line and local customers to drive higher volumes.

6.2.1.1 Initiative: VPT 1.1 Set up new Business Development team

Initiative Overview

VPT has no formal mechanism to engage with customers. There is an urgent need to target customers along unconstrained lines and attract them to VPT. This requires creating a separate Marketing/Sales or Business Development team that can take the responsibility of reaching out and engaging with the customers.

Key Findings

In a highly competitive setting with frequent churn of customers from VPT to Gangavaram, an absence of a Marketing/Sales or Business Development team is a severe handicap and is one of the key reasons why there have been a number of customer exits from the port. In addition, lack of awareness of the port facilities along with end-to-end handling cost is another constraint faced by the port operations.

Recommendations

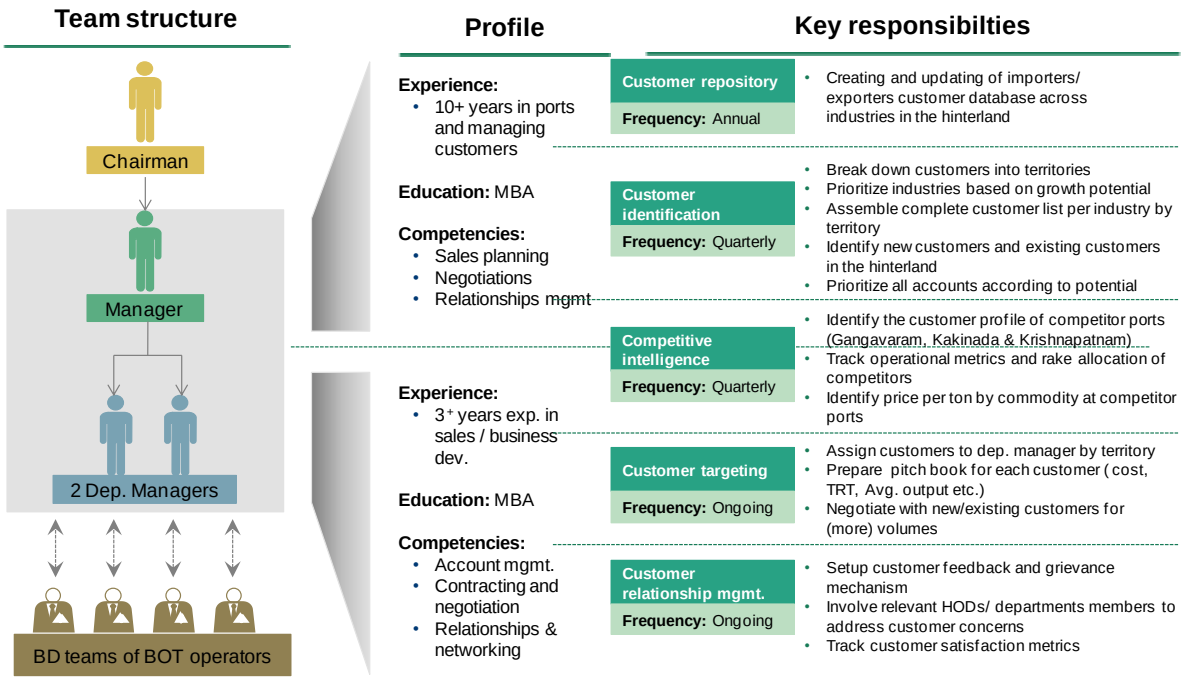


Figure 194: Need for a separate Business Development Capability at VPT

A BD team reporting to the Chairman with experience in driving marketing and sales is needed. This team will draw on support as needed from other teams—Traffic, Accounts, etc. Its core function will be:

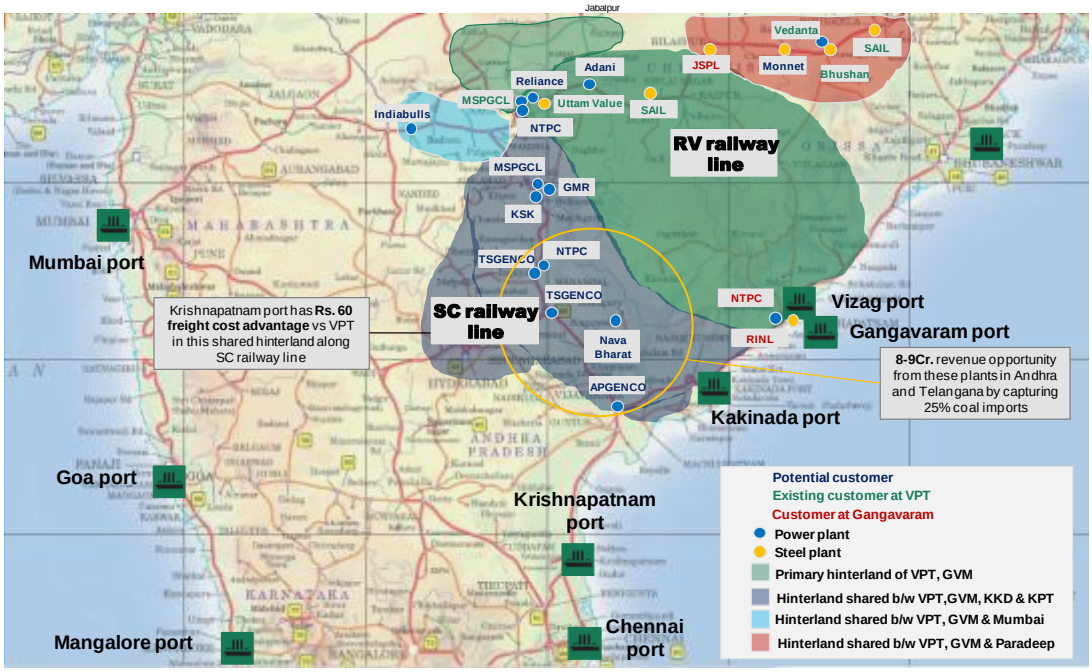
- Customer Identification and targeting: Identifying the customers in the hinterland. This in turn can be of the following categories:
- Customers already working with VPT
- Customers working with both VPT and Gangavaram
- Customers who have worked with VPT in the past, but are now working at Gangavaram
- Customers who have never operated through VPT
- Customer Repository: Developing a detailed customer repository to map the entire hinterland and their cargo requirement.
- Competitive intelligence: Cargo and volume handled of different customers at Gangavaram along with potential end-to-end handling cost, if possible.
- Customer Relationship management: Engage with existing customers to identify if they are facing any constraints at the port.

An initial list of customers who should be immediately targeted includes:

- Uttam Galva Metalliks for coking coal
- NALCO for steam coal
- AP Genco for steam coal
- TS Genco for steam coal
- Mah Genco in Wardha for steam coal
- Jindal Steel and Power for coking coal
- NTPC Simhadri

- Anrak Aluminium (customer at VPT till FY15)

In addition, new customer search and targets can be prioritized using the following map as a reference:



Shortest distance considered for determining the hinterland from the nearest ports
Source: BCG analysis; Indian Railways; Lit. search

Figure 195: Spread of power plants, steel plants, aluminium plants from Vizag Ports along different rail networks

Expected Impact

Having a Sales/Marketing or Business Development will help streamline existing customer handling processes and will, over a period of time, lead to increase customer retention and get additional customers and their cargo volumes to the port.

6.2.1.2 Initiative: VPT 1.2 Reconfigure cargo handling volumes along S. Central Railway

Initiative Overview

Same customers handle part of their cargo in mechanized berths and part of their cargo in conventional berths. The port makes around Rs. 70/MT of cargo handling on the mechanized berths, but makes a much smaller amount due to the use of labor at the conventional berths. If cargo volumes can be moved from the conventional berths to the mechanized berths, the operating profit for the port will go up. This initiative is also linked to initiative VPT 2.1 and VPT 2.2.

Key Findings

There are a number of customers who continue to handle cargo across both mechanized and conventional berths. The cargo in question is typically coking or steam coal.

Key customers handling coal cargo by both mechanized and conventional berths include:

Player	Adani (EQ1)	VGCB	VSPL	Others	Total
SAIL	-	2,574,513	1,433,831	210,702	4,219,046
Gandhar Oil Refinery India	-	547,889	357,559	302,527	1,207,975
Bhushan Power & Steel	220,179	701,145	-	116,048	1,037,372
Knowledge Infrastructure Systems	-	685,273	-	52,000	737,273
Uttam Galva Metallics	42,936	172,676	-	367,787	583,399
Jayswal Neco	-	142,970	44,268	288,767	476,005
Anrak Aluminium	-	297,655	39,931	68,954	406,540
Sesa Sterlite	-	327,396	49,320	-	376,716
Indermani Mineral (India)	225,832	29,677	-	47,443	302,952
Hind Energy and Coal Beneficiation (I)	36,000	34,263	-	158,384	228,647
Coastal Energy	-	95,645	-	113,300	208,945
Associated Cements & Ambuja Cements	-	37,251	97,805	-	135,056
India Coke and Power Ltd	-	47,746	70,921	13,569	132,236
Fuelco Coal (India)	-	13,424	19,076	93,169	125,669
Prism Cement	-	73,913	33,387	-	107,300

Figure 196: Coal cargo customers who use both mechanized and conventional berths

For actual end-customers (highlighted in gray), there is possibility to drive cargo handling towards mechanized berths, thereby improving port productivity and profitability.

Recommendations

The BD team lays special focus on interacting with the above customers. There is also a need to liaise with BD teams of the PPP – BOT operators and provide the right value proposition for each of the customers. This will help drive higher volumes through more productive berths and, hence, improve port efficiency.

Expected Impact

Reconfiguration of existing cargo from one berth to another will lead to improvement of overall port productivity and profitability. This will also drive improved environment management at the port as the volume will be directed through mechanized means.

PPT – BOT berth operations

VPT has been losing market share to Gangavaram for the following reasons:

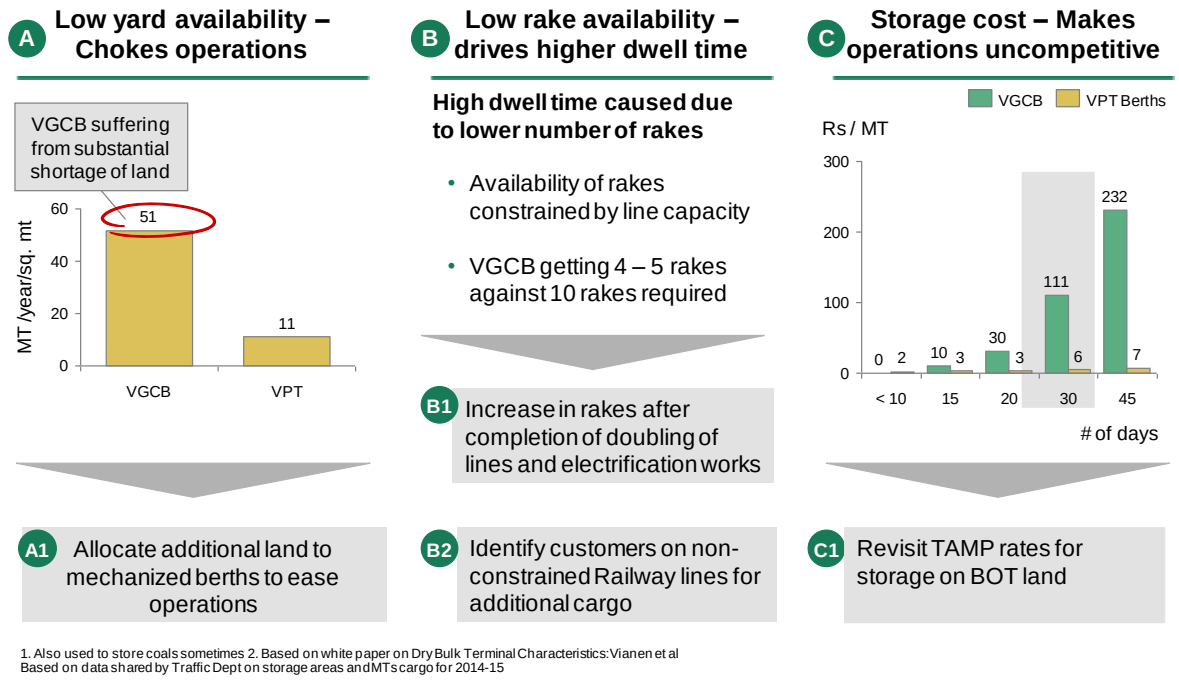
- Availability of multiple deep draught berths (Depth: 18m) at Gangavaram compared to only 1 current berth at VPT (VGCB berth)
- Low productivity, hence lower overall capacity utilization at VGCB due to operational constraints
- Prohibitive storage costs at VPT driving volumes away, compared to almost free storage at Gangavaram

The VGCB berth, like Gangavaram, is capable of handling cape size vessels bringing cargo of ~150,000 MT in each call to the port. However, average cargo parcel size handled at VGCB was only ~33,800 MT.

6.2.1.3 Initiative: VPT 2.1 Allocate additional land to high productive berths

Initiative Overview

Adequate space needs to be allocated to PPP – BOT berths to ensure effective productive operations keeping in view existing operating conditions within the port. Any development in space should ideally be carried out by the PPP – BOT.



1. Also used to store coals sometimes 2. Based on white paper on Dry Bulk Terminal Characteristics:Vianen et al
Based on data shared by Traffic Dept on storage areas and MTs cargo for 2014-15

Figure 197: Low yard availability, low rake availability and high storage cost are critical constraints for VGCB operations

Key Findings

VGCB was designed to handle ~10 Mn MT of import coal in a year. In order to do this, it needed ~7–8 rakes for coal evacuation in a day. In 2014–15, it could handle only ~6.9 Mn MT of coal. Such low cargo handling was chiefly due to lack of adequate rakes for cargo evacuation (1585 rakes/year or 4.3 rakes/day). Lack of adequate rakes is in turn being driven by delay in implementation of electrification and doubling of Raipur – Vizianagram line of the Railways, which is expected to be complete by end of 2018. This line connecting Chattisgarh, Madhya Pradesh and Western Odisha is populated by major steel plants in India and is key to driving coal cargo volumes for VPT.

In addition, the average inventory storage for VGCB was assumed to be 10 days, implying storage of ~300,000 MT of cargo. Land was suitably allotted (total ~33 acres, ~25 acres for cargo storage) to store ~400,000–450,000 MT of coal. However, due to slow cargo evacuation, the actual average inventory storage days for larger customers (especially SAIL) has increased to >20 days and is also closer to ~30 days in some instances. Due to slow evacuation, the berth gets frequently choked due to lack of land for evacuating the cargo. Therefore, instead of operating at a capacity of >80,000 MT/day, the berth is only able to operate at ~30,000–35,000 MT/day for full vessel discharge, severely increasing the time spent by the vessel at the port and increasing the cost for the end customer. Also, the berth was able to handle only 4 vessels out of 186 vessels with volume > 100,000 MT in 2014–15, though it is designed to handle high capacity vessels.

As the key RV Railway upgrade project is still not complete, it is important to increase the geographic spread of customers to be in a position to handle additional cargo. Currently, this is not possible as a large volume of existing storage is used by SAIL cargo (~150,000 MT–200, 000 MT out of ~400,000 MT of cargo stored in VGCB stackyard), and the remaining area is blocked by cargo from other major steel players.

Non exhaustive list of vessels supplying coal to end customers on S. C. Railway line from VGCB berths

Vessel	Cargo	Customer	Cargo handled at VGCB	Cargo handled at other berths	Potential revenue lost
SHIN YO	COKING COAL	Uttam Galva	27,155	47,875	INR 34L
PRABHU SHAKTI	COKING COAL	Uttam Galva	26,716	54,657	INR 38L
UNION TRADER	STEAM COAL	Gandhar Oil Refinery India	25,443	30,409	INR 21L
ECOLA	STEAM COAL	Gandhar Oil Refinery India	22,396	46,192	INR 32L
SEA HERMES	COKING COAL	Uttam Galva	26,415	52,947	INR 37L
IKAN BAWAL	COKING COAL	Uttam Galva	31,297	49,956	INR 35L
PEDHOULAS COMMANDER	COKING COAL	Uttam Galva	25,676	55,597	INR 39L
				Total	INR 2.4 Cr

Resultant loss of revenue due to handling at non VGCB berths

Extra cargo from same vessel for same customer not handled at VGCB berths due to non-availability of land

Overall, 119 vessels affected, with ~3 mn MT of coal not handled at high productive berths leading to lower realization of revenue

Note: Data for select customer in FY 14- 15
Source: Shipping Data, VPT. BCG Analysis

Figure 198: Space constraints at VGCB led to higher lighterage operations, hence loss of cargo handling at high productive and high profitability berths

- Inadequate storage space and difficulties in evacuation is resulting in lighterage operations and, hence, loss of both productivity and profitability for VPT.

Also, VPT has been facing multiple complaints from nearby residential areas of higher pollution due to handling and storage of dirty cargo near residential areas. One of the key drivers of this pollution has been handling of dirty coal cargo through conventional means at VPT. In order to make port operations sustainable in the long run, it is also important to move the handling of coal cargo through conventional means to mechanized means to reduce any instances of air pollution.

Recommendations

Adequate land needs to be allocated to PPT – BOT berths under the purview of existing contract conditions to drive higher port productivity and port volume.

- In order to decongest operations and meet project volumes at VGCB of ~10 Mn MT, average inventory turns of 12–15 or ~830,000 MT of inventory is required. At the current stack height of ~4 m of cargo storage, this requires an additional land parcel of ~22–25 acres of land.
-
- As per the current contract, provision for allotting excess land has been included in Clause 9 iii. Land lease charges paid on this land by VGCB to VPT will be the same as charged by the port for any long term lease rate as defined under SoR. The proposed clearing and development of land for use as storage areas (including capital expenditure such as setting up of conveyor land) should be taken up

by the private player under PPP – BOT. Existing contract conditions have this provision for additional land allocation to VGCB berth for project needs.

There is a land parcel of ~28–30 acres near the VGCB terminal that can be used for this purpose. It will involve movement of existing FCI godowns to the periphery of the port, and use of the said land parcel for coal storage. This will also reduce coal storage on the port periphery and replace coal with clean cargo of FCI.

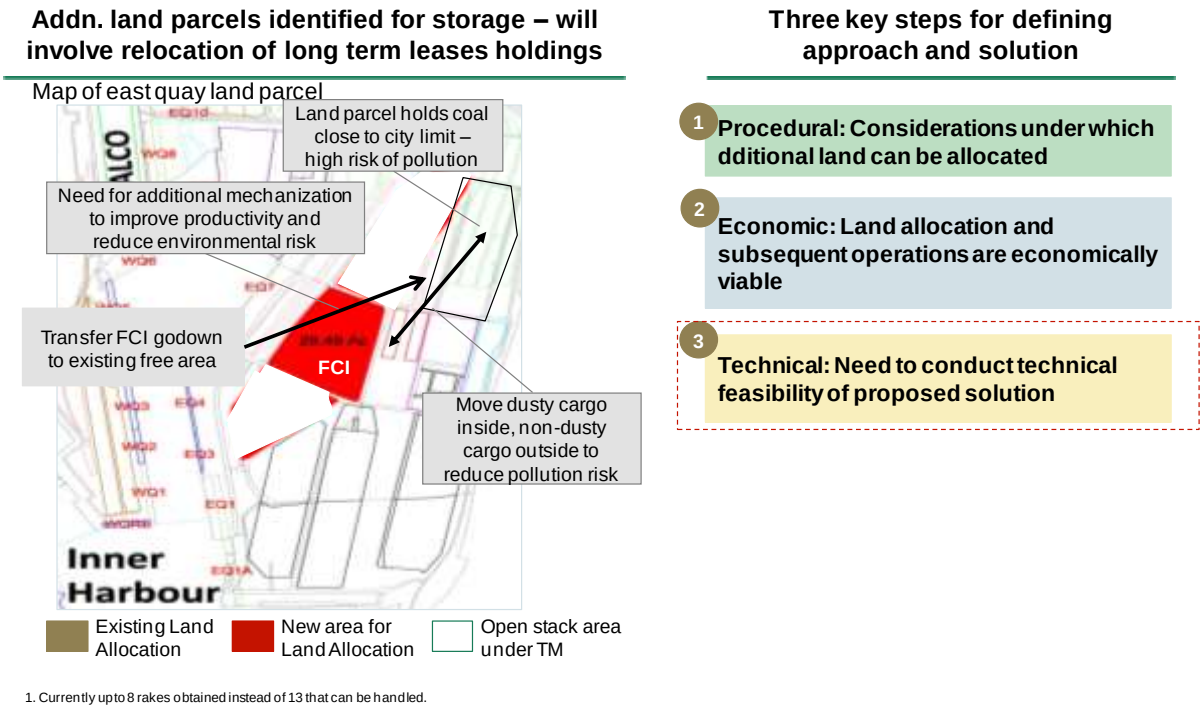


Figure 199: Identified parcel for land may need some godowns to be shifted out to the periphery area of the port

All technical studies of how the land will be developed should be carried out by the PPP – BOT player. Initial estimates for the overall investment required for the total development is ~Rs. 90–100 Crs, including 2-sway conveyor systems, stacker reclaimer systems and land development.

Expected Impact

VPT is expected to have the following benefits due to the proposed changes:

- **Productivity**: Higher coal volume handling through mechanized means at VGCB will lead to increase in overall productivity for the port, which in turn will lead to a reduction in the turnaround time for the vessels at the port. Higher space at VGCB will help the terminal maintain a larger distribution of end customers (geography-wise), increasing the number of rakes it gets every day.

- **Profitability:** Higher volumes at VGCB will lead to increase in revenues and, hence, revenue share for VPT. Because no costs are associated with the project from VPT's perspective, this will lead to a direct addition of operating surplus to VPT's books. For every additional ton of cargo handled, VPT will be making ~Rs. 70 in just cargo handling. Therefore, due to this allocation, if cargo volumes are taken up to ~10 Mn MT, it will lead to an increase in operating surplus by Rs. 21 Crs.

- **Environmental concerns**: Problems faced by VPT due to conventional handling of dirty cargo can be further mitigated as coal handling will move towards mechanized handling, with conventional coal handling volumes expected to decrease.

6.2.1.4 Initiative: VPT 2.2 Rationalize storage costs at PPT – BOT berths

Initiative Overview

The current storage cost structure at VGCB is:

- Free cargo storage for 10 days
- For next 5 days, i.e., days 11–15, ~Rs. 2/MT for each day
- For next 5 days, i.e., days 16–20, ~Rs. 4/MT for each day
- For every subsequent day, ~Rs. 8/MT for each day

This is a prohibitively high storage cost and is affecting VGCB's (hence VPT's) competitiveness vis-a-vis Gangavaram. Thus, despite VGCB's lower price point without storage costs, it is not a more effective proposition for the end customer due to the distortions created by the high storage costs, which make it a costlier option. This will lead to a further erosion of volumes over time, affecting port performance.

The current storage cost structure at Adani terminal (EQ-1) is:

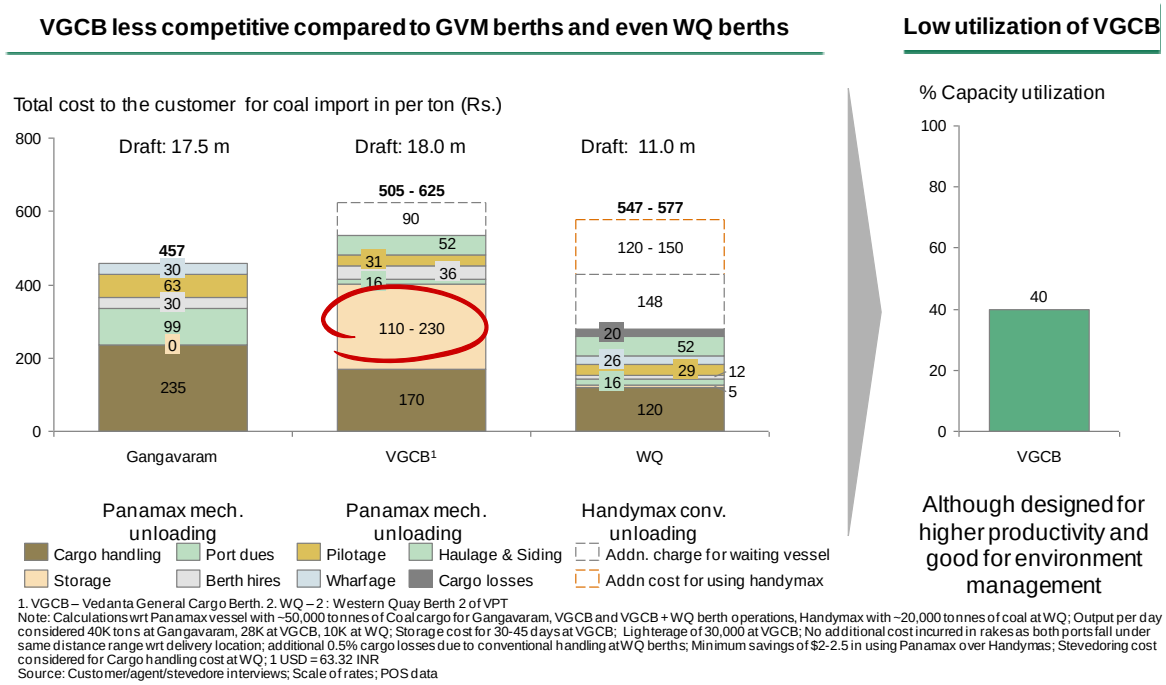
- Free cargo storage for 5 days
- For next 5 days, i.e., days 6–10, ~Rs. 2/MT for each day
- For next 5 days, i.e., days 11–15, ~Rs. 4/MT for each day
- For every subsequent day, ~Rs. 8/MT for each day

This is also a very high storage cost structure and will undermine competitiveness of the terminal when it is fully operational.

Key Findings

An analysis of end-to-end pricing structure for VGCB indicates the following:

- VGCB, while being mechanized like berths in Gangavaram, is not competitive on price points chiefly due to high storage cost
- In addition, even compared to lighterage operations at VGCB and WQ berths, VGCB is not competitive in spite of higher productivity and higher vessel size handling capability, which is again driven by very high storage costs



1. VGCB – Vedanta General Cargo Berth. 2. WQ – 2 : Western Quay Berth 2 of VPT
Note: Calculations wrt Panamax vessel with ~50,000 tonnes of Coal cargo for Gangavaram, VGCB and VGCB + WQ berth operations, Handymax with ~20,000 tonnes of coal at WQ; Output per day considered 40K tons at Gangavaram, 28K at VGCB, 10K at WQ; Storage cost for 30-45 days at VGCB; Lighterage of 30,000 at VGCB; No additional cost incurred in rakes as both ports fall under same distance range wrt delivery location; additional 0.5% cargo losses due to conventional handling at WQ berths; Minimum savings of $2-2.5 in using Panamax over Handymas; Stevedoring cost considered for Cargo handling cost at WQ; 1 USD = 63.32 INR
Source: Customer/agent/stevedore interviews; Scale of rates; POS data

Figure 200: VGCB berth is currently less competitive compared to Gangavaram, and even compared to part lighterage operations at VGCB and remaining unloading WQ berths

Recommendations

Rationalization of existing storage cost at PPP–BOT terminals is required. In 2014-15, instead of the planned storage revenues at VGCB of ~Rs. 1.7 Crs, the actual revenues were more than Rs. 20 Crs. This additional non-core revenue is at the cost of handling excess cargo volume and, hence, is a net non-value adding proposition for the entire logistic network.

The rationalization of storage cost needs to be worked out with TAMP as there are no existing clauses in the current contract that provides for change in storage cost structure.

Expected Impact

Lowering of storage charges from the current levels will only serve to make the existing operations more effective by attracting additional cargo to high productive, high profitability berths. This will also reduce lighterage operations and, hence, conventional coal handling operations at VPT.

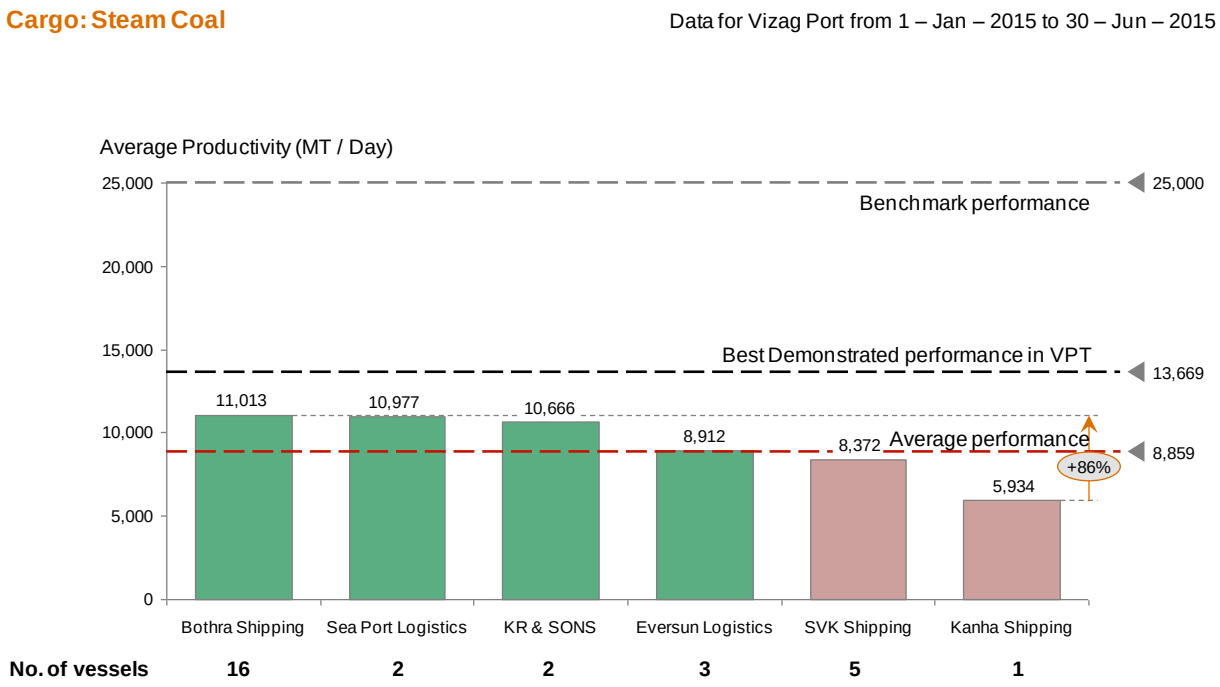
6.2.1.5 Initiative: VPT 3.1 Set up dashboard, regularize weekly meetings to track performance and use inputs to set up port productivity norms

Initiative Overview

At present, there is no regular performance review system at the port. In the absence of a tracking system, strict operational discipline is not enforced. As a result, varying levels of variance creep into regular operations. Also, from a port perspective, it gets difficult to benchmark performance levels for individual berths. There is a need to set up a dashboard-based weekly performance review to track performance across the berth–cargo–stevedore combination.

Key Findings

At present, there is minimal tracking and review of existing operations. As a result, there are significant variances in performance for the same berth-cargo-equipment combination for different stevedores, as well as for the same stevedore across different instances.



Source: Vessel Log data in 2015

Figure 201: Steam coal cargo handling performance for different stevedores

Absence of any productivity norms for the vessels or stevedore performance impacts the overall port productivity across conventional berths. Therefore, through a structured review mechanism, there is a need to identify the right productivity norms that can be set as targets for the stevedores.

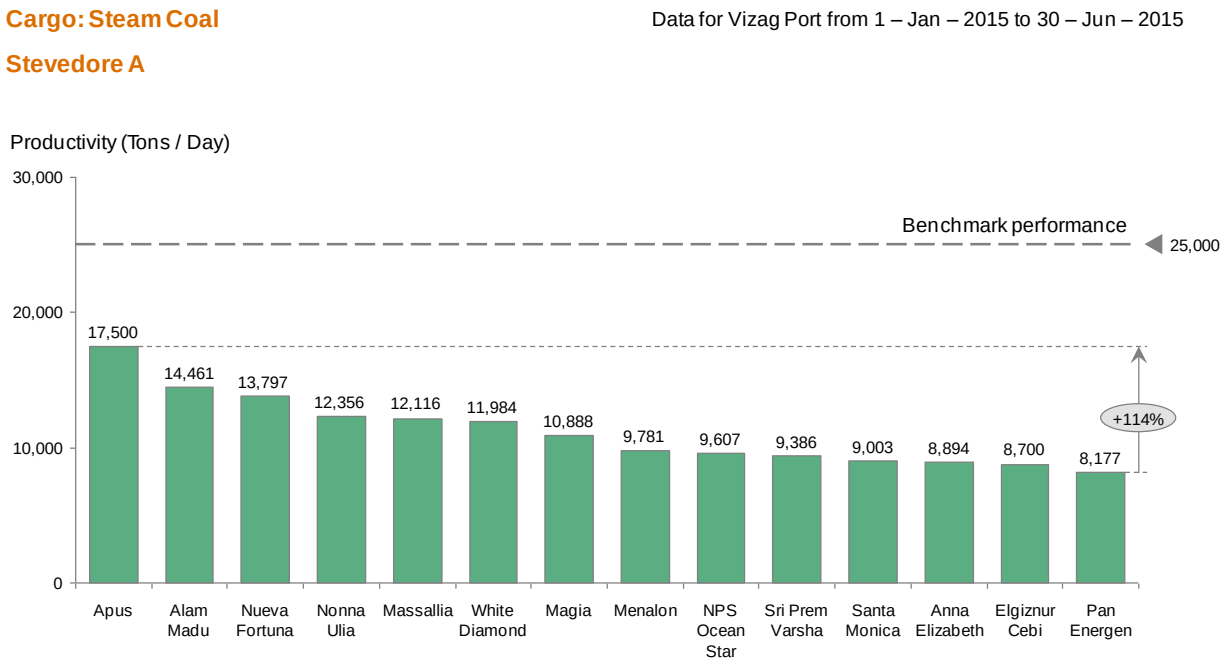


Figure 202: The same stevedore has a wide variance in performance across different vessels

Recommendations

Regular reviews of port operations are critical to create transparency, a single source of truth to measure performance and set up a process of continuous improvement. There is also a need to link performance reviews through an integrated IT system to remove any manual interventions.

In addition, targets and norms to govern equipment performance and vessel performance need to be put in place to ensure effective governance of operations.

Expected Impact

With adequate norms and tracking, there is a potential to increase the productivity of most cargo categories by > 10%. This will free capacity on the berth, will reduce vessel turnaround time, and will also help in reducing pre-berthing delays, improving the overall service levels at the port.