MASTER PLAN FOR CHENNAI PORT

Master Plan for Chennai Port

Prepared for

Ministry of Shipping / Indian Ports Association

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Executive Summary

Current Traffic and Future Projections

Chennai port is one of the largest ports in southern India. It currently handles more than 50 MTPA of traffic and is situated strategically close to the industrial area and is well connected both by rail and road to serve the hinterlands of Tamil Nadu, southern Andhra Pradesh and southern Karnataka (Exhibit 1). In FY 2016-17, the port handled 50.2 mn ton of traffic and witnessed an overall occupancy of 50 percent. The major commodities handled are containers and liquid cargo (majorly POL), which constitute more than 80 percent of the total traffic.

EXHIBIT 1

Important discrete manufacturing units near Chennai Port

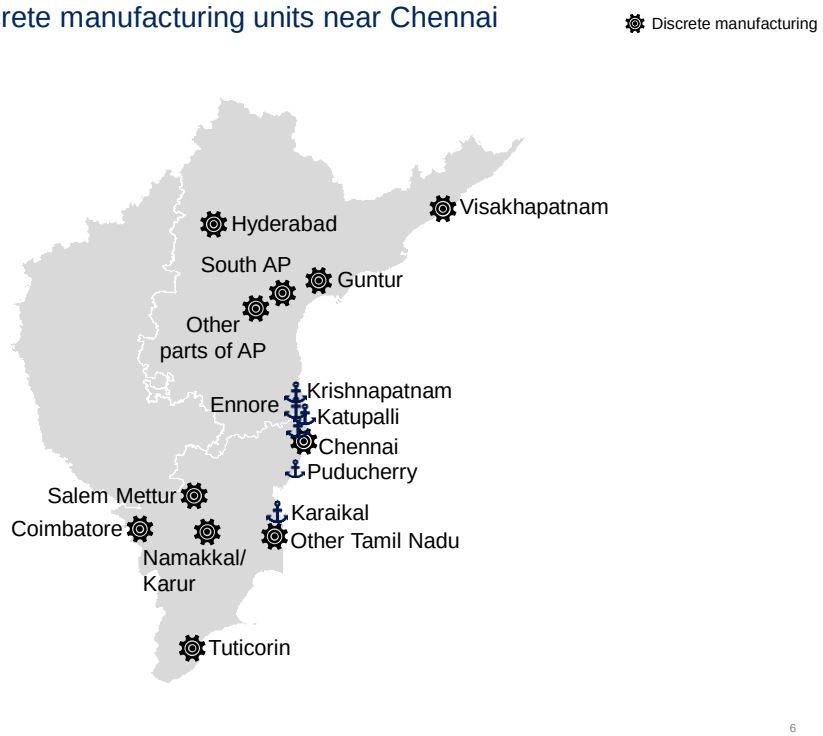
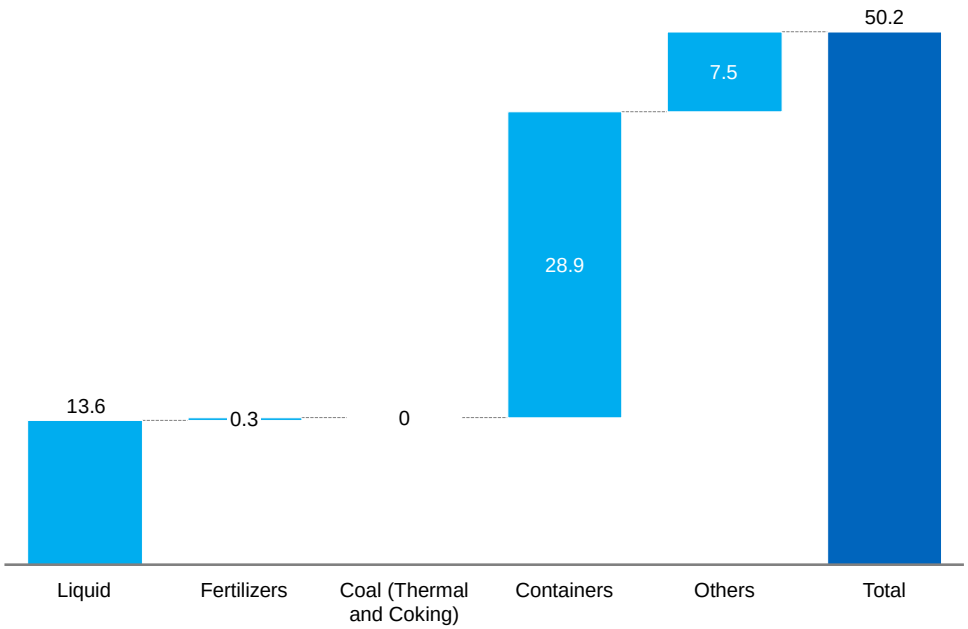


Exhibit 2 shows the commodity-wise split of the FY 2016-17 traffic.

EXHIBIT 2

Traffic handled at Chennai Port between April 2016 and March 2017

MTPA



The traffic handled is projected to be 48.3 MTPA by 2020. Exhibit 3 summarizes the traffic potential for key commodities for the port. The traffic projections are based on the OD study conducted in 2015-16. Actual traffic may vary depending on realization of the assumptions made in the OD study and any other developments not accounted for in the study[1].

[1] All traffic projections in this section are based on the Origin Destination study – National Perspective Plan

EXHIBIT 3

Chennai Port - Traffic Projections

Units: MMTPA (except Containers)

xx Base Scenario xx Optimistic Scenario

Commodity	FY17	FY20	FY25		Remarks
Liquid Cargo					
POL	12.21	13.30	13.10	18.80	▪CPCL expansion considered in optimistic case
Vegetable Oil	1.39	1.70	1.80	2.10	
Dry and Break Bulk Cargo					
Thermal Coal (Loading)	0.0	0.0	0.0	0.0	
Thermal Coal (Unloading)*	0.0	6.1	0.0	7.0	▪Traffic projections are contingent on permission to the port by Hon'ble SC to handle coal
Coking Coal	0.0	0.0	0.0	0.0	
Iron Ore	0.0	0.2	0.3	0.3	
Steel	1.4	1.9	2.5	2.9	
Limestone	2.0	2.1	2.3	2.5	
Dolomite	0.6	0.6	0.5	0.5	
Fertilizers	0.3	0.7	0.8	0.9	
Containers and other Cargo					
Containers (MnTEU)	1.50	0.90	1.20	1.40	▪Traffic may further reduce by 2025 if Enayam comes up
Others	3.44	4.30	5.70	6.00	▪Highly fragmented
Total (MMTPA)	**50.21**	**48.27**	**50.16**	**68.02**	

* Traffic potential include non-power thermal coal consumption in the hinterland and part of the thermal coal requirement projected for Mettur plant

Conversion Factor Used for Containers Projections: 1 TEU = 19.3 Tons

Traffic projections are based on the OD study conducted in 2015-16. Actual traffic may vary depending on the following developments:

- **Containers**: The port handles roughly 1.5 mn TEUs. The key hinterlands that the port serves for containers are Chennai and proximate SEZs, Bangalore, southern AP and parts of southern Tamil Nadu. Almost 50 percent of the traffic is transshipped from the port to other ports in Southeast Asia like Colombo and Singapore. With the growth of new ports, like Krishnapatnam and Katupalli, in the vicinity as well as the development of container terminal at Ennore, Chennai port could witness significant competition and a possible reduction in container traffic. Chennai as a city port also faces evacuation challenges that other ports currently do not face. The port is expected to cater to a traffic of roughly 0.9 mn TEUs by 2020 and 1.2 to 1.4 mn TEUs by 2025. In case a new transshipment hub on the southernmost tip of the country becomes operational, the potential traffic could decline further.
- **POL**: The port currently handles 12.2 MTPA of POL; majority of this is crude imports for the nearby CPCL Manali refinery. By 2025, the port will witness marginal increase of crude import to around 11 MTPA if the refinery operates to near capacity because of increased demand from the hinterland. The coastal product traffic is expected to move to Ennore port as OMCs, like IOCL, have been shifting their terminals there. The product export is expected to remain the same in the coming years. The CPCL refinery has not announced any plans to increase capacity currently—this could lead to an increase in traffic.

PORT CAPACITY – CURRENT STATUS AND FUTURE AUGMENTATION

Chennai port has three docks—Bharathi Dock, Ambedkar Dock and Jawahar Dock. Bharathi Dock houses the existing container terminal and contains seven berths; Ambedkar Dock has 11 berths and Jawahar Dock has six berths, i.e., a total of 24 berths. The major commodities handled in the port are crude oil and POL products, containers, automobiles, edible oil, finished fertilizers, fertilizer raw materials and general cargo.

Table 1 summarizes the existing capacity of the port as of 31st March 2017, based on the "Berthing Policy for Dry Bulk Cargo for Major Ports" released by the Ministry of Shipping in June 2016.

TABLE 1

Commodity	Berths	Rated Capacity (MTPA)
General Cargo	NQ	1.0
	WQ 1-4	8.3
	CQ	2.2
	SQ 1-2	4.0
	JD 1-6	22.1
Liquid	BD1	6.7
	BD2	2.8
	BD3	25.7
Container	SCB1-3	29.5
	CTB1-4	31.3
Total		133.6

The desired occupancy for berths handling non-containerized cargo is considered to be 70 percent and 85 percent for berths handling containerized cargo (due to pre-determined scheduling). Future projects could be planned after considering the existing rated capacity at desired occupancy level.

Ongoing projects

Table 2 lists the ongoing project at the port that will lead to additional capacity

TABLE 2

S. No.	Projects	Commodity	Rated capacity of ongoing projects (MTPA)
1	Construction of coastal terminal	General Cargo	1.6

Based on the current facilities and ongoing projects the capacity at desired occupancy for different commodities will be more than projected 2020 traffic (Table 3)

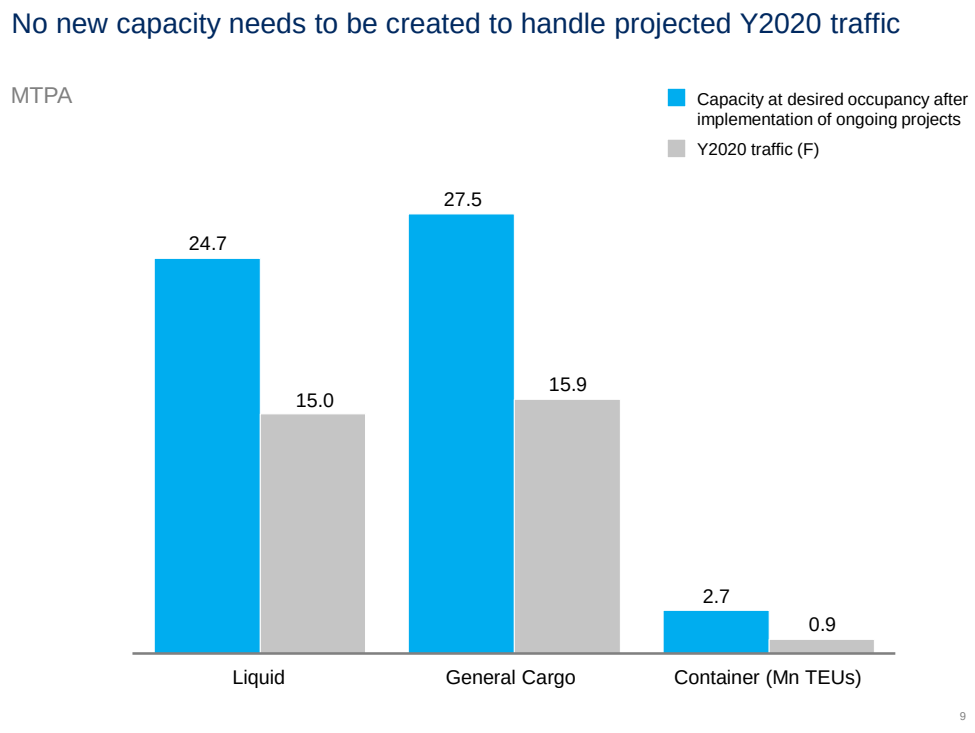
TABLE 3

Commodity	Current Rated Capacity (MTPA)	Current capacity at desired occupancy (MTPA)	Capacity at desired occupancy after ongoing projects (MTPA)	2020 Traffic
General Cargo	37.60	26.3	27.45	15.9
Liquid	35.22	24.66	24.66	15
Container	60.77	51.65	51.65	17.4
Total	133.6	102.6	103.8	48.3

Note: Traffic estimates are based on certain assumptions. The projects should be triggered only if the actual traffic is realized. The key assumptions are mentioned in the Section on “Current traffic and future projections”.

Based on the projected traffic in 2020 and the capacity at desired occupancy at the port, no new projects need to be awarded by 2020 (Exhibit 4).

EXHIBIT 4



PORT CONNECTIVITY

Chennai is well connected to other major cities through national highways, e.g., it is connected to Kolkata through NH 5, to Mumbai through NH 4 and to Kanyakumari through NH 45 (Exhibit 5).

EXHIBIT 5

Connectivity to Chennai Port

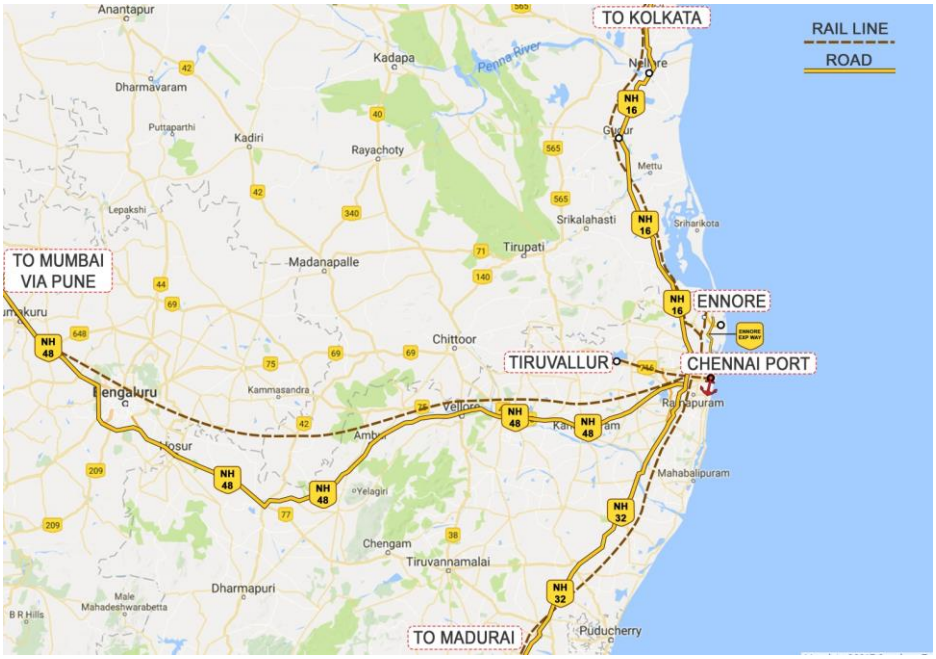


Table 4 Road connectivity infrastructure

S. No.	Key Destination	Road	Lanes (2/4)	Length (KM)
1	Hyderabad	NH 65	4	631
2	Vijayawada	NH 16	4	455
3	Guntur	NH 16	4	418
4	Hubballi	NH 48	6	769
5	Bangalore	NH 48	6	353
6	Vellore	NH 48	6	143
7	Mysuru	NH 275	4	487
8	Mettur	NH 44	4	371
9	Salem	NH 79	4	370
10	Villupuram	NH 32	4	186
11	Namakkal	NH 79	4	390
12	Karur	NH 81	4	434
13	Tiruppur	NH 544	4	490
14	Coimbatore	NH 544	4	531

The port is linked to the Southern Railway network through Chennai Beach Railway Station, connecting it to southern parts of Tamil Nadu, and through Royapuram Station, connecting it to the Southern Railway Trunk Line to major cities like Kolkata, New Delhi, Bangalore, Coimbatore, etc. The port also

has an internal rail network of about 70 km.

The following connectivity project is ongoing at the port (Table 5):

TABLE 5

S. No.	Project Name	Investment required (in Crores)	Distance (KM)	Mode of implementation
1.	Laying of new railway track at west of western yard I and laying paving block loading Platform	13	6	IPRCL
2.	Development of Coastal road to the East of container Terminal II at Chennai Port	63	1.3	Port Trust

Table 6 lists the recommended connectivity projects for the Chennai port in order to enhance the port connectivity

TABLE 6

S. No.	Project Name	Investment required (INR Crores)	Mode of implementation	Rationale
1.	Development of dedicated Container Corridor to NHAI road for quick evacuation, Chennai	100	Port Trust	For easy and effective container / cargo evacuation from the Port directly to NHAI Road grid and form a 8 lane concrete road to reach out by avoiding inter Port activities and create a dedicated container corridor.
2.	Puducherry (NH-32) - Marakkanam - Sadaras - Kovalam - Coromandel - Chennai (NH -32)	1,440	State PWD	For quicker evacuation of cargo

1.0 INTRODUCTION

1.1 Background

The Sagarmala initiative is one of the most important and 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 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 larger drivers of economy.

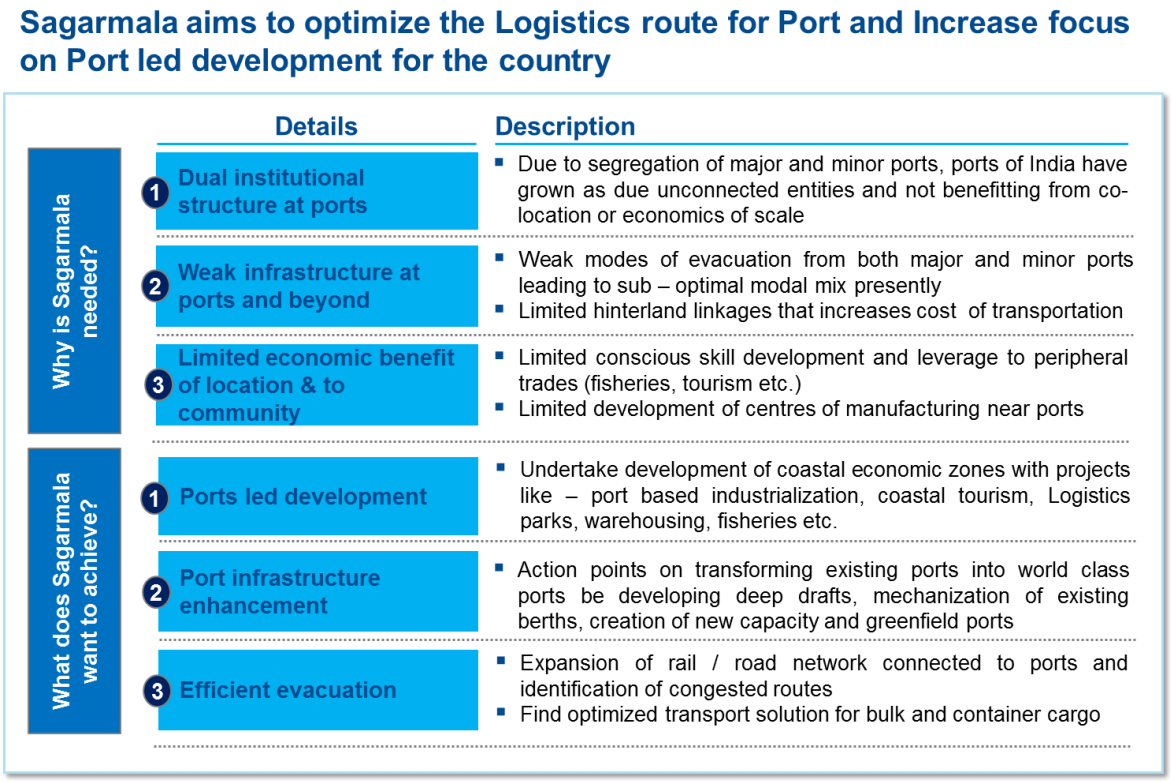


Figure 1.1 Aim of Sagarmala Development

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

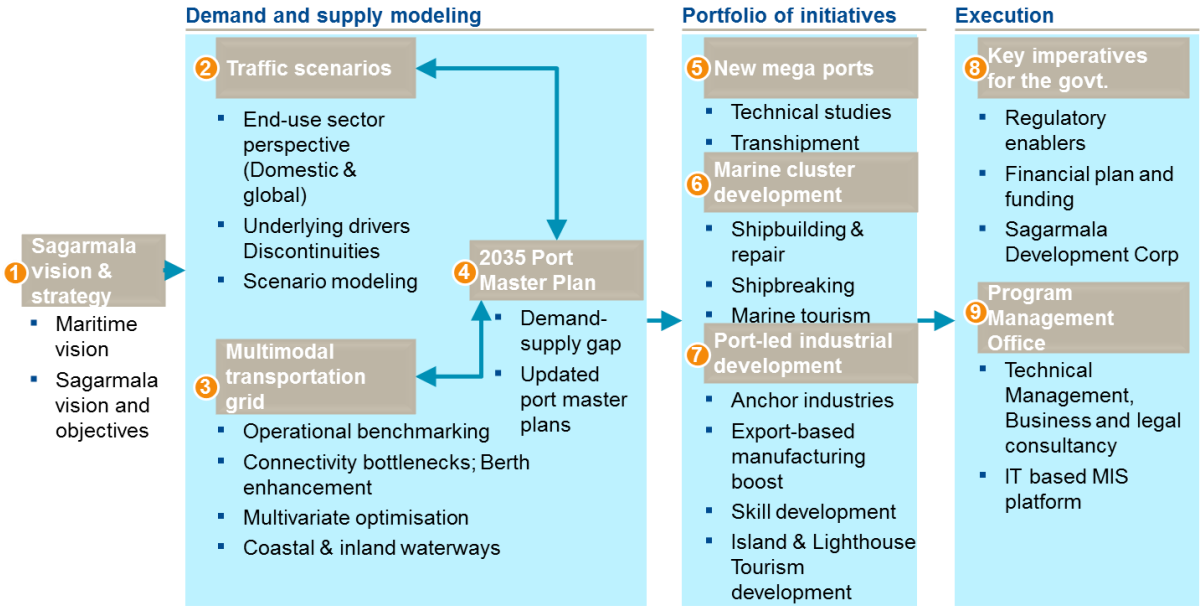


Figure 1.2 Governing Principles of Our Approach

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**.

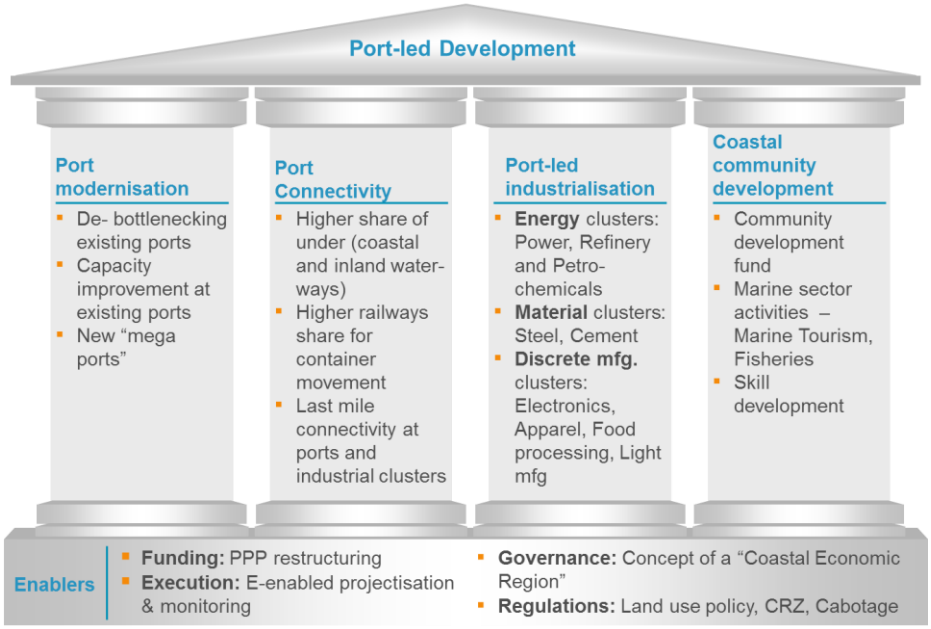


Figure 1.3 Port Led Developments

As part of the assignment, we were 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 Outline of the Report

The report is the Final report on Master Plan for Chennai Port as part of SAGARMALA assignment is organised in the following sections:

Section 1 : Introduction
Section 2 : The Port and Site Conditions
Section 3 : Details of Existing Facilities
Section 4 : Performance, Options for Debottlenecking & Capacity Assessment
Section 5 : Details of Ongoing Developments
Section 6 : Traffic Projections
Section 7 : Capacity Augmentation Requirements
Section 8 : Road and Rail – Internal Network and External Connectivity
Section 9 : Scope for Future Capacity Expansion
Section 10 : Shelf of New Projects and Phasing

1.4 Present Submission

Under the guidance of Ministry of Shipping, AECOM conducted the exercise of Port masterplan development in 2015-2016. Subsequently, the Ministry of Shipping formulated a new Berthing policy for Dry bulk for all major ports, which came into effect from 20th August 2016. The objective of the new berthing policy is to:

- Provide a standardized framework for calculation of norms, specific to the commodity handled and the infrastructure available on the berth
- Design norms with the objective of driving higher productivity and achieving near-design capacity of the available equipment/infrastructure in order to:
  - Reduce berthing time & overall turn-around time of ships; drive higher cargo throughput using the available infrastructure in the Major Ports.
  - Improve utilization of port assets and create additional capacity without any significant capital investment.
- Increase competitiveness of the Major Port by creating value for the trade through reduced logistics cost.
- Reassess the capacity of the berths based on the expected performance of the berth equipment and vessels derived from performance norms.
- Standardize anchorage charges across Major Ports to reduce turnaround time.

Following the methodology of Dry bulk as per the berthing policy, approach has also been laid out for other commodities – break bulk, liquid, and containers to get a comprehensive view of the port capacity. This is proposed to be added to the berthing policy to make it a comprehensive document for port capacity rating.

In line with the above, the capacity of the ports have been rated using a scientific approach. Due to this change in approach, the masterplans have been revised to reflect the revised capacity and additional projects that may be required thereafter based on the traffic projections.

This document is the revised Master Plan for Chennai Port based on the above.

2.0 THE PORT AND SITE CONDITIONS

2.1 Chennai Port as at Present

The location of Chennai Port is shown in **Figure 2.1**.

Figure 2.1 Chennai Port Location

Chennai Port is the third oldest and about 135 years old port among the twelve major ports of India. It has the strategic advantage of having the entire South India as its hinterland and is emerging as a hub port in East Coast of India. Chennai Port is located at latitude 13°06' N and longitude 80°18' E on the south-east coast of India and in the north-east corner of Tamil Nadu. Port location is on the flat eastern coastal plain. The location advantage enables the port to handle variety of cargo comprising containers, liquid & break bulk cargo.

The port comprises three dock systems viz. Ambedkar Dock, Jawahar Dock and Bharathi Dock. It has in all 24 berths with a total quay length of around 5.5 km. The maximum draft available is 17.4 m at some of these berths. The port is approached through a 7.0 km channel with water depths in the outer channel being 19.2 m and that of the inner channel being 18.6 m. The Port has a total land area of 240 ha. (approx.) and water spread area of 170 ha.

2.2 Rail and Road Connectivity

The **Figure 2.2** shows the rail and road connectivity of the Chennai Port to its hinterland.

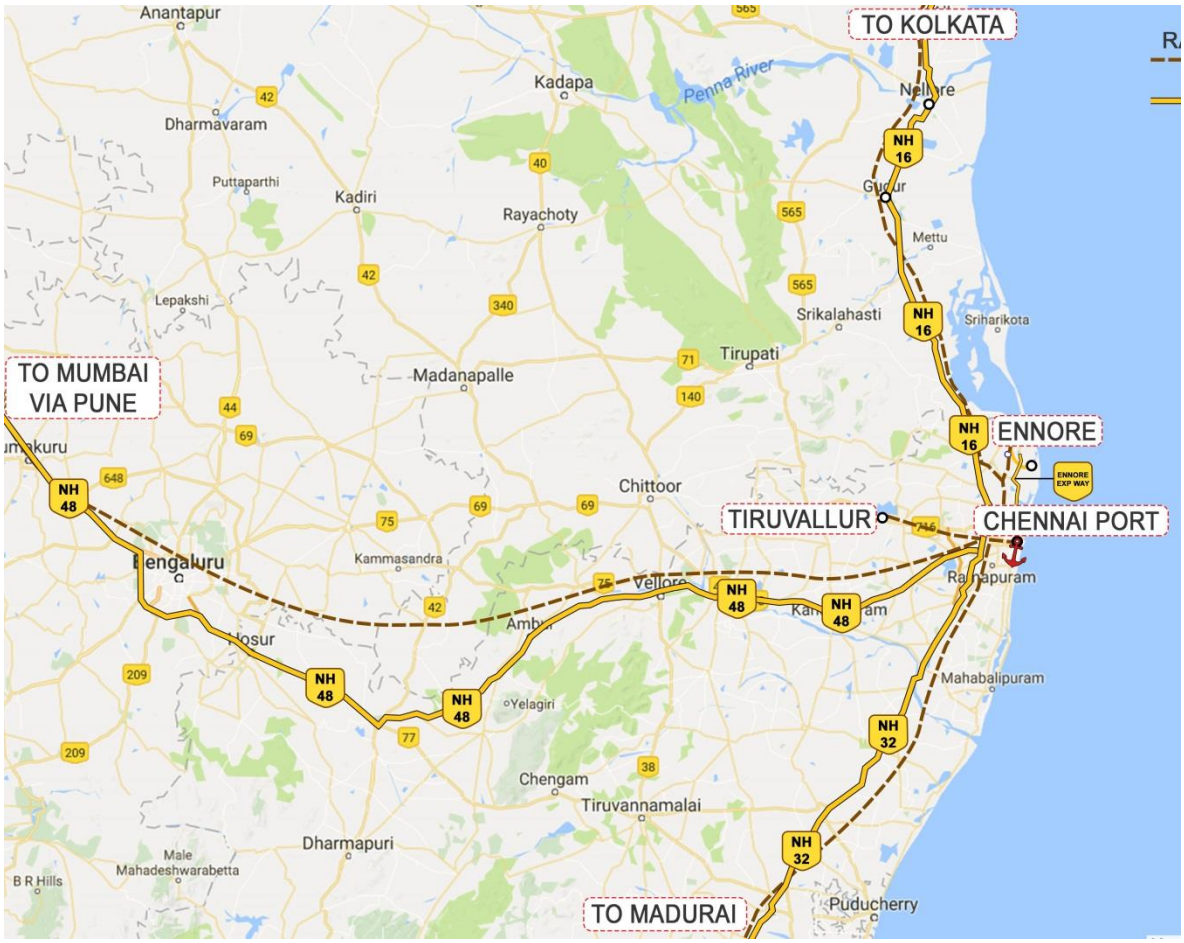


Figure 2.2 Rail and Road Connectivity to Chennai Port

2.2.1 Road Connectivity

Popularly known as “Gateway to South India”, Chennai is well connected to other major cities through national highways. It is connected to Kolkata through NH 5, to Mumbai through NH 4 and to Kanyakumari through NH 45.

2.2.2 Rail Connectivity

Chennai Port is well connected with the national railway network. The Port is linked to Southern Railway network through Chennai Beach Railway Station which connects Chennai Port to Southern parts of Tamil Nadu and through Royapuram Station which connects Southern Railway Trunk line to Kolkata, New Delhi, Bangalore, Coimbatore etc. The Port also has an internal rail network of about 70 km.

2.3 Site Conditions

2.3.1 Meteorology

The climate in the region has a typical monsoon character. Two monsoons dominate the climate - the SW summer monsoon and the NE winter monsoon. The summer monsoon starts around May and holds on until September. The NE monsoon starts by the latter half of October and lasts until February. The summer monsoon is stronger than the winter monsoon and the months between both monsoons form a transition period of calmer weather. Storms occur particularly in autumn months.

2.3.1.1 Winds

The wind rose indicating the wind climate near Chennai is given in **Figure 2.3**.

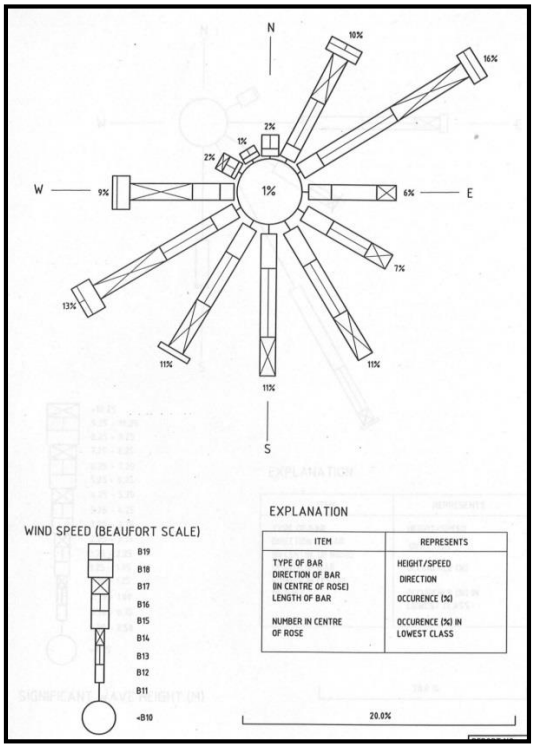


Figure 2.3 Wind Rose Diagram

The geographical position of the coast makes the region to experience the NE monsoon between October to February and the SW monsoon from May to September. South to southeast wind directions also occur frequently, mainly during the transition period between the two monsoons

The wind conditions that prevail in deep water during the monsoons are summarized below.

- NE monsoon:
  - Wind direction: 49 - 87°, relative to the North.
  - Wind speed: 5.8 - 7.5 m/s
- SW monsoon
  - Wind direction: 153 - 263° relative to the North.
  - Wind speed: 2 - 12 m/s

2.3.1.2 Rainfall

Region gets rainfall during October and November from NE Monsoon. During this time, temperatures are lower and humidity is still high. June to September may receive certain amount of rainfall as well. The pre-monsoon rainfall is almost uniform throughout the district. The coastal regions receive more rainfall than the interior ones. NE and SW monsoons are the major donors, with 54% and 36% contribution each to the total annual rainfall. During normal monsoon, the district receives a rainfall of around 1,200 mm.

2.3.1.3 Air Temperature

The average monthly air temperature varies between 37° C in May and June to about 29° C during December and January. The average minimum temperature varies between 28° C in May and June to 21° C in January and February. The highest recorded temperature is 43° C and the lowest recorded temperature is 15° C.

2.3.2 Oceanography

2.3.2.1 Tides

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

– Highest high water level	(HHWL)	+ 1.50 m
– Mean high water springs	(MHWS)	+ 1.10 m
– Mean high water neaps	(MHWN)	+ 0.80 m
– Mean Sea Level	(MSL)	+ 0.54 m
– Mean low water neaps	(MLWN)	+ 0.40 m
– Mean low water springs	(MLWS)	+ 0.10 m
– Lowest low water	(LLWL)	- 0.10 m

2.3.2.2 Currents

Chennai Port has observed the following current patterns in their area:

In January the current sets South Westward or Northward at a rate of 1 to 1.5 knots. But it is irregular in February (Northward parallel with the coast 1.5 knots). During March, April and May the current sets Northward from 1 to 3 knots. In June variable but sometimes Southward and weak in July and in August southward or against the wind from 2 to 3 knots at times. In September the current sets South and South-westwards and in October Southerly along the coast. In November and December the current sets South Westerly or Southerly along the coast.

2.3.2.3 Waves

As the near-shore area off Chennai is sheltered from the westerly winds by the mainland, the strong southerly to westerly winds during the southwest monsoon do not cause high waves due to the limited fetch available. Consequently, the wave conditions at Chennai are moderate.

Waves at Chennai approach predominantly from two directions:

- 135° N during March - September, and
- 90° N during November – January.

During the transition period (during February and October), waves approach from 115° N. The wave height is around 2.5 – 3 m with a wave period of 10 s during northeast monsoon and 2 - 2.5 m with a wave period of 6 s during southwest monsoon.

The wave rose diagram for offshore Chennai is shown in **Figure 2.4**.

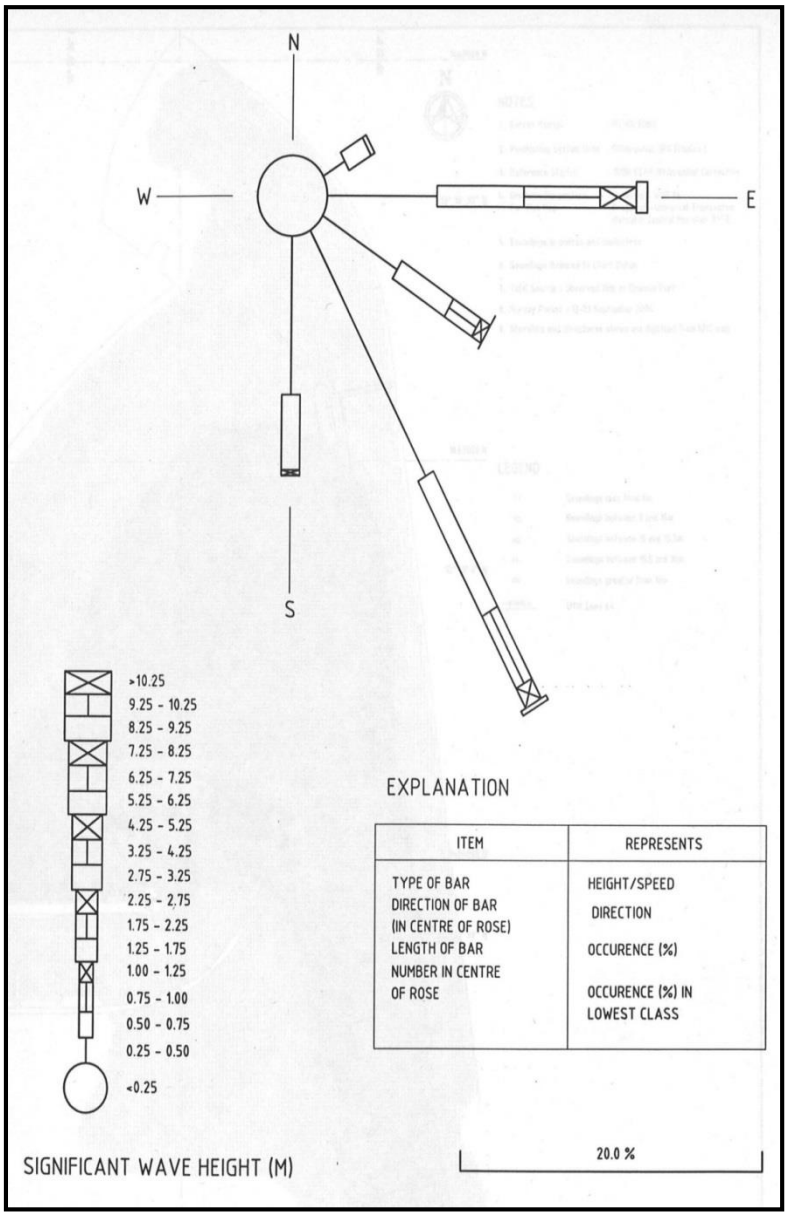


Figure 2.4 Wave Rose Diagram

3.0 DETAILS OF EXISTING FACILITIES

3.1 Existing Facilities

Chennai Port has three Docks - Bharathi Dock, Ambedkar Dock and Jawahar Dock. The existing Container Terminal is situated in Bharathi Dock. Bharathi Dock contains 7 berths; Ambedkar Dock contains 11 berths and Jawahar Dock contains 6 berths, all totalling to 24 berths. The major commodities handled in the Port are Crude oil & POL products, Containers, Automobiles, Edible oil finished Fertilizers, Fertilizer Raw Materials, and general cargo. The location of these docks is shown in the following **Figure 3.1**.

Figure 3.1 Location of the Three Docks

Entrance Channel

Length of Channel	-	About 7 km
Depth of Inner Channel	-	18.6 m at chart datum
Depth of Outer Channel	-	19.2 m at chart datum
Width of Channel	-	The width of channel gradually increases from 244 m to 410 m at the bent portion, then maintains a constant width of 305 m

Outer Harbour

Eastern Breakwater	-	590 m
Northern Breakwater	-	460 m
Outer Arm	-	1,000 m
Upper Pitch Revetment	-	950 m

The details of these docks along with their berths are brought out hereunder:

3.2 Bharathi Dock (BD)

Bharathi Dock is a relatively new addition to the port having been constructed during the late sixties and early seventies. It provides handling facilities for POL, edible oil and containers. The entrance to the Dock is 350 m wide. Particulars of berths at Bharathi Dock have been presented in **Table 3.1**.

Table 3.1 Details of Bharathi Dock Berths

Name	Commodity	Length (m)	Draft (m)
BD - I	POL	356	14.6
BD - II	Edible Oil/ POL	382	16.5
BD - III	POL - Crude	325	16.5
CTB I	Containers	200	13.4
CTB II	Containers	200	13.4
CTB III	Containers	200	13.4
CTB IV	Containers	285	13.4

3.2.1 POL Berths - BD I and BD III

The POL berths are shown in **Figure 3.2**. BD I (commissioned in 1972) has been designed to handle tankers up to 100,000 DWT while BD III (commissioned in 1986) has been designed for 140,000 DWT tankers. BD I have been provided with 5 × 12" marine loading arms while BD III has been provided with 4 × 16" + 2 × 12" marine loading arms. Both the berths are served by 1 × 30" pipeline for crude oil; 1 × 20" pipeline for white oils and 2 × 14" pipeline for black oils. There are separate service lines for LDO/FO/LO bunkers. The berths are provided with firefighting facilities including tower monitors served by a separate firefighting pump house with requisite pumps and connecting pipelines. Reception facilities, in accordance with MARPOL convention, have been provided for receiving ballast, sludge and slop.

Figure 3.2 POL Berths - BD I & BD III

3.2.2 Berth BD II

The berth BD II with back up area is shown in **Figure 3.3**. This berth was originally commissioned in 1977 to handle iron ore carriers up to 150,000 DWT. It was designed for receiving, stockpiling, reclaiming, weighing, sampling and ship loading with the facilities consisting of two rotary wagon tipplers, two lines of conveyors, two rail-mounted stackers, two rail-mounted bucket-wheel reclaimers and two rail-mounted ship loaders. Later with the decision to shift iron ore handling to Kamarajar port and also due to the ban on iron ore exports, the iron ore loading and unloading facilities are yet to be dismantled. The berth is presently used for handling edible oil imports.

Figure 3.3 Berth BD II

3.2.3 Chennai Container Terminal Pvt Ltd. (CCTPL)

Chennai Port was the first port to start container handling operations in 1983. This was later handed over to Chennai Container Terminal Private Limited (CCTPL), a Special Purpose Vehicle, formed by the consortium of M/s P&O Australia Ports Pty. Limited, and three others in 2001 for development, operation and management of the container terminal on a Build, Operate and Transfer (BOT) basis for a period of 30 years. In 2006, DP World, one of the world's largest container terminal operators, acquired P&O Steamship Navigation Company, UK thereby acquiring the 75% stake held by it. In 2008, DP World acquired the balance stake held by other consortium members effectively controlling 100% stake in CCTPL.

The Container Terminal with four berths CTB 1 to 4 has a quay length of 885 m. It can accommodate container vessels up to 6,400 TEU capacity. The total yard area is 21.4 ha and accommodates 3,842 ground slots with a holding capacity of 19,710 TEUs. It has 240 reefer plugs. The yard also houses a Container Freight Station of 6,500 m^2 area. The terminal is served by 7 Quay cranes and 24 RTG's. Its capacity is 1.6 MTEU per annum.

The berth with back-up yard is shown in **Figure 3.4**.

Figure 3.4 Chennai Container Terminal (CCTPL)

3.3 Dr. Ambedkar Dock (AD)

Dr. Ambedkar Dock is the oldest original dock more than 125 years old. It has 11 berths, with total quay length of around 2,308 m. The entrance width of the dock is 125 m. The components are North Quay, West Quay, South Quay and East Quay where the second container terminal is located. It also has two finger jetties which are presently used by the Navy and Coast Guard. These berths cater to automobiles, passengers, general cargo fertilisers and containers. Berth particulars and the commodities handled are presented in **Table 3.2**.

Table 3.2 Berths at Dr. Ambedkar Dock

Name	Commodity	Length (m)	Draft (m)
North Quay	GC/Liquid Bulk	198	8.5
West Quay I	GC/Ro-Ro/Other Liquids	171	11
West Quay II	GC/Ro-Ro/Other Liquids	171	12
Centre Quay	GC/Food grains	171	12
West Quay III	GC/Food grains	171	12
West Quay IV	GC/Passenger	171	11
South Quay I	Fertilizer / GC/Dry Bulk	246	9.5
South Quay II	Fertilizer / GC/Dry Bulk/Liquid Bulk	179	9.5
Second Container Berth - I	Containers	287	12
Second Container Berth - II	Containers	270	12
Second Container Berth - III	Containers	275	12

3.3.1 North Quay and West Quay Berths

The berths with their back up area /sheds are shown in the **Figure 3.5**.

Figure 3.5 North Quay and West Quay Berths

The NQ berth is used for handling general cargo and edible oil. WQ 1 & WQ 2 is used to handle car carriers for automobile exports. These berths have a backup area of over 65,500 m^2 in two plots. CB and WQ 3 are used for handling general cargo and food grains. They have transit sheds behind. WQ 4 handles general cargo as well as passengers. For this purpose, it is provided with a passenger station with all infrastructures. The entire WQ berths are provided with 2 Jessop Cranes and 2 L&T cranes all of 15 T capacity.

3.3.2 South Quay Berths

The berths with their back up area are shown in the **Figure 3.6**.

Figure 3.6 South Quay Berths

SQ 1 handles general cargo, dry bulk and fertilisers while SQ 2 handles fertilisers and edible oil/Phosphoric acid. The phosphoric acid tanks of Madras Fertilisers Ltd. and edible oil tanks of IMC are located just behind this berth.

3.3.3 Chennai International Container Terminal Pvt. Ltd. (CITPL)

Chennai Port awarded the second container terminal to Chennai International Container Terminal Private Limited (CITPL), a Special Purpose Vehicle, formed by the consortium of M/s Singapore Port Authority and SICAL Logistics Pvt Limited in 2007 for development, operation and management of the container terminal on a Build, Operate and Transfer (BOT) basis for a period of 30 years. It was commissioned in 2009.

The Container Terminal with three berths SCB 1 to 3 has a total quay length of 832 m. The total yard area is 35.8 ha including 7.8 ha of reclaimed area. It accommodates 5,424 ground slots with a holding capacity of 27,120 TEUs. It has 120 reefer plugs. The terminal is served by 10 Quay cranes and 20 RTGs. Its capacity is 1.5 MTEU per annum.

The berth with back-up yard is shown in **Figure 3.7**.

Figure 3.7 Chennai International Container Terminal (CITPL)

3.4 Jawahar Dock (JD)

Jawahar Dock was created during early sixties. The basin dimension is 655 m × 152 m. The total quay length is around 2 × 650 m with 3 berths each on either side. The entrance width of the dock is narrow and can permit only Panamax carriers. The particulars of the berths are presented in **Table 3.3**. Design dredge depth of the dock is - 14.0 m CD.

Table 3.3 Berths at Jawahar Dock

Name	Commodity	Length (m)	Draft (m)
JD I	Fertilizer/Dry Bulk	218	11.5
JD II	Fertilizer/Dry Bulk/ Edible Oil /Other Liquid bulk	218	12.0
JD III	Fertilizer/Dry Bulk	218	12.0
JD IV	Dry Bulk/Edible Oil	218	11.0
JD V	Fertilizer/Dry Bulk	218	12.0
JD VI	Dry Bulk	218	11.0

3.4.1 JD East Berths (JD II, JD IV & JD VI)

The existing berth structures are of varying type along the length. Initial 518 m from the basin entrance was constructed in 1964 with monoliths. Thereafter, the berth length was increased by another 137 m with a combination of diaphragm wall and piles in 1981. During 2000-07 additional structure supported on piles were constructed for strengthening of apron behind both the berths (mainly to cater to the proposed crane loads). However, two stretches in the apron measuring 97 m and 44 m could not be strengthened due to existing crane locations. These locations need to be strengthened.

The total width available now between the Quay face and the Boundary of CITPL is about 140 m. These berths were used to handle coal, but with the ban on handling coal, the yard area is presently vacant except for an area of 3,000 m^2. This area is occupied by tank farm and small building. There are, however space and unused building on the south west and south east direction of the existing yard.

JD II & JD IV is presently used for handling fertilisers and edible oil. Phosphoric tankers are also handled here in view of the tank farms nearby.

3.4.2 JD West Berths (JD I, JD III & JD V)

These berths are used for handling general cargo, fertilisers and dry bulk cargo. These berths have transit sheds behind them. JD I is equipped with 1 crane of capacity 10 T and JD III is equipped with 2 cranes of capacity 15 T each.

The berths with their respective back up area are shown in **Figure 3.8**.

Figure 3.8 Jawahar Dock Berths

3.5 Other Facilities at the Port

The cargo handling equipment's available at the Port are indicated vide **Table 3.4**, as under:

Table 3.4 Cargo Handling Equipment at the Port

S. No.	Equipment	Numbers	Capacity
1.	Floating Crane	1	150 T
2.	Diesel Electric Locomotive	10	700 HP – 8 Nos. 1,400 HP – 2 Nos.
3.	Harbour Mobile Crane	2	100 T

The cargo storage facilities available at the port are indicated in **Table 3.5**.

Table 3.5 Cargo Storage Facilities at the Port

Transit Shed / Over Flow shed	7 no. – 30,693 m^2
Warehouse	5 no. – 30,138 m^2
Container Freight Station	3 no. – 40,644 m^2
Open Space	3,84,611 m^2
Container Parking Yard	2,50,600 m^2

3.6 Bulk Liquid Storage & Linkages

In Chennai port the liquid bulk traffic is almost 25 % of the total traffic. The traffic comprises mainly crude oil for the Manali Refinery of Chennai Petroleum Corporation Ltd., POL product exports, Edible oil/Molasses and chemicals. While crude oil and POL products are handled at BD I & BD III, Molasses/Edible oil are handled at BD II, NQ, WQ 1 , WQ 2, SQ II, JD II & JD IV. Some of the agencies have their own tankage within the port custom bound area while some others are having their tankage outside the port limits. The details of the tankages and linkage are given hereunder.

3.6.1 Tankage & Linkage on the Northern Side

On their northern side of the port, near Gate 2 and at Biden Place the following agencies have their tank farms viz.

- Indian Oil Corporation Foreshore Tank farm
- IMC Ltd.
- Kaleesuwari Refinery Pvt. Ltd.
- Integrated Service Point Pvt. Ltd.

Their locations are given in the **Figure 3.9** & **Figure 3.10**.

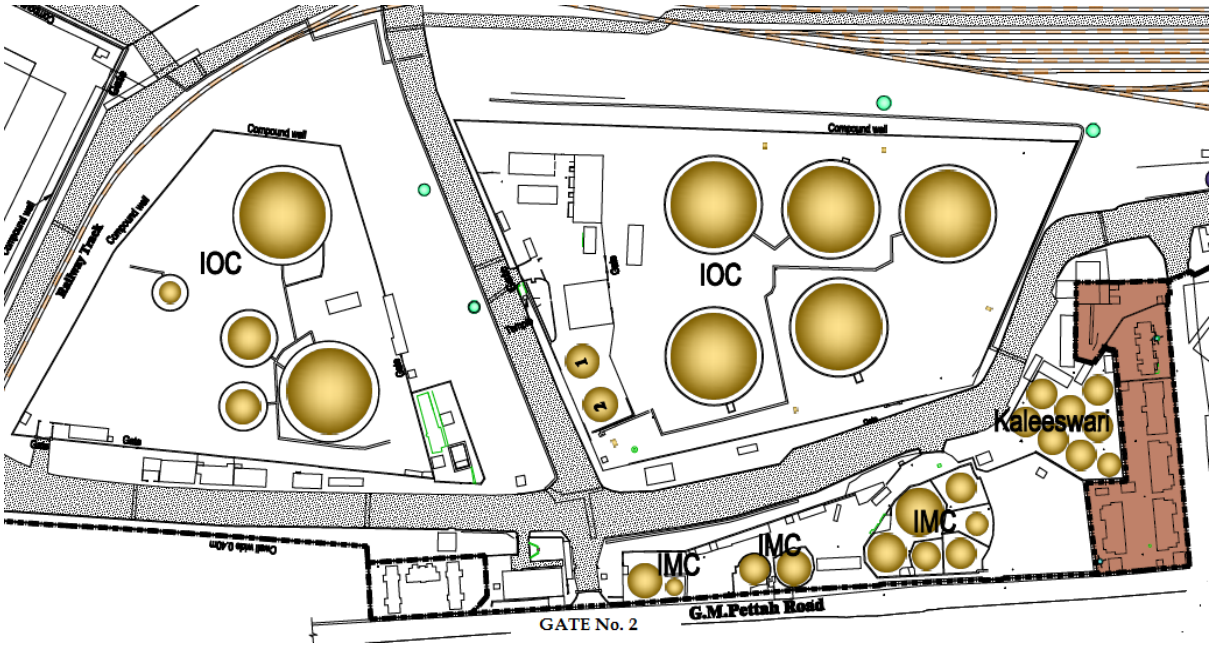


Figure 3.9 Tank Farms of IOC, IMC & Kaleesuwari – Near Gate No. 2

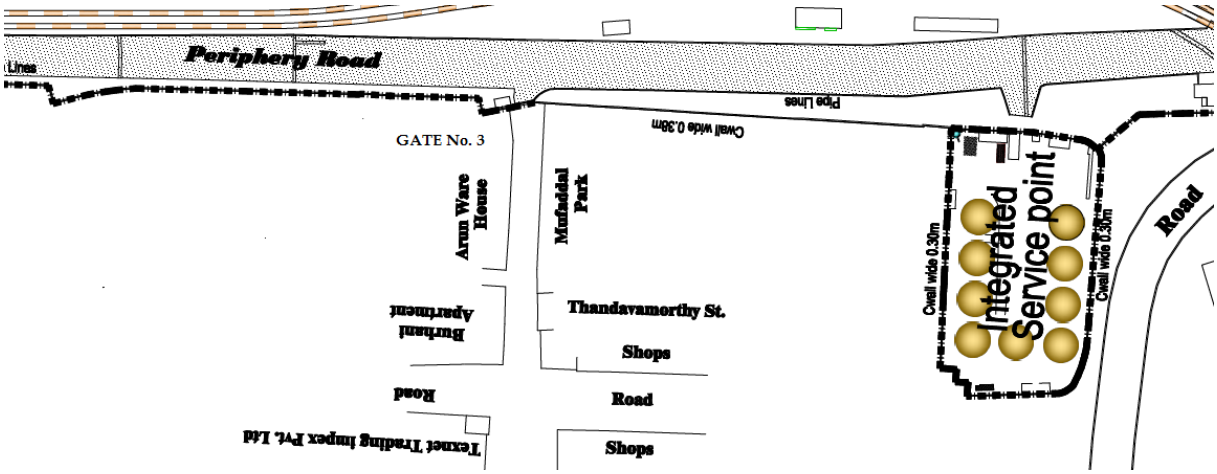


Figure 3.10 Tank Farm of Integrated Service Point – Near Gate No. 3

The details of the tankage and the linkage are shown in **Table 3.6**.

Table 3.6 Cargo Storage Facilities at the Port

Details of Tank farm within Port Custom bound Area Northern side near GATE No. 2						
S.No.	Name of Licensee	Product	No. of Tanks	Total Capacity (kL)	Linkage	
					Berth	Pipelines
1	Indian Oil Corporation Ltd.	POL Products	10	91,054	BD I	1 x 20" + 1 x 16" + 3 x 14"
					BD III	1 x 20" + 2 x 14"
2	IMC Ltd..	Molasses	11	33,402	BD I	1 x 12" + 1 x 8"
		Edbile Oil			BD II	1 x 12" + 2 x 8"
3	Kaleesuwari Refinery Pvt Ltd.	Edible Oil	8	23,000	BD II	1 x 12"
4	Integrated Service Point Pvt. Ltd.	Edible Oil	9	18,000	NQ - WQ 1	1 x 14" + 1 x 10"
Outside Custom bound Area						
1	Chennai Petroleum Corporation Ltd.	Crude Oil			BD I	1 x 30"
					BD III	1 x 30"
2	Hindustan Petroleum Corporation Ltd.	LSHS			BD III	1 x 16"
		Bitumen			BD II	1 x 12"
3	TCL	Chemical			BD III	1 x 8"
4	Ruchi	Edible Oil			BD II	1 x 12"+ 1 x 8"
					NQ - WQ 2	1 x 8"
5	KTV	Edible Oil			BD II	1 x 10"

3.6.2 Tankage & Linkage on the Southern Side

On their southern side of the port, near SQ II & JD II the following agencies have their tank farms viz.

- IMC Ltd.
- JRE Tank Terminals Pvt. Ltd.
- Kaleesuwari Refinery Pvt. Ltd.
- Madras Fertilisers Ltd.
- Oswal Oils & Vanaspati Industries
- Suraj Agro Infrastructure (India) Pvt. Ltd.
- AVR Storage Tank Terminals Pvt. Ltd.

Their locations are given in the **Figure 3.11** & **Figure 3.12**.

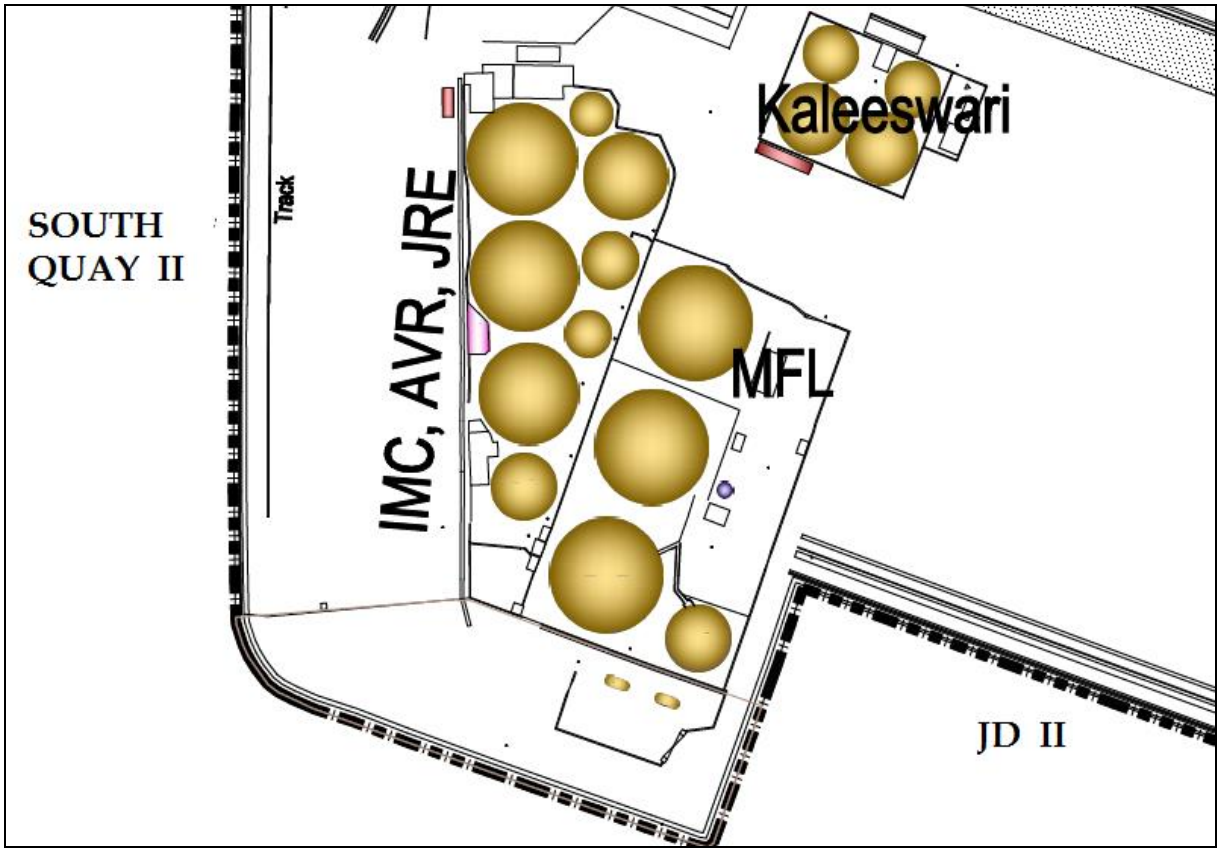


Figure 3.11 Tank Farms of MFL, IMC, JRE, AVR & KRL Near SQ II & JD II

Figure 3.12 Tank Farms of Suraj Agro & Oswal at JD East

The details of the tankage and the linkage are given in the following **Table 3.7**.

Table 3.7 Details of Tank Farms within Port Custom Bound Area Southern Side Near SQ II and JD II

S. No.	Name of Licensee	Product	No. of Tanks	Total Capacity (kL)	Linkages	
					Berth	Pipelines
1	Madras Fertilisers Ltd.	Phosphoric Acid	3	18,180	JD IV	1 x 12"
2	IMC Ltd.	Molasses	4	11,470	SQ II - JD II	1 x 18" + 1 x 10"
		Edbile Oil			SQ II	1 x 6"
3	AVR Storage Tank Terminals Pvt . Ltd.	Edible Oil	4	12,121		
4	JRE Tank Terminals Pvt. Ltd.	Molasses	1	5,834		
5	Kaleesuwari Refinery Pvt. Ltd.	Edible oil	4	11,796	SQ II	1 x 8"
6	Suraj Agro Infrastructure (I) Pvt. Ltd.	Non Hazardous	11	45,700	JD II - JD IV	1 x 18" + 1 x 8"
		Edible Oil			SQ II	1 x 8"
7	Owal Oils & Vanaspati Industries	Edible Oil	6	9,966	JD II - JD IV	2 x 8"
					JD II - JD VI	1 x 8"

4.0 PERFORMANCE, OPTIONS FOR DEBOTTLENECKING & CAPACITY ASSESSMENT

4.1 General

The total cargo handled through the existing facilities, during the past 5 years is presented in the following **Table 4.1**.

Table 4.1 Cargo Handled during last 5 Years (MT)

S. No.	Commodity	2014-15	2013-14	2012-13	2011-12	2010-11
Liquid Bulk						
1.	Crude oil imports	10.16	10.19	9.22	9.81	10.03
2.	POL – Imports	0.86	1.23	2.78	2.00	1.99
3.	POL – Exports	1.42	1.46	1.38	1.47	1.97
4.	Edible oil	1.07	1.03	1.06	1.12	1.08
5.	Other liquids	0.31	0.24	0.23	0.17	0.14
Dry Bulk						
6.	Coal	0	0	0	3.19	7.71
7.	Iron-ore	0	0	0	0	2.31
8.	Iron & Steel	1.42	1.41	1.12	1.00	0.88
9.	Food grains	0.04	0.31	0.49	0.19	0.42
10.	Other Dry bulk	4.93	4.64	4.57	3.33	2.15
11.	Break Bulk	2.10	1.24	1.46	1.97	1.95
12.	Containers – TEUs	1.55	1.47	1.54	1.55	1.52
	Containers – T	29.95	28.33	29.71	30.07	29.42
TOTAL TRAFFIC (MT)		**52.26**	**51.11**	**53.40**	**55.70**	**61.46**

4.2 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 tables hereunder. The berths are grouped under Liquid bulk handling berths viz. BD I, II & III; Ambedkar Dock berths viz. NQ, and WQ berths; SQ berths; Jawahar Dock West berths; Jawahar Dock East berths and Container Terminals CCTPL & CITPL.

Table 4.2 Performance of Liquid Berths During 2014 - 2015

S. No.	Berth	Occupancy	Cargo	Volume (T)	No. of Ships	Ship Category	Maximum (DWT / T)	Minimum (DWT /T)	Average (DWT /T)
1.	BD I & BD III	Average 65%	Crude oil	10,162,563	99	Ship size	1,64,787	73,531	1,22,538
						Parcel size	1,47,612	24,870	1,02,652
			POL Products - Import	727,837	52	Ship size	74,992	4,851	32,946
						Parcel size	32,000	400	9,705
			POL Products - Exports	1,421,378	53	Ship size	51,763	28,810	40,395
						Parcel size	38,487	400	26,322
				12,311,778	**204**				
2.	BD II	61%	POL Products - Import	592,432	85	Ship size	51,604	4,851	27,194
						Parcel size	28,547	400	5,386
			Edible oil	160,515	34	Ship size	19,386	6,300	11,833
						Parcel size	12,000	500	4,458
			Other liquids	139,894	30	Ship size	35,435	8,884	19,543
						Parcel size	9,011	193	4,663
			Steel & Barytes	5,053	2	Ship size	58745	50292	54518
						Parcel size	1976	572	1263
				897,894	**151**				

Table 4.3 Performance of North Quay & West Quay Berths During 2014-15

S. No.	Berth	Occupancy	Cargo	Volume (T)	No. of Ships	Ship Category	Maximum (DWT / T)	Minimum (DWT /T)	Average (DWT /T)
1.	NQ, WQ1, WQ2, CQ, WQ3, WQ4	Varies from 22% to 60% Average 45%	Automobiles	245,108	69	Ship size	30,990	9,663	17,282
						Parcel size	6,675	9	1,740
			General Cargo	450,739	110	Ship size	48,139	3,500	13,671
						Parcel size	25,200	4	1,507
			Iron & steel	437,889	21	Ship size	53,496	5,604	17,983
						Parcel size	30,689	33	4,561
			Edible oil	348,026	30	Ship size	44,370	6,300	14,841
						Parcel size	15,000	510	5,800
			Other liquids	145,913	25	Ship size	38,513	6,273	9,783
						Parcel size	8,957	440	4,169
				1,627,675	**255**	**Parcel size**			**6,383**

Table 4.4 Performance of South Quay Berths During 2014-15

S. No.	Berth	Occupancy	Cargo	Volume (T)	No. of Ships	Ship Category	Maximum (DWT / T)	Minimum (DWT /T)	Average (DWT /T)
1.	SQ 1 & SQ 2	Average 57%	Iron & Steel	300,407	19	Ship size	49,326	6,544	23,913
						Parcel size	30,090	38	3,851
			Cut stone	142,773	3	Ship size	63301	27321	49075
						Parcel size	34891	21600	28555
			Fertilisers Raw & Finished	130,383	5	Ship size	34,938	9,839	25,201
						Parcel size	30,414	5,900	16,298
			Edible oil	61,887	15	Ship size	19997	11321	15659
						Parcel size	10698	550	4126
			Barytes	51,006	3	Ship size	11606	10700	11153
						Parcel size	34746	1260	17002
			General Cargo	201,691	67	Ship size	50,363	2,300	13,884
						Parcel size	29,280	27	2,318
				888,147	**112**				**7930**

Table 4.5 Performance of Container Terminals During 2014-15

S. No.	Berth	Occupancy	Cargo	Volume (T)	No. of Ships	Ship Category	Maximum (DWT / T)	Minimum (DWT /T)	Average (DWT /T)
1.	CCTPL - CTB 1 to 4	Average 26%	Containers	862,595	393	Ship size	67,686	9,944	38,008
						Parcel size	2,866	2	1,061
2.	CITPL - SCB 1 to 3	Average 42%	Containers	719,745	369	Ship size	62,649	1,778	22,836
						Parcel size	2,957	1	856
				1,582,340	**762**				

Table 4.6 Performance of Jawahar Dock - West Quay Berths During 2014-15

S. No.	Berth	Occupancy	Cargo	Volume in T	No. of Ships	Ship Category	Maximum DWT / T	Minimum DWT / T	Average DWT /T
1.	JD 1 JD 3 JD 5	Varies from 41% to 63% Average 53%	Limestone	2,484,274	47	Ship size	63,351	47,286	54,454
						Parcel size	54,170	10,000	40,873
			Dolomite & Barytes	817,469	21	Ship size	61,344	23,524	44,795
						Parcel size	54,868	2,790	34,061
			Fertiliser - Raw & Finished	515,992	22	Ship size	57,572	20,479	41,105
						Parcel size	45,000	4,399	22,434
			Iron & steel	429,818	16	Ship size	53,208	8,241	32,546
						Parcel size	37,249	34	8,955
			General Cargo	319,729	29	Ship size	61,498	7,802	26,940
						Parcel size	53,830	19	8,198
				4,567,282	**135**	**Parcel size**			**33,832**

Table 4.7 Performance of Jawahar Dock - East Quay Berths During 2014-15

S. No	Berth	Occupancy	Cargo	Volume (T)	No. of Ships	Ship Category	Maximum DWT / T	Minimum DWT /T	Average DWT /T
1.	JD 2 JD 4 JD 6	Varies from 55% to 96% Average 73%	Cement Clinker & Limestone	393,433	18	Ship size	56,719	6,261	24,492
						Parcel size	50,537	5,750	19,672
			Dolomite & Barytes	363,831	9	Ship size	58,811	26,482	47,475
						Parcel size	52,983	8,761	33,076
			Edible oil	279,925	41	Ship size	50,844	6,337	17,305
						Parcel size	12,500	300	4,117
			General Cargo	863,528	32	Ship size	58,642	5,014	34,734
						Parcel size	48,100	75	24,672
			Fertiliser Raw Materials	19,800	1	Ship size	35050	-	-
						Parcel size	19800	-	-
			CBFS	2,849	1	Ship size	2931	-	-
						Parcel size	2849	-	-
				1,923,366	**102**	**Parcel size**			**18,856**

The following observations are made from this analysis:

- Almost 80 % of the port traffic is handled at the two oil jetties (crude oil & POL products) and the two container terminals.
- Automobiles are handled at the two WQ berths 1 & 2 which have the requisite back up area for parking the cars units.
- Edible oil is handled at BD II, NQ, SQ 2 and JD 2 berths as the related tank farms are located in two sectors – one near Gate 2 and the other on the east side of JD.
- Fertiliser materials – raw as well as finished are handled at SQ 2 and JD 2 berths.

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

4.3.1 Observations on CCTPL

Evacuation is a major challenge for Chennai port with large queue lengths of trailers observed from the container terminal gates. It has been found out that the yard productivity is the key constraint on evacuation. It has been observed that the yard throughput (measured as the no. of export TEUs moving in through the terminal gate) is inversely related to berth productivity (measured as the no. of TEUs handled in the berths). When large vessel berths in the terminal, the resources get deployed in the quay side to load/ unload containers from the vessel. This results in shortage of resources on the yard side and hence the number of containers moved from export trailers to yard drops significantly. To cope with this, the terminals proceed to close export gates to stop further inflow of export trailers to the container yard. This phenomenon can be corroborated from the fact that high berth productivity periods coincide with long duration of gate closures. The terminal needs to either boost their RTGC productivity to 15 moves / hr or employ additional RTGCs.

Optimal yard space is critical for maintain yard productivity. Shortage of yard space in this terminal is identified as a driving factor for low yard productivity that leads to congestion in the port. At present, the CCTPL yard has 3,940 ground slots for containers. The analysis carried out shows the optimal number of ground slots required in CCTPL is ~4,400. Adding 460 ground slots with an optimal ground slot density of ~200 would require a yard space of ~22 Ha. Hence 4-5 Ha of additional yard space should be provided to CCTPL for allowing proper yard management. This additional yard space can be provided by utilizing currently unused space near CCTPL terminal. This area would require minimum alterations before it can be handed over to DP World.

Modal shift of cargo from road to rail can help reduce pressure on roads for evacuation and hence ease the congestion issue in and around Chennai port. It will help the port to circumvent all issues with road infrastructure and traffic congestion outside the port boundary. At present, 0.07 M TEU of container cargo gets evacuated through rail. Chennai hinterland has four existing ICDs – Bangalore (Whitefield), Tondiarpet, Arakkonam and Irrungatukottai. Out of the four ICDs, only the Bangalore ICD currently has rake services to Chennai. The logistics cost for moving containers through rail from Bangalore ICD is higher than the cost for moving containers through road by ~Rs. 2,500 per TEU. This is in spite of the fact that the rail freight of Rs. 9,000 is lower than the road freight of Rs. 12,000 in this route. The additional rail yard handling cost, trailer cost for the last mile connectivity and the mark up charged by the liners for ICD bound cargo contribute to the difference in logistics cost. Additional charges are levied on CONCOR for the rake operations by the Chennai port and the railways. All these additional charges add up to ~Rs. 1,300. The port should waive its haulage charge, repositioning charge, port service charge completely on rake operations. This will have result in a loss of revenue for the port but will be critical for retention of container traffic.

The port must develop a common rail yard from where both terminals can move their cargo. Preliminary studies in the port has identified land parcel available near the current marshalling yard as the ideal location for building the common container yard. The yard would have space to handle up to 0.75 MTEU per year and would also have adequate equipment to maintain high productivity levels. The common yard will make running of mixed rakes viable. It will reduce the turnaround time for rakes by ~10 hours. This will allow rake operators to run rakes more frequently and hence increase the maximum rail throughput by 26%. It will also result in higher savings for the rail operator.

4.3.2 Observations on Edible Oil Traffic

In recent times, Chennai port has lost part of its edible oil traffic to Krishnapatnam. This is despite the fact that Krishnapatnam is farther from the plant locations than Chennai; hence it has higher logistics cost. But Krishnapatnam has compensated for the higher logistics cost by lowering the port charges on edible oil It has developed a practice of benchmarking its charges to the port charges in Chennai. This allows Krishnapatnam to offer lower prices to customers who can shift their traffic from Chennai to Krishnapatnam. Chennai port should also assign a team to track prices charged by Krishnapatnam and other ports. The pricing of port charges should be revised based on what competitors are charging the customers for the same cargo. In case of Edible oil Chennai port must reduce its port charges by more than Rs. 15/ T to attract additional volumes to the port. The study shows that port charges for Krishnapatnam are ~Rs. 35/ T lower than Chennai. Overall cost of handling edible oil in Chennai is costlier by Rs. 15/ T which translates to ~Rs. 2 lakhs per ship for an average edible oil carrier. Higher cost and evacuation issues in Chennai have made customers move to Krishnapatnam.

Madurai is farther from Chennai port than VOC port. The freight of carrying Edible oil from Madurai to Chennai is estimated to be around Rs. 1300/ T as compared to Madurai to Tuticorin freight of Rs. 700/ T. The higher freights make it infeasible for customers in Madurai cluster to use Chennai port. Running edible oil rakes from Madurai to Chennai can reduce the freight cost by Rs. 900/ T. This will reduce the overall logistics cost of handling edible oil in Chennai port to match that of the VOC port. Railways require a minimum of 6 rakes per month to start the service. This translates to a volume of ~15,000 T per month. Madurai cluster can attract >20,000 T of edible oil volume per month, which would require monthly service of 8-9 rakes. Moving edible oil in rakes will require storage of edible oil in the port till adequate quantity gets aggregated for filling one rake. It will be critical to develop adequate local storage facilities (tankers) in the port. Long-term land leases should be awarded to attract customers to invest in their tank farms in the port.

4.3.3 Observations on Fertiliser Traffic

Productivity of fertilizer handling facility in the Chennai port can be improved by mechanization of fertilizer handling facility in the port. Mechanized unloading of fertilizer for ships to conveyor belts can increase productivity by ~40% and match Krishnapatnam's productivity levels. To complement mechanical handling, Chennai port should also create mechanical bagging facility. As Chennai can realistically capture 0.5-0.7 MT of fertilizer cargo, the port should aim to develop a bagging plant of capacity 0.5 MT. Chennai is also well connected by rail network to the hinterland areas and distribution centres. Evacuation of rail can be explored further. The bagging plant must be located at vicinity of the existing rail yard

4.4 Measures for Capacity Enhancement

The observations made by BCG are examined and those that are appropriate and are feasible of execution have been considered in the subsequent sections based on the future traffic projections.

4.5 Capacity Assessment of Existing Facilities

The capacity of any existing port facilities depends on a combination of number of factors like the type of cargo handled, the DWT of the vessel, the vessel parcel size, the permissible berth occupancy, the type of handling facilities, the productivity of human resources both handling and managerial, the traditions and practices obtained etc.

The current capacity of Chennai port is worked out, based on capacity rating of all berths handling different types of commodities including container, liquid and general cargo (break bulk and dry bulk), as per guidelines provided in Berthing Policy for Dry Bulk Cargo for Major Ports, 2017.

The rated berth capacity and the capacity at desired occupancy based on sustainable occupancy rate of 85% for containers and 70% for rest of the cargoes) are given in **Table 4.8** below:

Table 4.8 Capacity of Berths

S. No.	Berths	Commodity	Rated Capacity (MTPA)	Capacity at Desired Occupancy (MTPA)
1.	NQ	General Cargo	1.04	0.73
2.	WQ	General Cargo	8.28	5.80
3.	CQ	General Cargo	2.21	1.55
4.	SQ	General Cargo	4.00	2.80
5.	JD	General Cargo	22.07	15.45
6.	BD1	Liquid	6.71	4.69
7.	BD2	Liquid	2.83	1.98
8.	BD3	Liquid	25.69	17.98
9.	SCB1-3	Container	29.50	25.07
10.	CTB1-4	Container	31.27	26.58
Total			**133.6**	**102.63**

The detailed methodology of arriving at the port capacity and the calculations are provided in **Appendix 2**.

5.0 DETAILS OF ONGOING DEVELOPMENTS

5.1 General

In recent times, in order to meet the growing traffic demands, Chennai Port has initiated action for creating additional terminal facilities. The ongoing projects are

- Development of Coastal Terminal near Northern sheltering arm;
- Construction of a Coastal road with necessary shore protection along the sea shore to the old harbour entrance; and
- Two numbers of Exim Godowns in order to enhance the stacking facility of EXIM cargo (Agri and Food grains).

The locations of these facilities are shown in **Figure 5.1**.

Figure 5.1 Layout Details of Chennai Port Showing the Ongoing Developments

The details of these facilities are brought out hereunder:

5.2 Development of Coastal Terminal near Northern Sheltering Arm

Taking into account the increasing demand for coastal shipping and the strategic location of Chennai Port on the maritime map of the country, the port has taken up the development of a Coastal Terminal near the northern sheltering arm of Ambedkar Dock. This terminal will be outside the custom bonded area of the port.

The Coastal Terminal will be a wharf structure of 260 m × 16 m to 19.5 m constructed with piled structure. Alongside the wharf structure and the adjacent areas of the turning basin will be dredged to -9.0 m CD to accommodate coastal vessels upto 10,000 DWT and having drafts upto 8.0 m. In addition the top surface of the existing damaged block wall will be retrofitted.

The adjacent reclaimed area of about 30 m width will be hardened as backup area for storing and handling of coastal cargo. An additional stocking area will be developed over the recently reclaimed land area for about 52,000 sqm.

A dedicated road shall be provided to width of 9.0 m from southern end of proposed berth to the upcoming revetment and coastal road along the shore.

This terminal will have a capacity of 1.0 MTPA and is expected to cost about Rs. 80 crores. This terminal is likely to be commissioned by 2017.

The location, layout and details of this coastal terminal are given in the **Figure 5.2**.

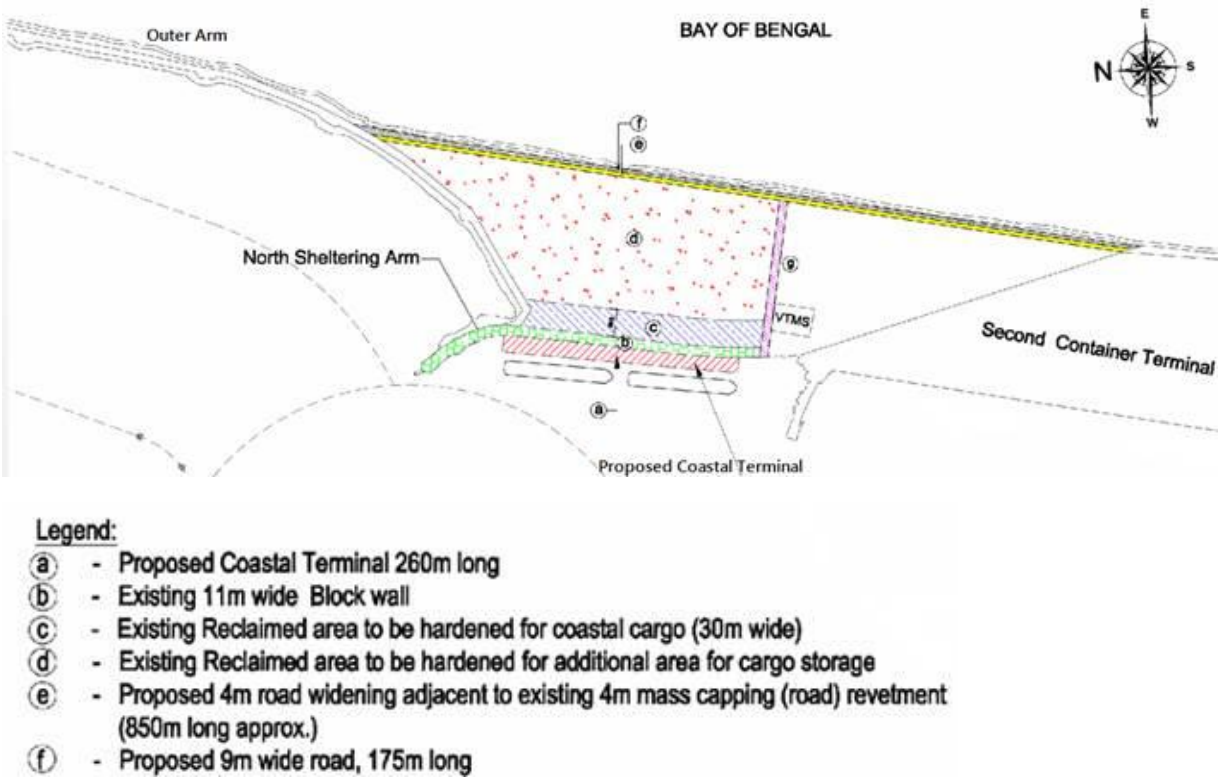


Figure 5.2 Location, Layout and Details of the Coastal Terminal

5.3 Construction of Coastal Road along the Sea Shore

In order to facilitate the evacuation of coastal cargo outside the custom bonded area, the Port Trust has undertaken the work of formation of a Coastal Road with necessary shore protection on the eastern periphery from INS Adyar to the old Harbour entrance.

From the north tower of old harbour entrance, a concrete road of 850 m length was provided while constructing the rubble mound revetment at east of east quay during 2008 and this road leads to the Outer Protection Arm Breakwater. In the absence of an access road in the portion between M/s Suraj Agro Industries and old harbour entrance, the port does not have access to the Outer Protection Arm breakwater and revetment at East Quay for any immediate rectification or repair works and to carry out further development works. Therefore, the port personnel and vehicles have to pass through the area leased to the 2nd Container Terminal Operator, M/s CITPL with the consent of the Licensee.

Hence, the port planned to provide an exclusive road access east of the 2nd Container Terminal area after carrying out the shore protection in the left out portion of coastal road. Due to instability of the shore area at left out portion of coastal road, it is proposed to provide two lane traffic (8 m width) after adequately strengthening the existing revetment along the eastern side of the M/s CITPL compound from M/s Suraj Agro Industries to Old Harbour Entrance. The core stone and armour layer below the existing revetment shall be the base for forming the road on top. The estimated cost of the project is Rs. 63 cr and the work is in progress. The location and alignment of this coastal road is shown in the **Figure 5.3**.

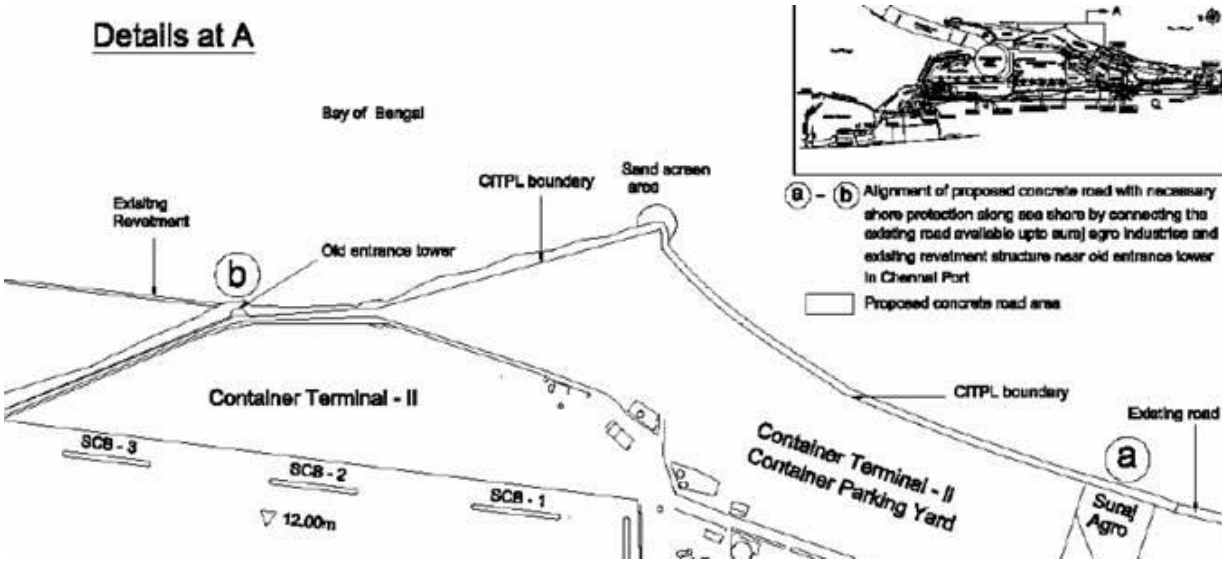


Figure 5.3 Layout and Alignment of the Coastal Road

5.4 Two Numbers of EXIM Godowns

In order to enhance the stacking facility for EXIM cargo (Agri & Foodgrains) inside the port, it is proposed to construct 2 no. EXIM godown of size 150 m × 30 m with a total area of 9,000 sq.m. The estimated cost of the work is Rs.17.57 crores. The location of the Exim Gowdowns is shown in the **Figure 5.4**.

Figure 5.4 Location of Two EXIM Godowns

6.0 TRAFFIC PROJECTIONS

6.1 General

The port of Chennai is one of the largest major ports in the Southern part of the country. It currently handles more than 50 MTPA of traffic and is situated strategically and well connected both by rail and road to serve the hinterlands of Tamil Nadu, Southern Andhra Pradesh and Southern Karnataka.

The port is also one of the major container ports in the country handling more than 1.5 MTEUs across the two terminals. Along with containers the port also handles large volumes of POL, Limestone, Steel and dolomite.

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

6.2 Major Commodities and their Projections

6.2.1 Containers

The port handles roughly 1.55 MTEUs with an export import balanced slightly tilted towards import (~55%). The key hinterlands that the port serves for containers are Chennai and close by SEZs, Bangalore, Southern AP and parts of Southern Tamil Nadu. Large portion of the traffic (~50-60%) is transhipped from the port to other ports in South East Asia like Colombo and Singapore.

Going into the future, with the growth of new ports in the vicinity of Chennai like Krishnapatnam, Katupalli as well as the development of container terminal at Ennore, we expect significant share of volumes to be taken away from Chennai. The port is expected to cater to traffic of roughly 0.9 MTEUs by 2020, 1.2-1.4 MTEUs by 2025 and 2.0-2.4 MTEUs by 2035.

In the case of a new transhipment hub coming up on the Southern tip of the country the potential traffic is expected to further decline owing the fact that most of the South Tamil Nadu containers will go directly to the transhipment hub.

The **Figure 6.1** below show the split of the container traffic from the different hinterlands as well as the projected growth.

COMMODITY TRAFFIC | CONTAINER

Tamil Nadu is the primary hinterland of Chennai port with small traffic from Bangalore and Hyderabad

Primary hinterland of port

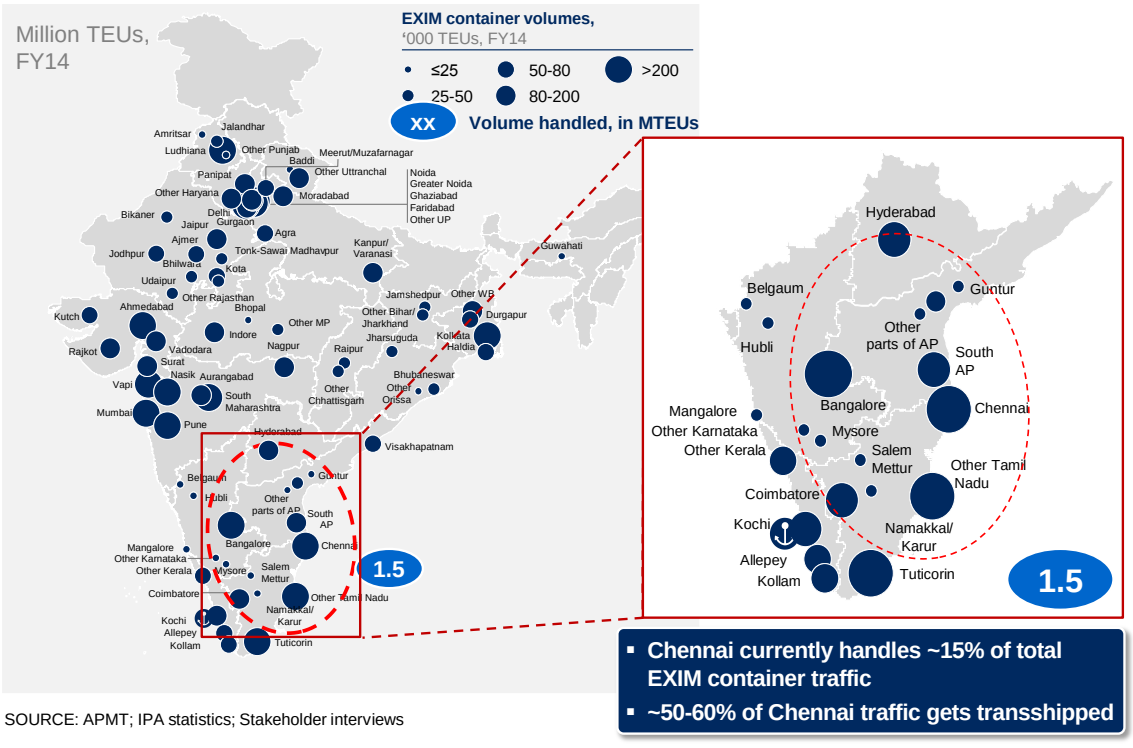
EXIM container volumes, '000 TEUs, FY14	JNPT	Mundra	Chennai	Pipavav	Tuticorin	Haldia	Cochin	Visakha-patnam	Mangalore
NCR+Punjab	936	1,264	0	329	0	0	0	0	0
Maharashtra	2,121	54	0	0	0	0	0	0	0
Tamil Nadu	0	0	1,240	0	484	0	0	0	0
Gujarat	552	262	0	169	0	0	0	0	0
Uttar Pradesh	228	274	0	107	0	0	0	0	0
West Bengal	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 6.1 Hinterland of Chennai Port

COMMODITY TRAFFIC | CONTAINER

EXIM container generating hinterlands for Chennai port



SOURCE: APMT; IPA statistics; Stakeholder interviews

Figure 6.2 EXIM Container Generating Hinterland

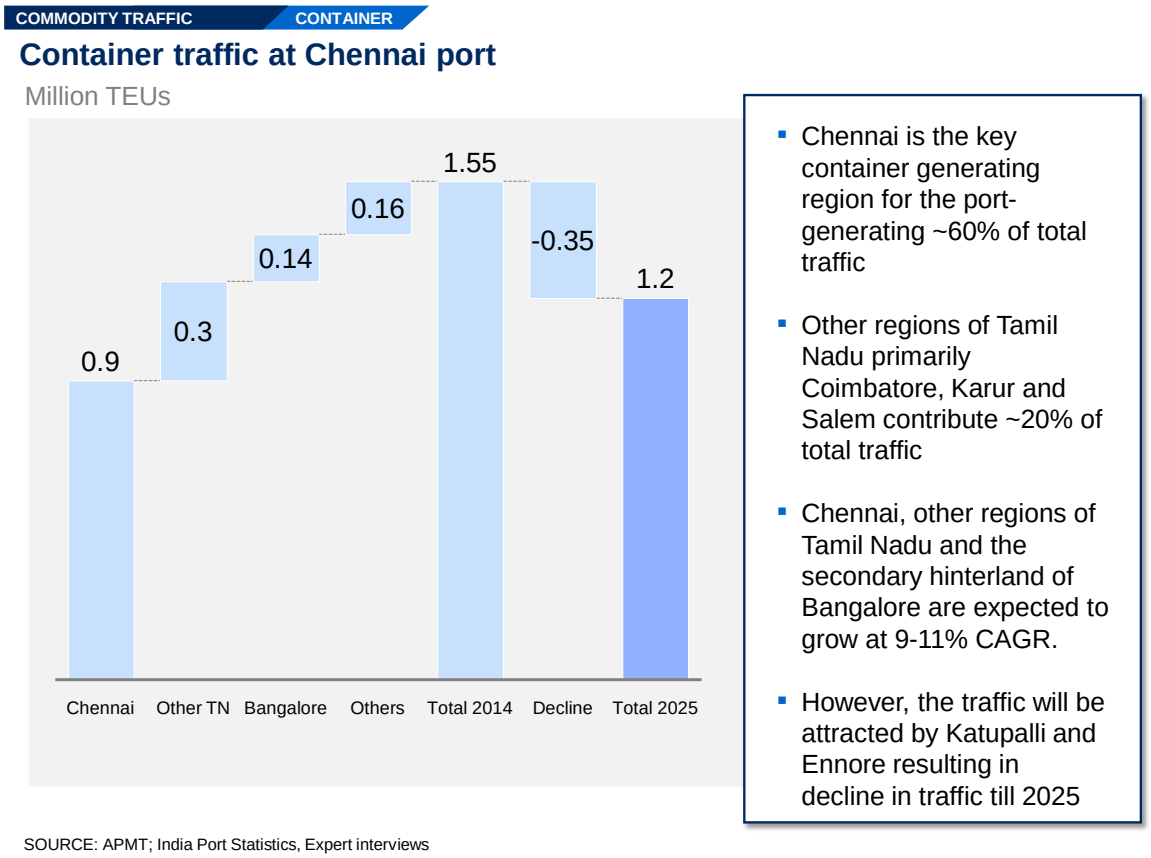


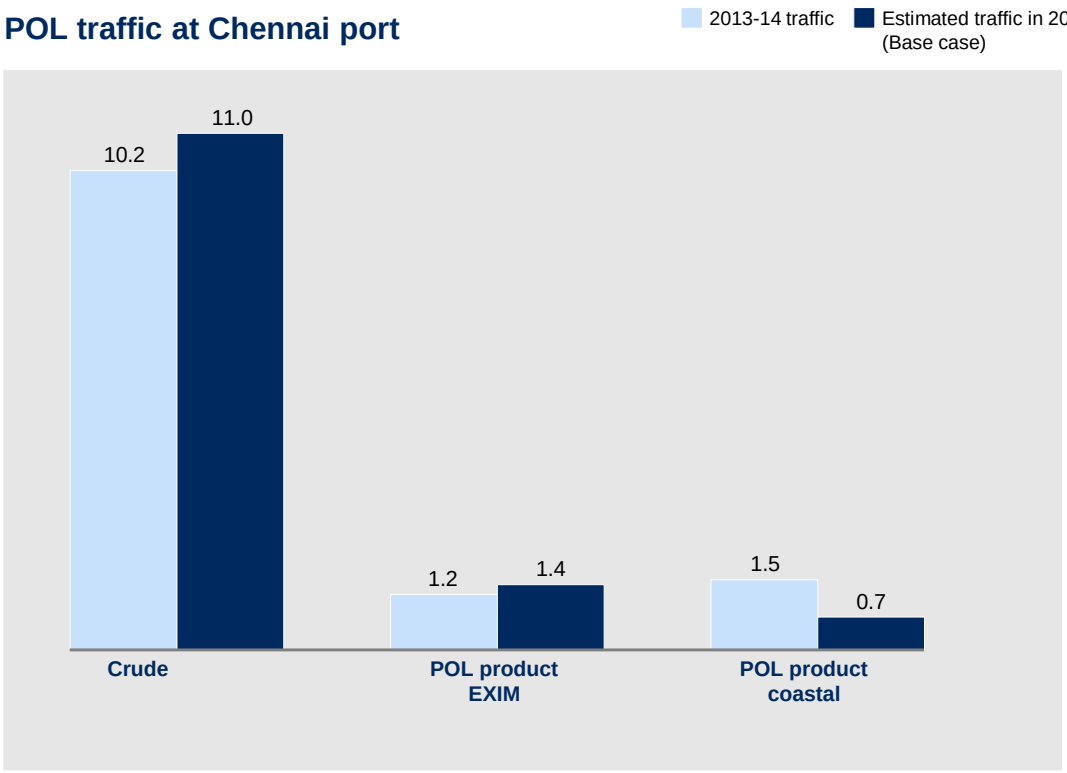
Figure 6.3 Container Traffic at Chennai Port

6.2.2 POL

The port currently handles 12.7 MTPA of POL; ~10.2 MTPA of this is crude imports for the nearby CPCL Manali refinery. The port also exports roughly 1 MTPA of products from the same refinery and receives roughly 1.5 MTPA of products to cater to the specific demands of the Chennai cluster.

Going into 2025, we expect to see marginal increase of crude import to ~11 MTPA as refinery operates to near capacity because of increased demand from the hinterland. In addition to this, most of the coastal product traffic is expected to decrease in the next few years. This is because the product traffic could move to Ennore port as OMCs have been shifting their terminals there. It is understood from IOC that they are planning to shift incoming POL products at Chennai Port for marketing purposes to Ennore for which they have been given a captive berth. The product export is expected to remain the same in the coming years. Please note that this shift of traffic will have no project implications for Chennai port.

The split of the current POL traffic and the projected future traffic is as shown in **Figure 6.4**.



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

Figure 6.4 POL Traffic at Chennai Port

6.2.3 Steel

The port current handles ~1.4 MTPA of steel roughly divided 50-50 in terms export and imports. The imports cater to vibrant auto industry in the vicinity of the port.

The overall volume of steel handled at the port is expected to grow to ~2 MTPA by 2020, ~2-3 MTPA by 2025 and ~3-5 MTPA by 2035.

6.2.4 Limestone

The port also imports large amounts of limestone to cater to the cement industry in the Chennai area. The current volume of limestone handled by the port is roughly 2.6 MTPA. However, the volume has declined to 2.25 MT during 2015-16 and it is learnt from JSW sources (Major importers of Limestone / Dolomite) that they are contemplating on alternate indigenous resources to replace Limestone / Dolomite. The projected traffic at the port is hence expected to decline in the future.

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

Table 6.1 Traffic Projection

Units: MMTPA (except Containers)

Chennai Port - Traffic Projections

xx Base Scenario xx Optimistic Scenario

Commodity	FY17	FY20	FY25		FY35		Remarks
Liquid Cargo							
POL	12.2	13.3	13.1	18.8	14.3	19.2	▪ CPCL expansion considered in optimistic case
Vegetable Oil	1.4	1.7	1.8	2.1	3.0	3.4	
Dry and Break Bulk Cargo							
Thermal Coal (Loading)	0	0	0	0	0	0	
Thermal Coal (Unloading)*	0	6.1	0	7	0	12.5	▪ Traffic projections are contingent on permission to the port by Hon'ble SC to handle coal
Coking Coal	0	0	0	0	0	0	
Iron Ore	0	0.2	0.3	0.3	0.4	0.4	
Steel	1.4	1.9	2.5	2.9	3	5.5	
Limestone	2	2.1	2.3	2.5	1.2	1.2	
Dolomite	0.6	0.6	0.5	0.5	0.3	0.3	
Fertilizers	0.3	0.7	0.8	0.9	1	1.4	
Containers and other Cargo							
Containers (MnTEU)	1.5	0.9	1.2	1.4	2.0	2.4	▪ Traffic may further reduce by 2025 if Enayam comes up
Others	3.4	4.3	5.7	6.0	9.2	10.8	▪ Highly fragmented
Total (MMTPA)	**50.3**	**48.3**	**50.2**	**68.0**	**71.0**	**101.0**	

* Traffic potential include non-power thermal coal consumption in the hinterland and part of the thermal coal requirement projected for Mettur plant

Conversion Factor Used for Containers Projections: 1 TEU = 19.3 Tons

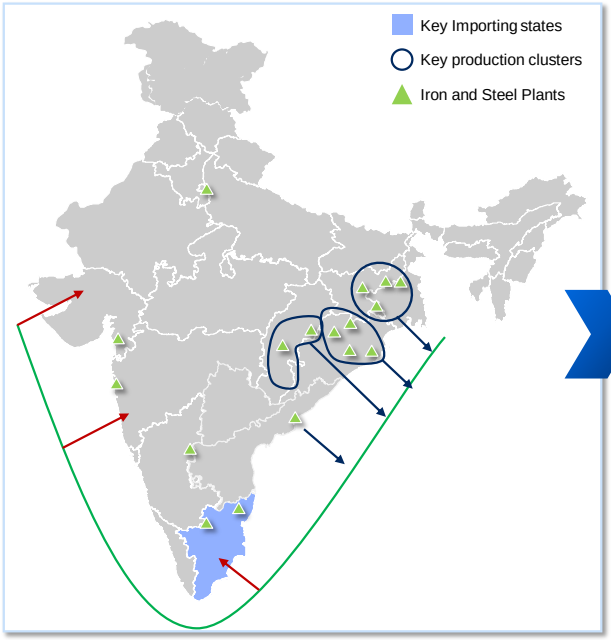
6.3 Coastal Shipping Potential

Chennai is strategically positioned to serve the large demand hinterland of Chennai and the adjoining areas through coastal shipping. Steel and cement can be major commodities to Chennai in case coastal shipping revolution takes place in the country. In case a central AP port comes up in the near future roughly 5 MTPA can be imported in the area to support constructions in view of the diminishing reserves of limestone in the state.

- **Steel:** ~1 MTPA of steel can be coastally shipped to Chennai port by 2025 to cater to the demand of the immediate hinterland of Chennai and southern Andhra Pradesh. Odisha will be the key source state for this movement.

COASTAL SHIPPING | IRON AND STEEL

~1 MTPA of steel can be coastally shipped to Chennai Port by 2025; Odisha being the primary source state



Key ODs with coastal shipping potential to Chennai Port

Route[1]	Volume, '000 TPA
Odisha to Andhra Pradesh	799
Odisha to Tamil Nadu	198

1 Small quantities will move on a number of other routes via Chennai port

SOURCE: DGCIS data 2013-14

Figure 6.5 Coastal Shipping Potential to Chennai Port

- **Cement:** ~2-3 MTPA can be coastally shipped to Chennai port by 2025 contingent on the development of coastal cement cluster facilitated by the proposed central AP port.

COMMODITY TRAFFIC | CEMENT

~2-3 MTPA can be coastally shipped to Chennai Port from the proposed cement cluster in AP by 2025

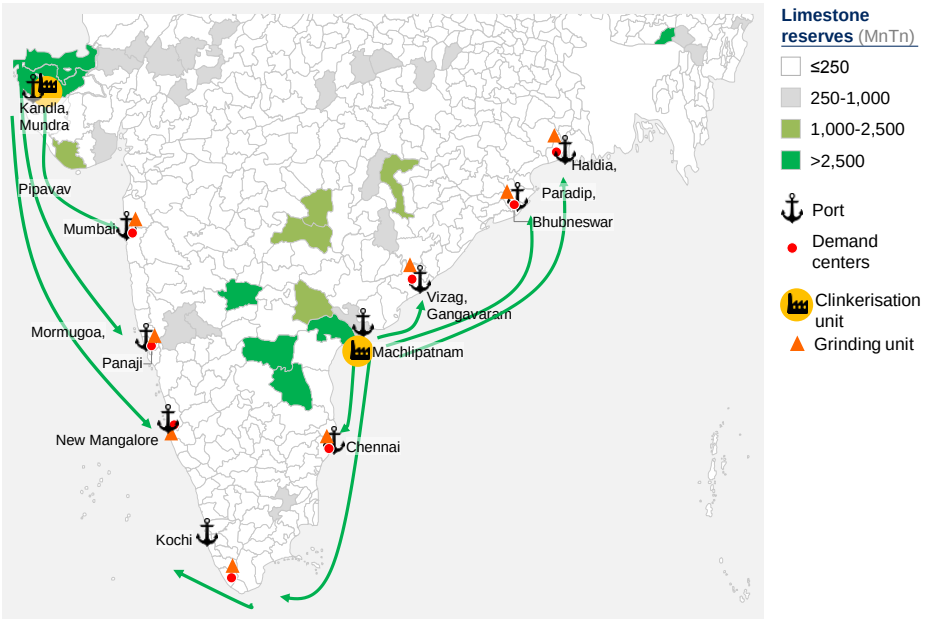


Figure 6.6 Coastal Shipping of Cement to Chennai Port

The **Table 6.2** summarizes the potential of coastal movement for key commodities.

Table 6.2 Chennai Port – New Oppoirtunities Possible via Coastal Shipping

Chennai Port – New Opportunities Possible via Coastal Shipping

Units: MMTPA (except Containers)

Commodity	2020	2025	2035
Steel (Loading)	0.05	0.07	0.13
Steel (Unloading)	0.86	1.15	2.06
Cement (Loading)	0.0	0.0	0.0
Cement (Unloading)	0.11	2.65	2.77
Fertilizer (Loading)	0.04	0.04	0.06
Fertilizer (Unloading)	0.34	0.41	0.61
Food Grains (Loading)	0.02	0.02	0.04
Food Grains (Unloading)	0.35	0.42	0.62

- 2-3 MMTPA can be shipped from Central AP cement cluster (If Central AP port comes up)

7.0 CAPACITY AUGMENTATION REQUIREMENTS

7.1 Requirement for Capacity Expansion

Considering the traffic potential and the capacity of existing berths, the need for capacity augmentation has been examined as presented in **Table 7.1**.

Table 7.1 Capacity Augmentation Required (MTPA)

Cargo Handled	Current Capacity at Desired Occupancy (MTPA)#	2020		2025		2035	
		Projected Traffic (MTPA)	Capacity Augmentation Required (MTPA)	Projected Traffic (MTPA)	Capacity Augmentation Required (MTPA)	Projected Traffic (MTPA)	Capacity Augmentation Required (MTPA)
Crude & POL	24.7	13.3	0.0	13.1	0.0	14.3	0.0
Dry & Breakbulk	23.5	16.9	0.0	13.1	0.0	17.1	0.0
Fertilizers	2.8	0.7	0.0	0.8	0.0	1.0	0.0
Containers	51.7	17.4	0.0	23.2	0.0	38.6	0.0
Total	**102.6**	**48.3**	**0.0**	**50.2**	**0.0**	**71.0**	**0.0**

Current capacity is basically the capacity of the berths arrived as per the berthing policy of the ministry of shipping. It is considered that the bottlenecks in terms of storage space and evacuation, if any, of the corresponding terminal could be mitigated at much smaller cost.

It could be observed that the port will have surplus capacity at different timelines as compared to the projected traffic. Giving due consideration to the competing ports that operate on either side of Chennai Port viz. Krishnapatnam Port, Kattupalli Port, Kamarajar Port, Karaikal Port and Tuticorin Port, it is felt that the focus of Chennai Port should be to enhance the productivity and efficiency of cargo handling so as to retain the traditional cargo before attempting to attract new cargo volumes.

8.0 ROAD AND RAIL - 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 Chennai Port and their proposals are described in the following sub sections. The rails and roads are been connected to Chennai Port to its hinderlands as shown in **Figure 8.1**.

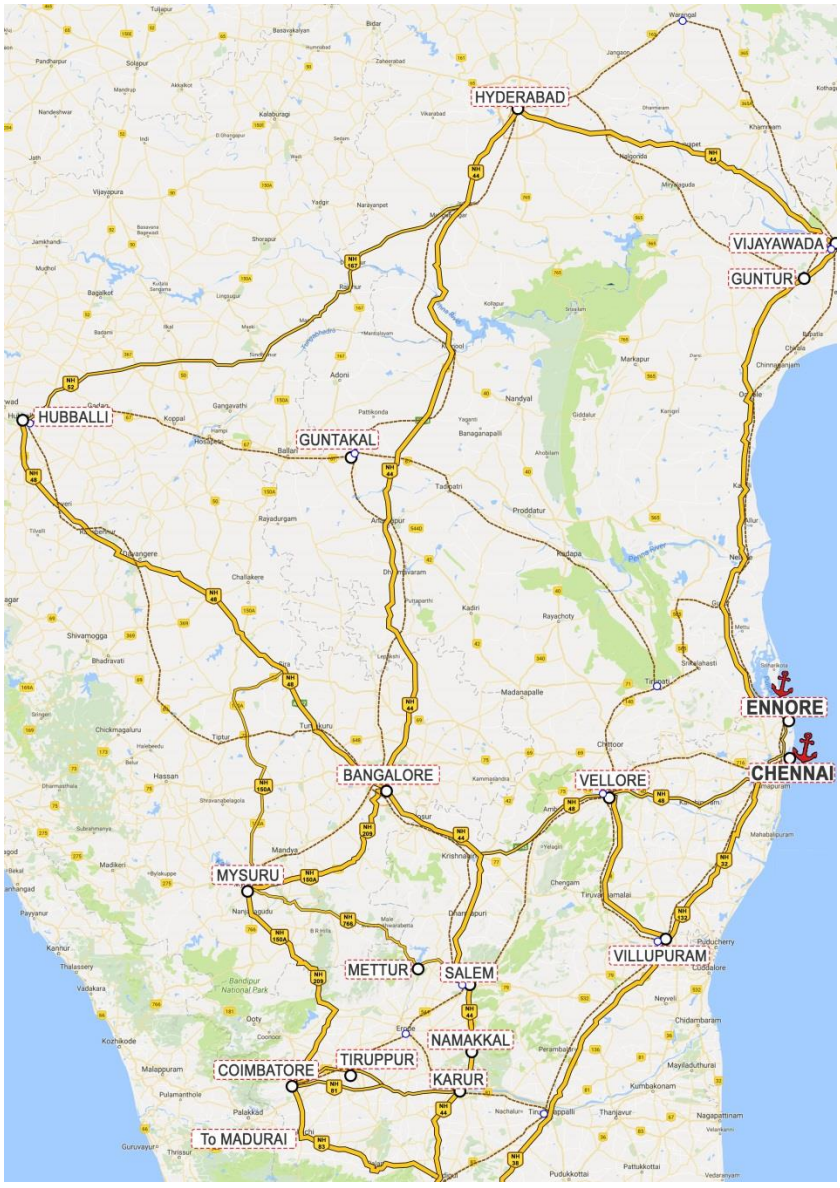


Figure 8.1 Rail and Road Connectivity

8.2 Modal Split of Traffic

The cargo handled at the port could be classified under three major heads – dry/break bulk, containers and liquid bulk. While liquid bulk mostly is evacuated through pipelines, the other two are evacuated through road and rail. At Chennai Port, the proportion of traffic handled through these three modes for the past 5 years are presented in the following **Table 8.1**.

Table 8.1 Modal Split of Traffic Handled (MT)

Year	Total Traffic handled	ROAD		RAIL		PIPELINE	
		Tonnage	Percentage	Tonnage	Percentage	Tonnage	Percentage
2015 -16	50.06	33.12	66%	4.85	10%	12.09	24%
2014 -15	52.54	32.75	62%	6.87	13%	12.93	25%
2013 -14	51.11	30.25	59%	6.88	13%	13.98	27%
2012 -13	53.40	32.54	61%	6.18	12%	14.69	28%
2011 -12	55.71	33.46	60%	7.69	14%	14.56	26%

The Port should, accordingly, have proper and sufficient infrastructure for ensuring the smooth and fast movement of trucks by road and rakes by railway lines. The existing internal network or roads and railway lines are examined in the following paras.

8.3 Internal Road Network

8.3.1 Overview

The Port has in all 10 Gates for entry and exit. Gate no. 1 & 10 are well connected. Gate no. 2, 3, 5 & 7 opens into small arterial roads, while Gate no. 8 is non-functional. Gate No. 4, 6 & 9 are railway gates which connect to the Southern Railway lines.

The location of the Gates and their connectivity is shown in the following **Figure 8.2**.

Figure 8.2 Internal Road Connectivity – All Gates and their Connectivity

The detailed internal road network linking the various gates and the docks inside the port are shown in the **Figure 8.3**, **Figure 8.4** and **Figure 8.5**.

Figure 8.3 Internal Road Connectivity – from Gate no. 1 to Bharathi Dock

Figure 8.4 Internal Road Connectivity – Dr. Ambedkar Dock and Jawahar Dock

Figure 8.5 Internal Road Connectivity – Marshalling Yard to Gate no. 10

8.3.2 Interconnectivity of CCTPL and CITPL Terminals

Chennai port has two container terminals, viz. Chennai Container Terminal Private Limited (CCTPL) and Chennai International Container Terminal Private Limited (CITPL).

DP World is operating the CCTPL and PSA is operating the CITPL. Both the terminals get the export and import containers through Gate no. 1.

The container trailers moving containers to and from the CFSs located on the northern side take Ennore High Road, Cassimode Fisheries Harbour road and Suryanarayana Road to reach Chennai port through Gate no. 1. From the Surya Narayana Road junction Gate no. 1 is at distance of about 2 km.

Gate no. 1 is an 8 lane gate complex which has 4 import and 4 export gates. The import and export gates are divided into 3 covered roof structure and 1 open gate to allow ODC (over dimension cargo) packages each at either end of the 8 gates complex.

Once the gate-passes are verified, the container trailers move towards their respective terminals. In front of the container scanner complex, separate dedicated single lane roads are made available for CCTPL and CITPL. This dedicated single lane road to CCTPL is around 1.3 km which will take the loaded container trailers directly into the terminal yard from the backside entry. The empty trailers has a dedicated road in front of northern side of the proposed truck and trailer parking area, then the trailers follow the same road till BD II berth, and it has to take the road parallel to the berth BD II to reach CCTPL's back end gate.

The container trailers bound for CITPL have to cross the CCTPL yard boundary area in the single lane road. After crossing the CCTPL out gate area, 4 lane road is available all the way till central workshop 1. On this road, the extreme east side lane is dedicated to CITPL users. From central work shop 1 to the junction at the corner of Timber Pond it is a 3 lane road. Again from this junction to the CITPL entrance gate, 4 lane road is available.

The loaded container trailers come out from the out- gate of CITPL and follow the same incoming route but in the extreme west lane dedicated to the CITPL till CCTPL junction. At this junction CCTPL loaded container trailers join the loaded container trailers from the CITPL. Just beyond the gate no. 4 both the terminal loaded trailers take the peripheral road to reach gate no. 1 to exit from the port.

The empty trailers are allowed to go out from gate 2A at night from 11 p.m. to 4 a.m.

Gate no. 2 is handling oil tankers, tippers and all other cargos.

The layout of road connectivity for both the terminals is shown in **Figure 8.6**.

Figure 8.6 Internal Road Connectivity of CCTPL and CITPL Terminals

8.3.3 Interconnectivity of Ambedkar and Jawahar Docks

Dr. Ambedkar Dock consists of NQ, WQ1, WQ2, CQ, WQ3, WQ4, SQ1, SQ2, SCB1, SCB2 and SCB3. Jawahar Dock consists of JD1, JD2, JD3, JD4, JD5 and JD6. Both the docks are utilizing the ONB yard for stacking their cargo while the Ro-Ro cargo is parked in the yard parallel to the southern side of the ONB yard which is paved with bitumen.

JD 1, JD 3 and JD 5 are using the western side road of Jawahar Dock and JD2, JD4 and JD6 are using eastern side road. Both are 2 lane roads.

The incoming cargo for Jawahar Dock and Dr. Ambedkar Dock move from gate no. 10 through firefighting road which runs parallel to the compound wall.

Outgoing cargo take the South Spring Haven Road and the Marshalling Yard Road to reach Gate no 10 to exit from the port.

The firefighting road is a 2 lane road but at certain stretches it reduces to a single lane road. The South Spring Haven Road and Marshalling Yard roads are both 4 lane roads. The pink line shown in **Figure 8.7** represents the road circuit.

Figure 8.7 Road Connectivity of Jawahar Dock and Dr. Ambedkar Dock

8.4 Improvements to the Internal Road Network

8.4.1 Widening of Arterial Road & Construction of a ROB

Chennai Port has got a simulation study on congestion issue at Port carried out by IITM and as per the recommendations of the study the congestion issues are mainly attributable to criss cross movement of vehicles of the two container terminals, CCTPL & CITPL, as both terminals are located opposite to each other and the entry and exit with in the Port is same. The container trailers remain outside terminals but inside port for quite a long time as such the by-passes are required for easy movement of containers.

Presently, the road leading from gate no. 1 to CCTL entry gate is being used by both the terminal operators to enter inside the port and thus causing traffic congestion inside the port. Hence to overcome this traffic congestion inside the port, it is proposed to provide a new 4 lane road starting from North West corner of IOCL terminal B boundary. Further, it is proposed to shift the port compound wall between Gate no. 4 & 6 in lieu of upcoming 3rd and 4th railway line by southern railway. A new 8 lane peripheral road is proposed to be laid alongside of the new compound wall to enable the remaining portion as an effective storage area. Also the present project start near Gate no. 1 and ends near Gate no. 6 which will cross over the existing railway line near gate no. 4 and proposed railway line near CISF crime office building. Hence, it is proposed to provide a Road Over Bridge to cross these railway lines. Further details are provided hereunder.

- It is proposed to widen the existing concrete road starting from North West corner of IOCL Foreshore terminal – B (near Gate no.1) and ending up at the container scanning station. The proposed road length is about 284 m and width in this stretch of about 18 m to accommodate 4 lane traffic with central median. Separate chase for power cables and storm water will be provided alongside of the proposed road.

- From container scanning station, it is proposed to provide new four lane road for 1,542 m length and 18 m width alongside of the new eastern side boundary of IOCL Foreshore terminal A' upto the existing loco shed.
- From existing loco shed to CISF crime office building, it is proposed to provide a new 4 lane concrete road of 18 m width in eastern side of the existing peripheral road leaving a gap of 2 m for proposed oil pipe line of IOCL. All the above stretches will have cable chase and storm water drain arrangement.
- From E - FLT service station (near CCTL exit gate) to gate no. 6, it is proposed to provide 36 m wide eight lane road for 1,104 m length with 1.5 m wide foot path on both the sides with storm water drainage arrangements alongside of the proposed compound wall between E -FLT service station and gate no. 6. It is proposed to provide 13 m space in width alongside of the new compound wall between gate no. 4 & 6 left for proposed railway track connecting northern and southern part of the port. However, as the alignment of the internal railway lines connecting the port to the 3rd & 4th lines of Southern Railway is yet to be finalised, the adequacy of this 13 m wide corridor cannot be confirmed at this stage.
- It is also proposed, a four lane Road Over Bridge of width 18 m (approx.) for existing railway crossing at gate no. 4 and proposed railway crossing near CISF crime office building. The 4 lane ROB consist of 500 m length bridge length portion with 200 m length ramp portion on both ends of Bridge. (Total ROB length is 900 m). Financial Assistance of Rs.100 cr. is expected for the entire scheme from Government in the form of grant in aid.

8.4.2 Truck Parking Yard for the Two Container Terminals

At present, the overall incoming traffic at Gate no. 1 is moving towards their respective terminals to unload the loaded containers or to fetch the loaded containers. In this process, the trailers and trucks without proper pass or paper work also move along with the trailers and trucks having proper pass and paper work which leads to the confusion and congestion in the roads leading to the terminals. Moreover, trucks and trailers are parked randomly on the side of busy roads and on open lands which obstructs the moving traffic.

The trailers should be discouraged from parking inside the Port area as it leads to idling trailers being parked within the port. With the introduction of RFID, only those vehicles with work proof shall be permitted inside the port. It is suggested to provide parking areas for each terminal separately.

- **Suggested Parking Yard for CCTPL Trailers**

  The proposed location is situated near gate no 1 and adjacent to the compound wall of CFS and container scanner complex. Out of the total 5.8 ha area available in this location, 2 ha has been suggested for locating tank farms for bunkering. In the balance 3.8 ha area, it is possible to park about 750 trailers.

- **Suggested Parking Yard for CITPL Trailers**

  There is not adequate space within custom bound area. However, a small buffer area for 50 – 60 trailers may be created as a common user facility for exigencies.

Facilities like canteen, bathrooms, toilets and rest rooms need to be provided at these parking yards. Check-post shall be established to allow the vehicles out of the proposed parking area only if they possess the complete paper work to fetch or unload the containers from the both the terminals. This, in-turn, will reduce the queuing and congestion in the roads leading to the terminals.

Figure 8.8 Proposed Truck Parking Area for CCTPL

8.5 External Road Connectivity

Popularly known as “Gateway to South India”, Chennai is well connected to other major cities in the north, west, south and north-east through National Highways. The directly connected Highways are NH 48 (NH 4), NH 16 (NH 5) & NH 132 (NH 45). The road network linking Chennai to some of the major cities and industrial / cargo generating clusters is shown in **Figure 8.9**.

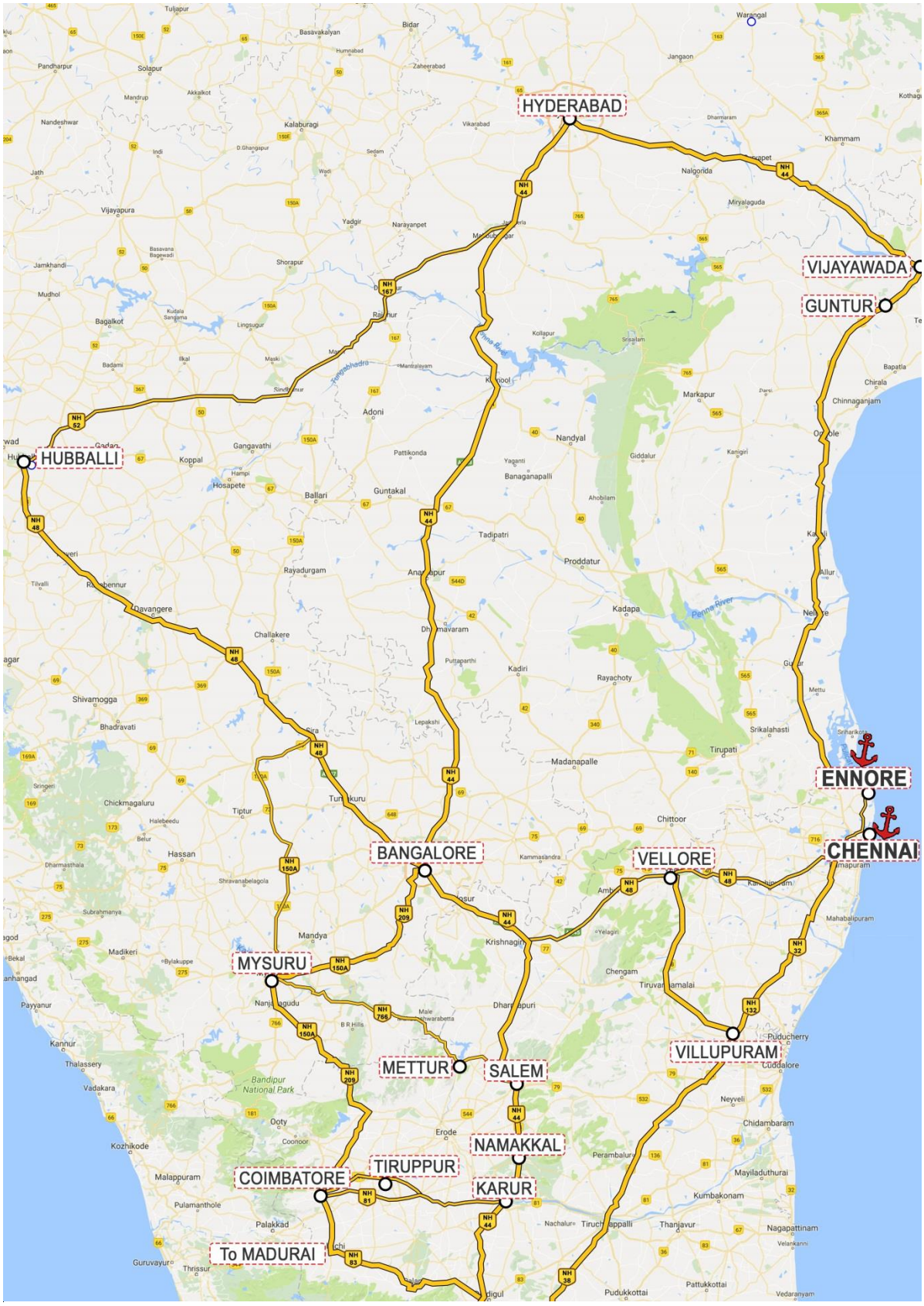


Figure 8.9 National Highway Network Linking Chennai

NH 132 (NH 45) from the south is connected with NH 48 (NH 4) & NH 16 (NH 5) through outer and inner ring roads bypassing the city as shown in the **Figure 8.10**.

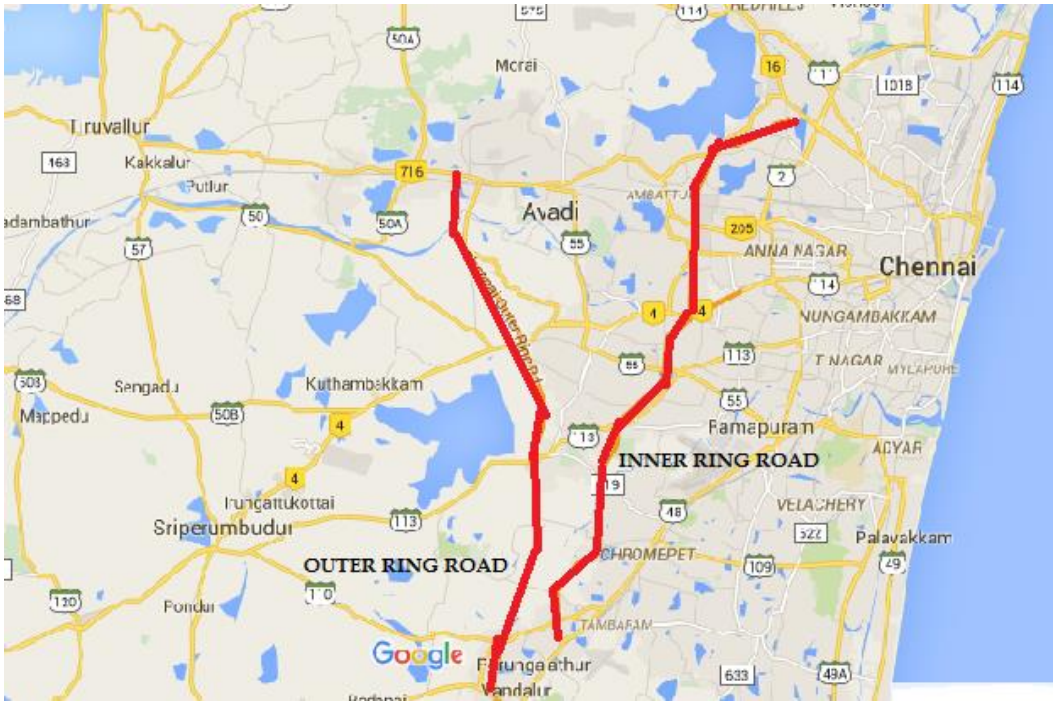


Figure 8.10 Outer & Inner Ring Roads Bypassing Chennai City

The stretch of 15 to 20 km from north, west and south to Chennai port from the National Highways are clogged and constrained by traffic restrictions. Heavy port traffic is permitted only during nights. The ring roads circumventing the city have helped but increased the distance and costs against marginal savings in haulage time. Hence there is a need to upgrade the port linkage to these highways to ease cargo movement. Accordingly, two schemes were proposed for evacuating cargo from the port through the north as well as from the south. They are: Chennai Ennore Road Connectivity Project on the northern side and Maduravoyal elevated corridor on the south. These are detailed hereunder.

8.5.1 Chennai Ennore Port Road Connectivity Project (formerly EMRIP)

The Chennai Port Road Connectivity Project (formerly EMRIP) was planned to improve the northern connectivity of the Port to the National Highway network by strengthening the connecting roads from the Port. This project is expected by a Special Purpose Vehicle comprising NHAI, ChPT, KPL and GoTN at the current estimated cost of Rs. 600 crores. The project network covers 30.1 km with 6.0 km of Ennore Expressway, 1.6 km of Ennore Expressway (inside Fishing Harbour), 9 km of Thirvottiyur – Ponneri - Panchetty road (TPP) and 5.4 km of Manali Oil Refinery Road (MORR). The project also involved construction of groynes along the seashore for coastal protection. The Equity contribution of ChPT is Rs. 139.80 crores. and debt contribution is Rs.110.68 crores. ChPT has already paid its entire equity amount.

The contract for executing this work was awarded to a joint venture of M/s Coastal and SPL during June 2011, at a contract value of Rs. 253.47 crores. As of date about 90% of the work has been completed and the balance is pending due to non-shifting of Project Affected Families (PAF's) from the alignment of road in two small stretches by GoTN. Both NHAI and ChPT are pursuing with the state government for speedy action in this regard.

8.5.2 Maduravoyal Elevated Corridor

This road is envisaged for the smooth movement of the commercial traffic to and from Chennai Port on the southern side. All the traffic will get distributed to the three national highways NH 132 (NH45), NH 48 (NH4) & NH 16 (NH5) from Maduravoyal. It is proposed that this elevated road will follow the banks of river Cooum for the entire length. The project corridor commences at Chennai port (Gate 10) near War Memorial and ends near Maduravoyal Municipal Office, at km 13 at NH48 (NH4). The total length of this road will be about 17.5 km. The location and alignment of this elevated corridor is shown in **Figure 8.11**.

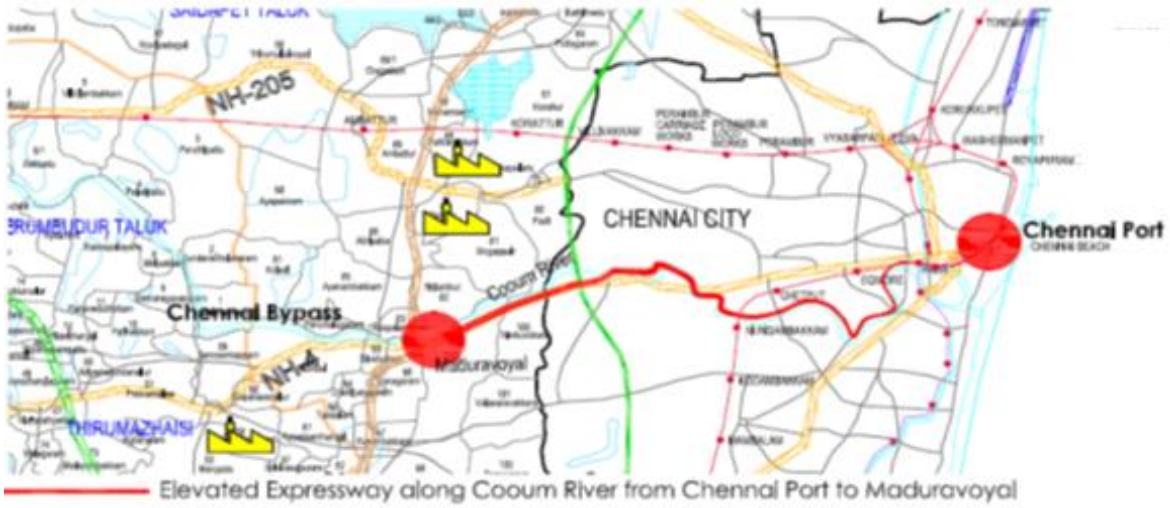


Figure 8.11 Location and Alignment of Maduravoyal Elevated Corridor

The project was included under NHDP VII and is being executed through NHAI. The Project proponents are NHAI, ChPT and GoTN. The present estimated cost is Rs. 1,815 crores with Rs. 1,345 crores towards civil works and Rs. 470 crores towards R&R activities. ChPT and GoTN will be sharing the costs of land acquisition and R&R equally.

Project starts from War Memorial gate of Chennai Port and runs upto Maduravoyal for a length of 19.01 km, which runs along Cooum river bank upto Koyambedu and the balance stretch along NH 4 thereafter. The BOT tender was awarded to M/s Soma Enterprise Ltd., Hyderabad during January 2009, for a concession period of 15 years (including 3 year construction period). After progressing for about 15% the project has landed up in litigation. PWD, GoTN has issued a stoppage notice stating that certain conditions have been violated. On consequent events, NHAI filed a WP in the High Court of Madras against the stop notice by GoTN and as a one of the respondents Chennai Port also filed a counter and additional counter affidavits. After hearing proceedings, the judgment has been delivered by in favour of Chennai Port and NHAI. However, a SLP has been filed by CE, PWD, GoTN in Hon'ble Supreme Court against the judgment delivered by the High Court. The case is still pending.

8.6 Internal Railway Network

8.6.1 Overview

Chennai Port is served with two rail entry / exit arrangements connecting Indian Railway network - one connecting Chennai Beach Station to the Port Marshalling yard at the southern end through Gate no. 9; and the other connecting Royapuram Station with Bharathi Dock at the northern end through Gate no. 4. Bharathi Dock linkage was mainly for handling iron ore at BD II berth. As of date, the iron ore traffic has been stopped and this Gate no. 4 remains closed. The overall port railway network is shown in the **Figure 8.12**.

Figure 8.12 Overall Port Railway Network

8.6.2 Port Marshalling Yard

Port Marshalling yard is at the southern end of the port and is connected to the Southern Railway network through Chennai Beach station with a single line. This Marshalling yard distributes the railway traffic to the various docks inside the port. Port Marshalling yard is the feeding yard for the second Container Terminal, Jawahar Dock and CONCOR yards. In addition, this yard also handles loading / unloading of Port's other general cargo handled in Eastern and Western yards. The layout of Port Marshalling yard is such that entry/ exit to all sidings and Chennai Beach are on the Northern end of this yard.

Incoming trains with electric locos are received at the eastern end of the yard and the electric engine is released. Port owned diesel locos shunt the rakes to the various feeder yards like CONCOR yard or CITPL yard or for handling general cargo for placement. After unloading / loading, the rake is brought back to the Central yard by the Port's diesel loco and forms a train. The train is attached with electric loco and dispatched to Chennai beach station through Gate no. 9.

This marshalling yard consists of 4 lines of Eastern yard, 6 lines of Central Yard and one line of Western Yard. The railway network at the Marshalling Yard is shown in **Figure 8.13**.

Figure 8.13 Railwy Network at the Marshalling Yard

8.6.3 Jawahar Dock, CITPL & CONCOR Linkage

Jawahar Dock East and West are served by railway lines linked to the marshalling yard. Cargo are loaded/unloaded onto and from railway rakes at the dockyard siding.

The second container terminal CITPL has 2 rail sidings in its yard, the containers are loaded on to the rail rakes. From here the loaded rakes are moved to the marshalling yard. DLI is handling JD west line. From here DLI is picking the containers from CITPL or CCTPL and loading into the rakes and moving them to marshalling yard. The CITPL yard has the capacity to handle 10 incoming and 10 outgoing rakes per day.

The first container terminal, CCTPL, does not have railway siding inside its yard. Since the containers in the port are handled by CONCOR, a separate siding for CONCOR has been provided west of Ambedkar Dock. This siding can handle a full rake. CONCOR is the only operator handling rail bound container traffic of CCTPL from its rail terminal and that of CITPL from the yard sidings of CITPL. The total container traffic handled by CONCOR by rail, for the both operators, is about 2 rakes a day, mainly to and from its ICD at Whitefield in Bengaluru. The reason being the limited equipment (2 reach stackers only) provided at the yard. In case additional 2 reach stackers are provided, each rake can be loaded and unloaded in less than 4 hours, which would enable handling 5 rakes per day.

The layout of the railway network linking CITPL, JD EAST, JD WEST and CONCOR Yard is shown in the **Figure 8.14**.

Figure 8.14 Railway Network Linking CITPL, JD EAST, JD WEST and CONCOR Yard

8.6.4 Bharathi Dock – BD II Berth

Bharathi Dock – BD II is served by rail connectivity through Royapuram Railway station. A railway yard with 5 reception lines, 4 dispatch lines and unloading facilities with tippling arrangements are available, mainly handling iron ore for exports. Since Chennai port is banned from handling iron ore and coal due to environmental issues, this railway yard area and railway lines are kept idle and Gate no. 4 exit / entry lines are non-operational.

The layout of the railway network as existing at BD II yard is shown in the **Figure 8.15**.

Figure 8.15 Railway Network at BD II Yard at Bharathi Dock

8.6.5 Constraints at the Marshalling Yard

Some of the major constraints in Port Marshalling yard are:

- As per present yard design, only Eastern Yard 2, 3, 4 is meant for reception of rakes and they are fully wired. Each line has a designed length to accommodate only 58 wagons with brake van and power loco. Eastern Yard 1 siding is used for loading/unloading & Centre Yard 1 line is utilized for Southern Railway Loco as escape line and also as a crossover for the movements between Reception and Despatch yard. Centre Yard 2, 3, 4, 5, 6 are despatch lines which are top wired along with Western Yard 1. Even if the despatch yards are fully wired, sufficient track length is not available at the southern end, for loco to escape, due to the existing road leading to Gate No. 10.
- All the feeder sidings and Chennai Beach station which is the gate way for rail movement are on the northern end of the yard with a result, a Z type movement at the Port Marshalling yard is inevitable
- Independent entry and exist arrangements to each of the feeder sidings is not available resulting in criss-cross movements and avoidable detentions.
- Availability of a single line for movement to and from Chennai Beach Railway station which is the only entry / exit point of Chennai Port at present

It is suggested that all the 11 lines could planned to be wired in a period manner depending upon the traffic growth.

8.6.6 Laying of 3rd and 4th Line from Royapuram

In order to remove the constraints at the marshalling yard and also to enhance the movement of railway rakes, Southern Railway have come up with a proposal to introduce 3rd and 4th line from Royapuram to Madras Beach Station which will be further extended upto the Port Marshalling Yard. For this purpose they have requested for the release of 1.67 Ha of port land between Royapuram and Madras Beach Station. In exchange they are prepared to hand over equivalent area to the Port. This proposal has been approved both by the MoS and the Ministry of Railways.

Southern railway has requested the port to construct the compound wall as a deposit work and also requested to allow them to carry out the construction of 3rd & 4th tracks. The shifting of existing boundary wall by about 13 m towards the periphery road is going on and the construction work is under progress. After the completion of the work, these new lines will ease the railway operations through the marshalling yard. This proposal is shown in the **Figure 8.16**.

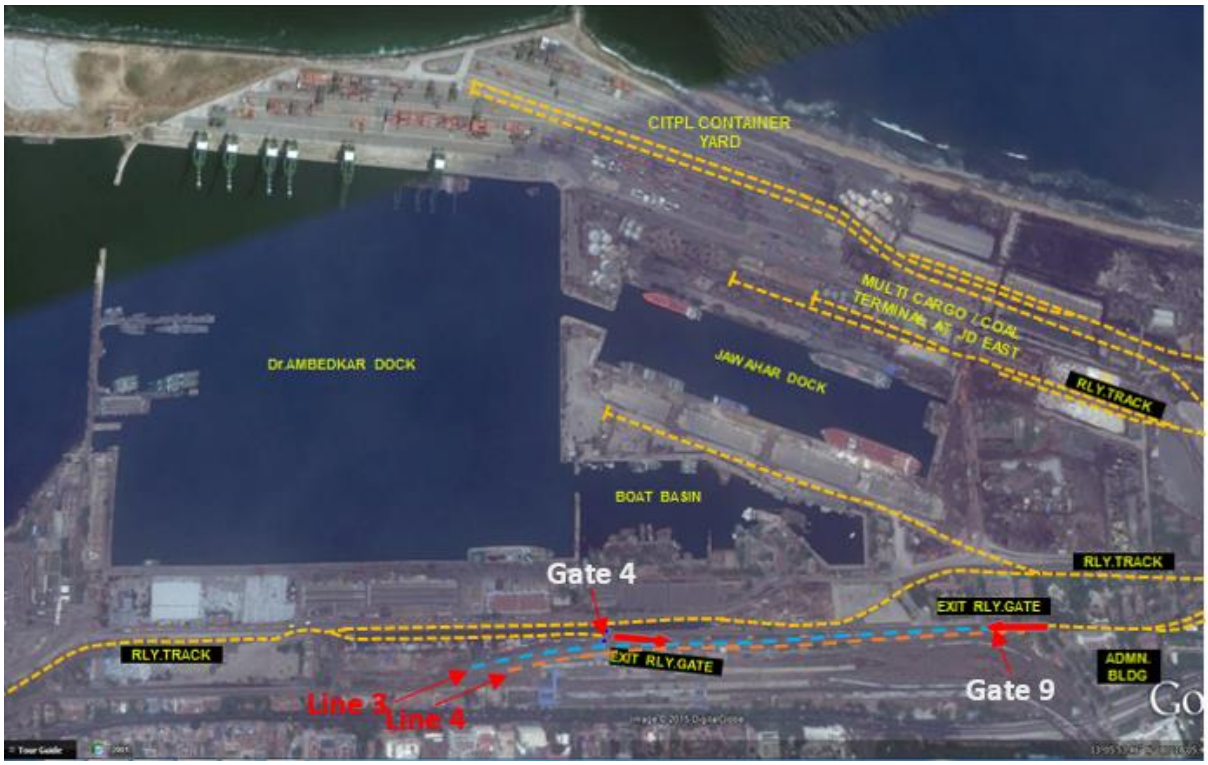


Figure 8.16 The Proposed 3rd & 4th Line from Royapuram

It is further suggested that Doubling of track be also taken up at Gate no. 9, so that 3rd and 4th line of southern railway are connected to the ChPT lines for enhanced evacuation of cargo through rail mode.

8.6.7 Common Railway Yard for Containers

The port is presently developing a common rail yard in the area west of marshalling yard. The basic purpose of this yard is to aggregate the containers from both the terminals at one location to ensure faster turnaround of rakes. It will also allow handling of DFCC (Dedicated Freight Corridor Corporation) rakes which will be double the length of the current rakes.

This common railway yard is being executed by IPRCL (Indian Port Rail Corporation Ltd.) a SPV formed by Major Ports and RVNL. IPRCL have appointed RITES as the PMC for executing this work. The yard will have two lines on either side of a 700 m × 30 m platform with a main railway line and a reserve line.

The common rail terminal shall have the following components:

- Sidings for receipt/dispatch of DFCC rakes.
- Roads for movement of ITVs in the yard area and rail yard.
- stacking space adjacent to rail yard
- RTGs at the Yard area
- ITVs, other equipment, utilities.

The proposal envisages a full rake loading and avoid cutting of rakes so that the rakes can be released immediately. The concept is to have “Engine on load” which will ease operations. ChPT is at present handling 4 to 7 rakes per day. The proposed common siding is top (partially) wired. Hence, Diesel Loco has to be provided by Southern Railway for placing full rake as direct placement at the common railway yard instead of the rake going to Reception Yard (Eastern Yard) and to be placed in multiple shunts or otherwise the rake has to be pushed from Chennai Beach to Marshalling Yard having Brake Van on the southern side with Southern Railway to enable loading the wagons directly on reception of the rake. With the proposed new platform the number of operations will increase and may be able to handle 10 - 15 rakes per day. The yard would have space to handle up to 0.75 MTEU per year and would also have adequate equipment to maintain high productivity levels. The proposed common yard is as shown in the **Figure 8.17**.

Figure 8.17 Proposed Common Rail Yard

The relative locations of the common railway container yard and the two container terminals are shown in the **Figure 8.18**.

Figure 8.18 Proposed Common Rail Yard wrt Existing Container Terminals

8.7 Ongoing and Planned Projects for Connectivity

The Port is linked to Southern Railway network through Chennai Beach Railway Station which connects Chennai Port to Southern parts of Tamil Nadu and through Royapuram Station which connects Southern Railway Trunk line to Kolkata, New Delhi, Bangalore, Coimbatore etc. The Port also has an internal rail network of about 70 km.

The following connectivity projects are ongoing developments at the port:

Table 8.2 List of Ongoing Connectivity Projects

S. No.	Project Name	Investment required (in Crores)	Distance (KM)	Mode of implementation
1.	Laying of new railway track at west of western yard I and laying paving block loading Platform	13	6	IPRCL
2.	Development of Coastal road to the East of container Terminal II at Chennai Port	100	4	Port Trust

The following connectivity projects are recommended for the Chennai port to enhance the connectivity

Table 8.3 List of Recommended Connectivity Projects

S. No.	Project Name	Investment required (INR Crores)	Mode of implement-tation	Rationale
1.	Development of dedicated Container Corridor to NHAI road for quick evacuation, Chennai	100	Port Trust	For easy and effective container / cargo evacuation from the Port directly to NHAI Road grid and form a 8 lane concrete road to reach out by avoiding inter Port activities and create a dedicated container corridor.
2.	Puducherry (NH-32) - Marakkanam - Sadaras - Kovalam - Coromandel - Chennai (NH -32)	1,440	State PWD	For quicker evacuation of cargo

9.0 SCOPE FOR FUTURE CAPACITY EXPANSION

9.1 Development of a Bunkering Terminal

9.1.1 Bunkering Industry – An Overview

Fuel utilized by shipping companies for fuelling their marine fleet is commonly referred to as bunker fuel. In the bunker industry, there are two primary kinds of fuels currently being used; distillate fuel and residual fuel. Among the two, residual fuel account for around 75% of global bunker consumption. Ships use heavy fuel oil to power their engines, and lighter fuels such as diesel or gas-oil to power the generators that run their lights and other electrical utilities.

The marine fuel grades have been broadly segmented into four major categories: IFO 380, IFO 180, IFO Others, and MDO/MGO. The IFO Others segment includes fuel grades IFO 500, IFO 700, LS 380, and LS 180. With majority of ship engines capable of combusting IFO 380, it is currently the most popular in the bunker market and is the most traded marine fuel oil grade globally. It is easily available at all bunkering destinations in the world, and is more economical when compared to other fuel grades.

The specifications for all types of marine fuel are set out in the International Standard ISO 8217-1996. It is a commercial standard and is not a mandatory one. Subsequently, it was revised in 2005. The latest version was released in June, 2010. Most major suppliers in major ports supply fuels conforming to IS 8217 -2005. If buyer and supplier agree, fuel can be supplied to IS 8217 -2005 or even ISO 8217-1996. There are only very limited people conforming to 2010 version. These cover IFO 40 cst to IFO 380 cst; MGO and MDO.

The requirement for bunker fuel is relatively high in bulk and general cargo vessels. While the major demand from bulk carriers has been recently exhibiting a decreasing trend, the requirement for bunker fuel in the container ships segment is anticipated to grow at a substantial rate in the future.

Selection of the right type fuel is of significant importance to the safety of the ship (substandard fuel can cause severe damage to the ship's engine) and its profitable operation. Bunker fuel costs account for approximately 60% to 70% of the total voyage expenditure for a vessel. Ship operators, while taking fuel, look for the following three important aspects, viz. that the bunkers they buy are of sufficient quality to allow use without any problems; that they can get their bunkers at a good price; and that they buy at the most cost-effective location on their ship's itineraries. This implies that for any bunkering business to thrive, these three aspects are to be satisfied. This also implies that to meet the demand for bunkers there needs to be a corresponding supply source.

With this background, an overview of the region around the Indian sub-continent is made as this is more relevant for this specific study. India lies in between the two significant bunker ports viz. **Singapore and Fujairah** as shown in the **Figure 9.1**. While Singapore is the world's largest bunker port at 45 MTPA of bunker sales, Fujairah is the second with 25 MTPA bunker sales.

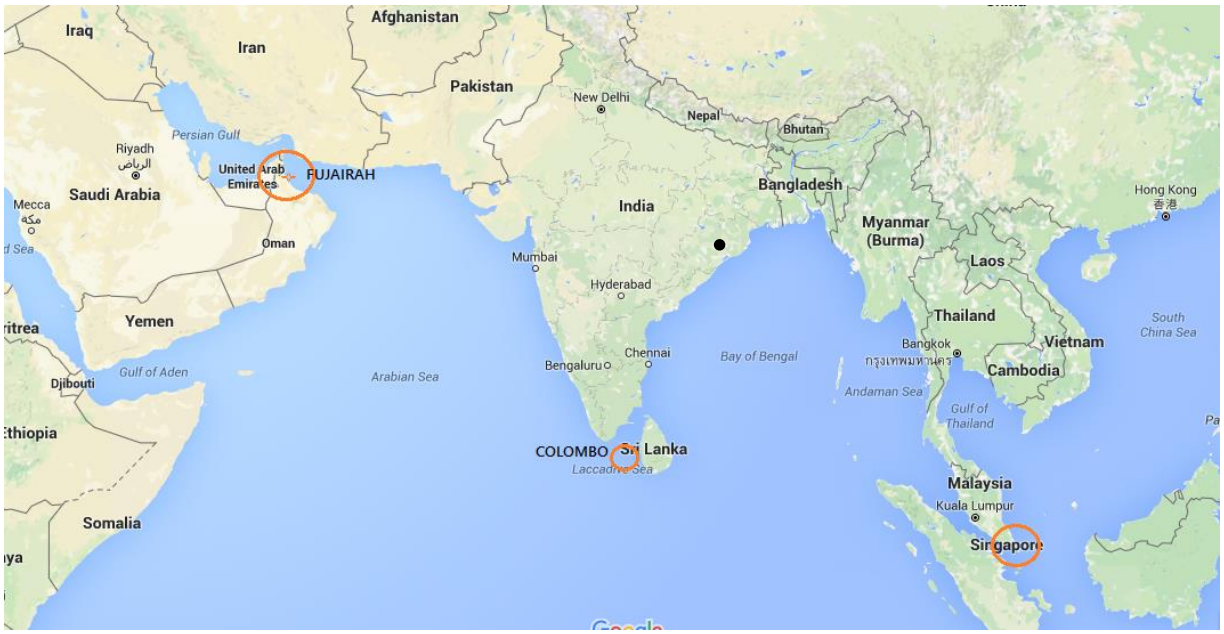


Figure 9.1 Significant Bunker Ports – Singapore and Fujairah

9.1.1.1 Singapore

Geographically, Singapore enjoys a crucial locational advantage as all the vessels sailing from the West to Southeast pass by it making it an ideal stopping point for bunker calls. As of date, Singapore is the busiest and also the leading bunker port in the world with over 581 MT of cargo traffic and over 45 MT of bunker deliveries in a year, which is around one sixth to one seventh of the total quantity of marine fuel sold annually around the world.

The following **Table 9.1** gives the statistics relating to the types and volumes of bunker supplied at Singapore during the past five years.

Table 9.1 Singapore Bunker Sales (in '000 T)

Year	Total	MGO	MDO	MFO 180 cst	MFO 380 cst	MFO 500 cst	LSMGO	LSFO 180 cst	LSFO 380 cst	LSFO 500 cst	Others
2011	43,153.6	1,569.6	6.6	1,641.0	34,122.1	5,577.7	N.A.	N.A.	N.A.	N.A.	236.6
2012	42,685.4	1,454.2	2.2	1,247.0	33,685.5	6,225.4	N.A.	N.A.	N.A.	N.A.	71.1
2013	42,682.2	1,182.9	2.0	950.2	32,070.2	7,661.5	190.9	1.8	541.1	15.0	66.5
2014	42,416.8	1,023.8	1.9	747.6	31,812.7	8,106.0	287.4	2.0	412.6	4.9	18.0
2015	45,155.5	936.2	1.5	673.4	34,106.8	8,599.7	784.4	0.5	23.7	0.2	29.2

While there is a steady demand for bunkers, there should be a corresponding steady supply. Singapore is home to an impressive cluster of refineries including Shell, Mobil and Singapore Refining Company. With refining capacity totalling almost 1.4 million barrels per day, Singapore generally has plenty of availability, keeping prices down and making it the cheapest bunker port in Southeast Asia.

There are over 100 bunker suppliers/traders operating from Singapore. There are about 230 bunker tankers with sizes ranging from a minimum 290 T to a maximum 6,500 T serving the bunker trade.

In order to enhance the quality assurance, Singapore Port has put into effect a standard bunkering procedure, setting out a minimum standard of bunker delivery. Bunker receiving ships and bunker tankers are required to follow this procedure. Otherwise, chances of a claim recovery can be difficult in cases of dispute. The Singapore Bunkering Procedure was a world-first when it was introduced in 1992.

The Singapore Standard CP 60 (Code of Practice for bunkering by Bunker barges/ tankers) applies when bunkers are being delivered by bunker tankers to ships and lays down the minimum documentation and equipment requirements and, verification during a bunkering operation. It covers pre-delivery, actual delivery and post-delivery documentation. All bunker suppliers and bunker craft operators are licensed by the Maritime Authority of Singapore (MPA) to comply with the SS CP 60 as a licensing requirement. There is another Standard SS CP 77 (Code of Practice for Bunker Surveying). This sets out the procedures and the documentation and equipment requirements of a bunkering operation between a bunker barge/tanker and a vessel. It covers pre-delivery and post-delivery checks and documentation.

9.1.1.2 Fujairah

Fujairah is the second largest bunkering port in the world next to Singapore with bunker traffic of about 25 MT during 2015.

This bunker market came into prominence as a result of the Iran/Iraq war in the 1980's. Full scale operations started in 1983. The area known as the 'Fujairah bunker market' encompasses the three ports of Khor Fakkan, Kalba and Fujairah itself, all located on the east coast of the UAE

Fujairah's biggest advantage is its location. Fujairah and the neighbouring port of Khor Fakkan are located about 70 nm from the Straits of Hormuz. This strategic location attracts ships traders from the Persian Gulf to anchor here for provisions, bunkers, repair and technical support, spares and stores before proceeding on long voyages.

Fujairah boasts good, open, safe anchorages with ample vessel space. Favourable weather conditions and good strategic location for crew changes and maintenance work at facilities such as Dubai dry docks also attract vessels. So important is bunkering in the region that the anchorages off Fujairah are demarcated for different purposes. There is a particular area called 'Bravo' anchorage used solely for normal bunkering operations.

Fujairah Offshore Anchorage Area (FOAA), located 10 nm offshore, has earned an international reputation establishing Fujairah as one of the largest bunkering and marine logistics hub. There are about 40 bunker suppliers and a fleet of more than 100 independently owned and professionally operated Supply vessels based in the port service the Port and the Anchorage. The average stem size is higher than at other major bunkering ports due to the large number of bigger vessels like VLCCs, tankers and gas carriers bunkering here. The average pumping rate is in the range of 300 to 350 TPH except during winter when it is lower.

At least 95% of bunkers are delivered offshore. Bunker barges vary in size from 40,000 DWT to 2,000 DWT. There is a great flexibility for time and location of bunker delivery. All bunker barges are self-propelled. Bunkering in international waters is beyond control.

There is no bunker fuel indigenously available at Fujairah and Khor Fakkan. Most suppliers import from refineries in Bahrain, Saudi Arabia and Iran – often straight run material. All suppliers in this market have to import product and store it afloat or ashore. This adds to the costs of running a bunker operation in this market, and also demands careful forward planning by the operators if continuity of supplies is to be achieved.

However, the International Petroleum Investment Company (IPIC) refinery with a processing capacity of about 200,000 bpd is expected to be on stream in 2016. This will further boost the bunker sales at Fujairah.

9.1.2 Indian Scenario in Bunkering

It is ironical that India, lying in between the two large bunker markets of Singapore and Fujairah, is yet to establish itself as a recognised bunkering destination. It has to be noticed that India is a major supplier of bunker cargoes to Singapore. It has to realise its potential as a major bunker supplier.

Administrative problems coupled with uncompetitive prices compared to direct rivals at Fujairah and Singapore have often been blamed for the relatively slow progress made by the country's bunker sector. In this context, reference is invited to a presentation made by Indian Oil Corporation Ltd. at an international conference in Colombo during September, 2015 on "Indian Bunker Sector Developments". In this they have listed out the negative points restricting the growth of bunker traffic in India. These are presented hereunder:

- India lies in between the two strong bunkering hubs of Singapore & Fujairah
- Different tax structure at different states. Vat is applicable on Bunker supply to FG vessels being deemed export. Exemption / reductions obtained from few States after prolonged follow ups.
- Distributed potential in India leading to multiple expenditure for creating facilities for much smaller volumes as against concentric potential at Singapore & Fujairah
- Desired grades of bunker fuel are not available at all ports
- Port specific restrictions/regulations on bunkering beyond daylight, physical supervision and lengthy documentations
- Barges are not allowed to be used as floating storage of bonded bunker fuel
- Bunkering at OPL (Off Port Limits) is not permitted by ports. At OPL vessels need not come inside the port and save on port charges and time.
- Loading of bonded bunker is allowed against specific vessels with specific approval for which nominations are received.

In another presentation made by Matrix Bharat (a Joint venture between BPCL and Matrix Marine Fuels Pet Ltd., a subsidiary of Mabanaft, a leading oil trading company based at Germany) at Delhi on India Maritime Day in February, 2014, the way forward for bunkering in India has been indicated viz.

- Dedicated Barge loading Jetty at ports
- Barges with higher capacity and better pumping rate.
- Ex pipe bunker delivery facilities at ports
- Proactive steps by port authorities for setting up bunkering facilities and reduced port charges and wharfages.
- Tax concessions and duty draw backs on bonded bunker deliveries
- Simplified customs & excise formalities
- Floating storage for quicker delivery
- Formation of Bunker Association

In recent times, the situation has improved. As an important step, the tax structure has been modified favourably by the states. The applicable taxes in the various states for bunkering are brought out in the following **Table 9.2**.

Table 9.2 All India Tax Applicability on Bunkers (%)

State	Port	Foreign		Coastal	
		IFO	MGO	IFO	MGO
West Bengal	Kolkata / Haldia	1.5	17	5	17
Odisha	Dhamra / Paradip	5	23	13.5	23
Andhra Pradesh	Visakhapatnam / Gangavaram / Kakinada / Krishnapatnam	4	22.25	4	22.25
Tamil Nadu	Kattupalli / Ennore / Chennai / Karaikal / Tuticorin	4	4	5	21.43
Kerala	Cochin	0.5	0.51	5	24.52
Karnataka	New Mangalore / Karwar	1	1	14.5	16.65
Goa	Mormugao	1	4	12.5	22
Maharashtra	Mumbai	0	0	12.5	24
	Jawaharlal Nehru				21
Gujarat	Kandla / Mundra / Pipavav / Hazira / Dahej	5	24.63	5	24.63

[Courtesy: IOCL presentation on “Indian Bunker Sector Developments”.at Colombo]

Note: Andhra Pradesh has reduced the taxes on bunkers to foreign vessels from 14% to 4% effective February, 2016.

As a result, the prices of bunkers at Indian Ports have come down with shrinking differential as compared to Singapore & Fujairah. This is brought out in the following **Table 9.3**, as presented by IOCL in the Colombo Conference.

Table 9.3 Bunker Prices at Indian Ports

INDIAN OIL

	As on 23.09.2015	Current price in USD		
	Major Ports	IFO180cst	IFO380cst	MGO
1	Haldia	276.34	239.61	528.39
2	Paradeep	294.23	0	518.49
3	Vishakapatnam	273.55	0	517.78
4	Ennore	286.21	0	516.77
5	Chennai			
6	Tuticorin	286.75	0	524.11
7	Cochin	266.39	235.986	512.68
8	Mangalore	264.09	0	509.97
9	Mormugao	267.03	0	516.84
10	JNPT	263.53	0	509.81
11	Mumbai	263.53	0	509.81
12	Kandla	265.12	0	507.31

Exchange rate wef 17.09.15 INR 66.90 per USD

IFO380cst	As on 23.09.2015 in USD
Singapore	229.5
Colombo	293.5
Fujairah	233.5

With the improving situation, renowned foreign players are entering the Indian bunkering market. Earlier most of the bunkering was done by the oil PSUs viz. IOCL, HPCL and BPCL.

In 2008 Chemoil Energy Ltd., a Singapore headquartered natural resources company engaged in trading marine fuel, aviation fuel and land - based diesel products, joined hands with Adani for form a JV "Chemoil Adani Pte Ltd." (registered in Singapore) for supplying bunker fuel to vessels in Mundra and other ports. In October, 2015 they sold their entire equity to Adani leaving them the whole ownership. The company was renamed "Adani Bunkering Pte. Ltd.". It imports and sells bunkers IFO 380, IFO 180 & MGO as per specifications of ISO 8217: 2005 (Sulphur Max 3.5%) and supplies are made in compliance with MARPOL Annex VI with competitive prices. They have reserved 90,000 T of tankage at their Mundra terminal exclusively for bunkering. They supply bunkers to Gujarat Ports from Mundra and at other ports supplies are made in association with PSU oil companies. They have a fleet of 2 × 3000 T; 1 × 1350 T; 1 × 500 T; 1 × 450 T; & 1 × 400 T. During 2014-15, they are understood to have supplied 1.2 MT of bunkers.

In the same year 2008, Matrix Marine Fuels Pet Ltd.,(MXB) a subsidiary of Mabanaft, a leading trading company based at Germany, formed a bunkering JV in Singapore with BPCL named "Matrix Bharat Marine Services Pte Ltd.". The JV is engaged in retail bunkering as physical supplier of bunker fuel at Mumbai, JNPT, Kochi, Colombo, Fujairah and Singapore. MXB operates with 11 barges with capacity ranging from 300 T to 1500 T at Mumbai and Kochi. There is no blending of bunker fuel as it is directly sourced from the refineries. While at Mumbai, JNPT and Kochi supplies are from their own source, at other ports supplies are arranged through other physical suppliers/National oil companies.

As at present there are about 50 bunker fuel suppliers/barge operators serving the Indian bunker market.

9.1.3 Bunkering at Chennai Port

At Chennai Port bunkering is done by IOCL, HPCL & IMC. The bunker traffic for the past 7 years is presented in the **Table 9.4**.

Table 9.4 Bunker Traffic at Chennai Port

S. No.	Year	Bunker Volume	Total Vessel Calls
1.	2008 - 09	1,20,258	2,078
2.	2009 - 10	1,74,835	2,131
3.	2010 - 11	1,27,127	2,181
4.	2011 - 12	82,164	2,043
5.	2012 - 13	62,259	1,928
6.	2013 - 14	62,528	1,756
7.	2014 - 15	48,059	1,741

These volumes include the bunkers supplied to vessels of Navy and Coast Guard.

IOCL has a tankage at the Foreshore Terminal. It has the following storage capacity viz., IFO 180 - 19,020 T; IFO 380 - 16,325 T and MGO - 17,400 T. The supplies are made through barges. They have presently two barges – one for white oil and the other for black oil.

The bunker barges are handled through a small jetty at the root of the northern breakwater of Bharathi Dock and west of BD II. This is closer to the IOCL Foreshore Terminal and connected to it by 2 × 10" lines for FO and 1 × 8" line for HSD. HPCL and IMC have each 1 × 8" line for FO. The layout of the barge jetty is shown in **Figure 9.2** and the satellite picture is shown in **Figure 9.3**.

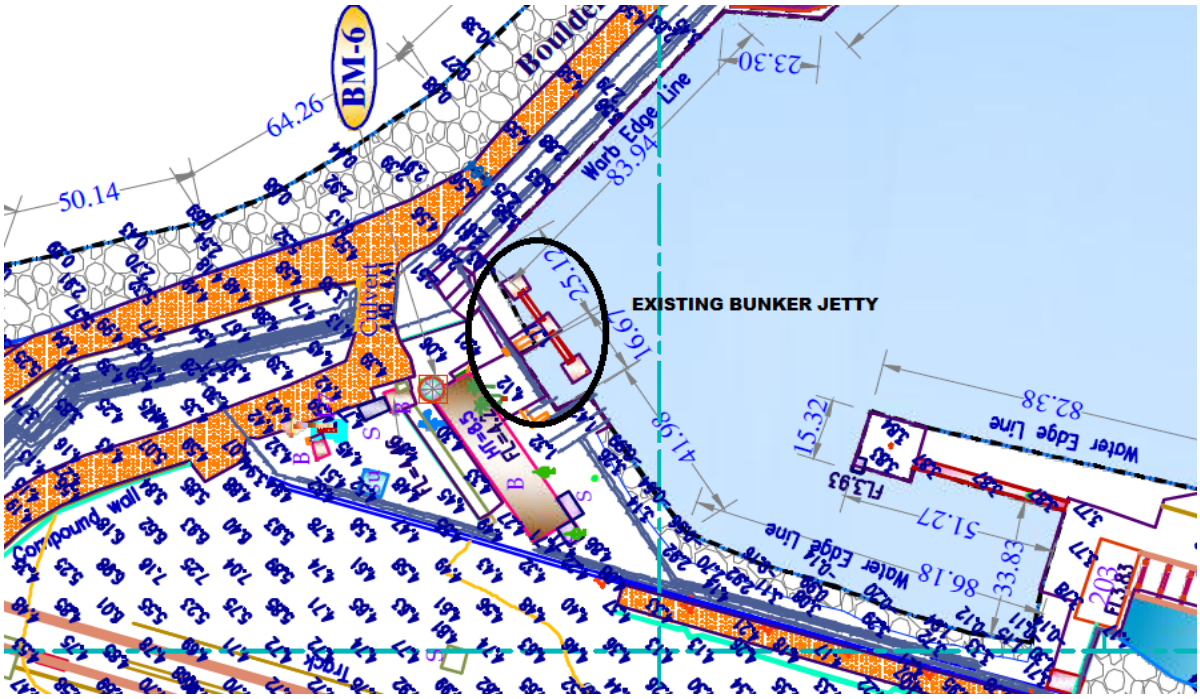


Figure 9.2 Location and Layout of Existing Bunker Jetty

Figure 9.3 Location and Layout of Existing Bunker Jetty

While IOCL supplies Furnace Oil (FO) and High Flash High Speed Diesel (HFHSD) meeting stringent BIS specifications, it also offers the entire range of SERVO brand marine grade lubricants. It has also started supplying Bonded 380 cst FO bunker fuel from Chennai from May 2009 as per ISO 8217:2005 specifications. The price of this product is internationally competitive. These products are available locally through the refinery at Manali of Chennai Petroleum Corporation Ltd., a unit of IOCL.

Last year Chennai Customs Department allowed OPL (Off Port Limits) bunkering through a public notice outlining the procedures for bunker supply at anchorages/outer anchorages.

Along with this, Chennai Port is trying to set up an exclusive bunker terminal which crucial infrastructure was missing all these years. During March 2013, the Port signed a concession agreement with "Chennai Bunkering Terminal Pvt Ltd." a SPV formed by IMC Ltd. to develop a barge handling jetty under PPP mode. The licensee was expected to construct a jetty of 150 m × 15 m east of BD II with shore connection for handling bunker barges and edible oil vessels. But the licensee did not proceed with the project as planned and hence the Port has cancelled the license.

It is now proposed to develop an exclusive and integrated bunker terminal with berthing facilities and reserved land area for setting up bunker storage tanks.

9.1.4 Proposed Bunker Terminal

9.1.4.1 Suggested Framework

It is suggested that the Port can construct the berthing facility on its own instead of passing through the PPP mode. This berthing facility can be used by all the agencies interested in carrying out bunkering business at the Port for berthing their bunker tankers on first-come first- served basis. The Port can also reserve certain land area nearby for interested agencies to set up their storage tanks. The Port can provide ROW for requisite pipelines from the storage tanks to this berth. This will encourage better participation and fair play in the business.

9.1.4.2 Traffic Potential

It can be seen that during 2009 -10, Chennai Port experienced the maximum bunker traffic of about 1.75 lakh T. This was even without the basic infrastructure required. Subsequently, though, the volumes gradually dropped down. Now with the permission for OPL bunkering and with exclusive bunker terminal there is good prospects of the traffic picking up.

Matrix Bharat have indicated the potential for bunkering assuming stem sizes of 800 T for container vessels; 500 T for liquid bulk vessels; 400 T for break bulk and other vessels and 300 T for bulk carriers. The category wise vessel traffic at Chennai Port for the past 5 years is presented in the following **Table 9.5**. Taking the average and applying the stem volumes, the potential is established.

Table 9.5 Chennai Port Vessel Traffic & Bunker Requirements

Vessel Category	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	Avg	Stem	Bunker Need
Dry Bulk carriers	309	223	183	165	175	211	300	63,300
Liquid Bulk carriers	502	507	460	429	427	465	500	2,32,500
Break bulk vessels	500	437	499	430	426	458	400	1,83,200
Container vessels	812	789	786	780	762	786	800	6,28,800
Total	2,123	1,956	1,928	1,804	1,790	1,920		11,07,800

This gives a very optimistic picture of all vessels taking bunkers leading to a total traffic of over 1.0 MTPA. This may not happen. A realistic estimate of certain percentage taking the bunker could be taken – gradually growing from 10% onwards.

On the other hand, IOCL assumes a mean figure of 120 T stem per vessel which gives the possible traffic as 0.23 MTPA. This definitely appear feasible considering the earlier traffic of 1.75 lakh T during 2009-10.

9.1.4.3 Location of the Terminal

It is proposed to locate the berthing facilities east of the existing barge jetty and parallel to the pipeline trestle leading to BD I & BD III. An area of about 2 ha can be made available for interested agencies for setting up their bunker tankage on the reclaimed land at the root of the northern breakwater of Bharathi Dock and east of the CFS. The location of the berthing facility and the area for the tank farm are shown in the following **Figure 9.4**.

Figure 9.4 Locations of the Berthing Facility & Area for Tank Farm

9.1.4.4 Selection of Design Tanker

From the information about the leading bunker suppliers at Indian Ports, Adani has 6 bunker tankers of sizes ranging from 400 T to 3000 T. Matrix Bharat has 11 bunker tankers of size ranging from 300 T to 1500 T. Most of the others have smaller tankers of size in the range of 300 T to 500 T. The sizes of some of the bunker tankers operating at Singapore are given in the **Table 9.6**.

Table 9.6 Size of Some of the Bunker Tankers Operating in Singapore

S. No.	Name of vessel	DWT	LOA (m)	Beam (m)	Draft (m)
1.	Marine Protector	420	30	8.0	3.2
2.	Northeast Progress	620	49	8.3	3.0
3.	Pacific Honour	1,502	73	12.0	
4.	Foresa	1,650	67	13.5	4.0
5.	Marine Priority	1,783	50	12.0	4.0
6.	Marine Promise	2,074	50	12.0	4.0
7.	Crown Fortune	2,984	78	15.0	3.9
8.	Global Duri	3,123	89	13.0	5.7
9.	Marine Matrix	3,865	101	18.0	5.0
10.	Kitek 9	3,911	96	14.0	5.8
11.	Southern Pec 6	4,700	100	15.0	5.5
12.	Sea Swift	4,998	92	15.0	5.6
13.	Pacific Wise	4,999	90	16.0	5.0
14.	Sea Frontier	4,999	104	15.0	4.0

The picture of a typical 1,600 T bunker tanker is given in **Figure 9.5**.

Figure 9.5 A Typical 1,600 T Bunker Tanker

Considering all these aspects, and also taking into account the fact that bunker traffic at Chennai Port is yet to pick up its full potential, it is suggested that the proposed berthing facility be designed to accommodate bunker tankers up to 5,000 T capacity of size LOA :100 m × Beam :15 m × Draft 5.6 m.

9.1.4.5 The Berthing Facility

The location and layout of the berthing facility along with the approach is shown in the **Figure 9.6**.

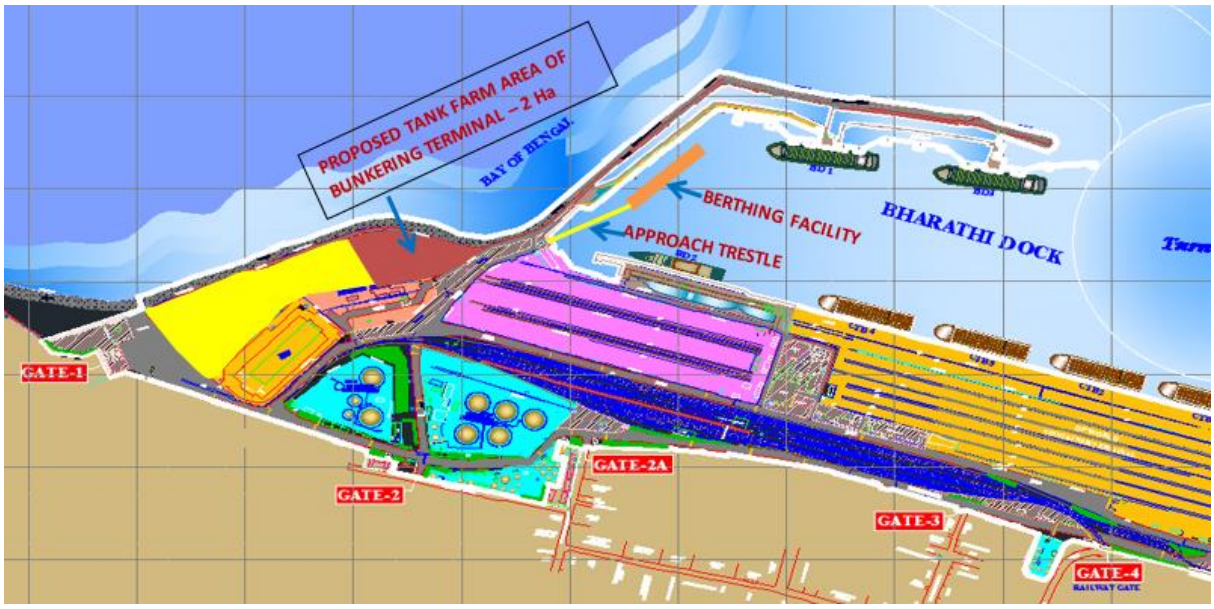


Figure 9.6 Location & Layout of the Bunkering Facility with Approach

The berthing facility will be of an open piled structure with RCC cast–in-situ bored piles. Considering that the bunker tankers will be of a varied size, it is recommended to have a continuous berthing face so that two smaller tankers could be berthed concurrently. The length of the jetty will be 130 m considering the maximum tanker size of 100 m LOA. The structure will be designed to handle tankers of 5,000 DWT. The width of the jetty will be 15 m. The jetty will be provided with 30 T bollards at 15 m intervals and 600 mm super arch rubber fenders, also at 15 m centres. Though the structure will be designed for vessels up to 5.6 m draft, during the initial stages smaller vessels of less than 4 m draft will be operational. Since the available depth at this area is about 5 m no dredging will be required.

The topside facilities on the berthing jetty will just consist of a pipeline manifold with a continuous header with flanges at the centre of the berth and at quarter points so that two smaller tankers side by side and one large tanker could be handled. The transfer will be through rubber hoses only. The incoming pipelines of the various agencies will be linked to this header.

9.1.4.6 Approach Trestle

The berthing jetty will be connected to the shore by an approach trestle of 40 m length. It will have a 5 m wide roadway and a 2.5 m wide pipe rack. This will also be of open piled structure.

9.1.4.7 Area for Tank Farm

It is recommended that an area of about 2 ha. at the reclaimed land at the root of the northern breakwater of Bharathi Dock as shown in **Figure 9.6** be earmarked for location of bunker tank farm by interested agencies. This area could accommodate about 25,000 kL to 30,000 kL tankage with all infrastructures. IOCL has its own tankages at the Foreshore Terminal. This additional area will encourage interested agencies to set up their own tankage and use the berthing facility. This will also facilitate enhancing the bunker traffic at Chennai Port.

9.2 Crude Oil Imports

Chennai Port is presently handling the crude oil imports for the Manali Refinery of Chennai Petroleum Corporation Ltd. Chennai Petroleum Corporation Ltd. (CPCL) has a refinery at Manali with a present refining capacity of 11.1 MTPA consequent to the various debottlenecking initiatives as well as addition of Crude Distillation Units 2 and 3. The refinery imported 10.19 MT of crude during 2013-14 and 10.16 MT during 2014-15. The crude imports are handled through berth BD III in Bharathi Dock of Chennai Port. This berth is designed to handle suezmax tankers up to 150,000 DWT with 16.5 m draft. During 2014-15, out of the 10.16 MT handled, about 80% of the quantity was handled through suezmax tankers with an average parcel size of about 138,000 T.

CPCL had a proposal to increase the refining capacity by another 6 MTPA and for this purpose they considered a SBM terminal off Ennore for handling VLCC's. However, this project has been put on hold for the present.

CPCL is currently laying a new 42" crude oil pipeline from the port to the refinery as the existing 30" pipeline, which was laid during 1969 when the refinery was commissioned, has developed leaks causing safety concerns. CPCL has initiated action the construction work. This pipeline will be laid from the BD III berth in Bharathi Dock of Chennai Port up to the refinery running for a length of about 17 km. The line will be laid along the Ennore Highway and Manali Highway. The relative locations of the refinery, Chennai port crude oil berth and the route of the new 42" pipeline are all shown in the **Figure 9.7**.

Figure 9.7 Route of the New 42" Pipeline

In view of this development, it has been suggested that if a SBM is located south of the earlier location with the feasibility of routing the submarine pipeline in such a way that the landfall point is located near Ernavoor at the junction of Ennore Highway and Manali Highway, this will avoid having a tankfarm at Ennore and laying a 23 km long cross country line within the city limits.

At Ernavoor the submarine pipeline from the SBM could be hooked with new the 42" pipeline leading to the refinery tankage. This SBM will have a double advantage – even with the present traffic, CPCL stand to gain through freight advantage which could be in the range of US $ 3 /T; as and when the refinery capacity expands, this SBM will be able to handle the entire crude imports, which BD III will not be able to handle.

The SBM could be located in water depths of about 32 m and at a distance of about 11 km from the Ernavoor Landfall point. Considering another 8 km from Landfall point to the refinery tankage, the total pumping distance will be about 19 km. However, this falls within the notified Navy Firing Practice Area as marked in the Naval Hydrographic Charts. Chennai Port has already taken this up with the Navy and the Navy is likely to shift their base to the south of the port thus clearing the way for the SBM.

The location of the SBM is shown in the **Figure 9.8**.

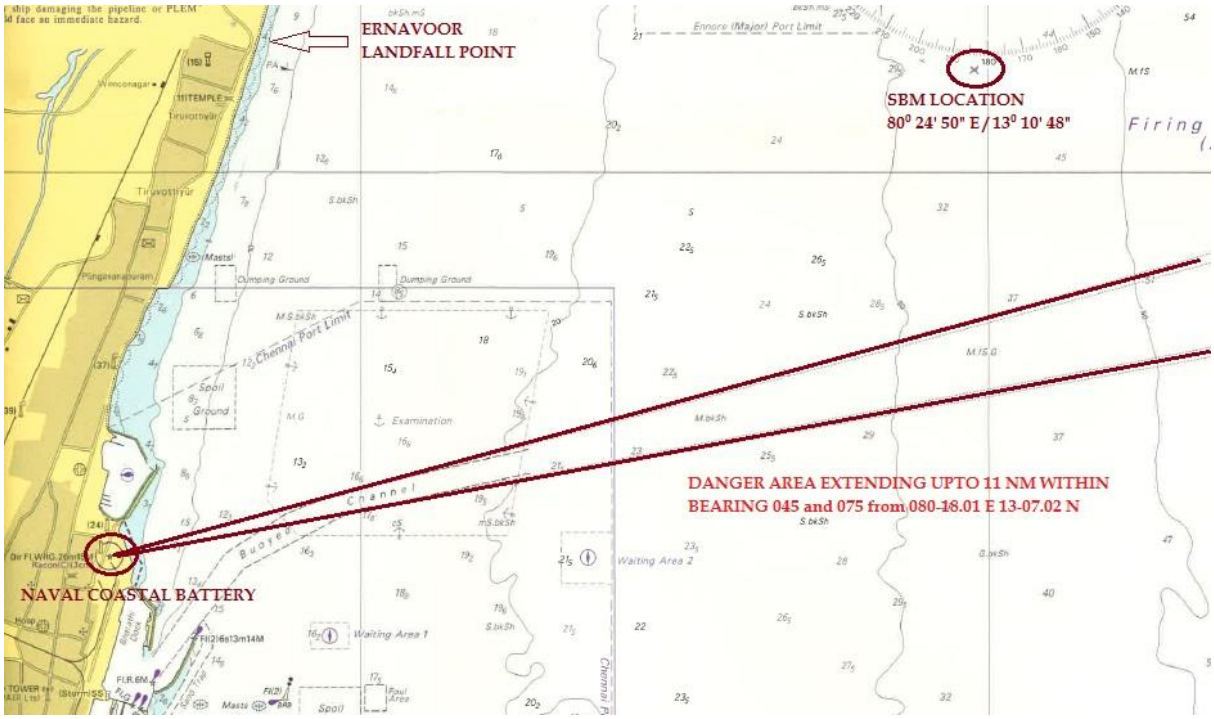


Figure 9.8 Location of the SBM

A technical note was prepared and sent to CPCL which was subsequently discussed between the Port and CPCL. It was then decided that a technical committee comprised of CPCL & ChPT will examine the technical and financial aspects and submit a report for further consideration.

This technical committee has since submitted its report. The summary of their report is as follows:

- Capital cost of the project based on budgetary quotes : Rs. 820 cr. (comprising Rs. 587 cr. for SBM system; Rs. 173 cr. for onshore tankage & accessories; Rs. 60 cr. towards other costs viz. contingencies, statutory fees, financing costs)
- Annual Operating & Maintenance costs Rs. 19 cr.
- Of the total crude imports of 10.5 MTPA, 6.7 MTPA (≈ 70%) will be handled through VLCCs
- The total freight savings per annum works out to Rs. 130 cr.
- With these parameters, the project IRR works out to 8.55%
- Hence this project is not viable and cannot be implemented.

It has to be noted that CPCL had a proposal for enhancing its capacity by 6 MTPA more which is presently put on hold. The “Concept Note on POL sector study under Sagarmala” by MoS/IPA also indicates that there will be an additional crude oil demand of about 72 MTPA in the next 10 years and CPCL would be required to enhance its capacity by 2025. At this stage, the existing facilities will not be able to handle the projected traffic and the setting up of the SBM terminal will become a necessity. The increased traffic will increase the freight savings and consequently the project IRR will increase beyond 15% making the project viable. Hence this SBM project is retained to be considered for 2025 timeline.

Meanwhile, CPCL is exploring a possibility of handling partly loaded VLCCs by utilizing the existing liquid berths as short term measure. This may fulfil in realizing the freight savings to CPCL without incurring any capital cost and without establishing the additional crude storage facilities at the Refinery through sharing crude between nearby refineries having SPM facilities.

9.3 POL Products

Presently, the imports of POL products for marketing purposes is being gradually shifted to Kamarajar Port as the oil companies are setting up their own marketing terminals at Ennore. Hence Chennai Port will be handling only the exports of surplus products.

With the commissioning of the 42” new crude oil line, the discharge rate of tankers will improve resulting in faster turnaround time. This will result in spare capacity in BD III.

If the refinery capacity is increased, the crude oil imports will be shifted to the SBM and the two oil jetties will be able to handle the increased product exports. Hence no additional facility will be needed.

9.4 Edible Oil

The edible oil traffic has been more or less stagnant at 1.0 MTPA. This traffic has been partially taken over by Krishnapatnam. However, by 2025 the traffic is expected to get doubled. It is essential for Chennai Port to streamline the handling of edible oil and provide additional facilities to attract the customers.

There are five customers on the northern side linked to the port, viz. Kaleesuwari Refinery, IMC, ISP, Ruchi and KTV. Their pipelines are linked to BD II, NQ and WQ. As it is unlikely that BD II will be used for either iron ore or coal handling due to environmental issues, the existing berth could be permanently be used for handling of edible oil tankers at one place. Considering the berth length two tankers could be handled simultaneously.

9.5 Steel Products & Other Dry Bulk

The traffic in steel products is about 1.4 MTPA. Steel products are presently handled at WQ berths; JD West berths and at SQ 1. The other dry bulk includes primarily limestone imports and dolomite exports. These cargos are presently handled mostly at JD West berths and to a limited extent at JD East berths.

The berths which handle this cargo are presently not fully equipped with requisite equipment to load/discharge the vessels. The available equipment's are presented in the **Table 9.7**.

Table 9.7 Ship Shore Cargo Handling Equipment

S. No.	Name of the Equipment	Name of the Berth	Operating Capacity
1.	2 no. Mobile Harbour Cranes	JD – 1,3 &5 WQ 1, 2, 3 & 4 Centre Berth & SQ 1 & 2	100 T
2.	4 no. Electric Level Luffing Wharf Cranes of 15 T Capacity of L&T Make	L&T 1 – JD3 L&T 2 – JD1 L&T 3 – WQ2 L&T 4 – WQ1	15 T
3.	15 T Jessop Make Electric Level Luffing Wharf Crane. Crane No J2 and J3	J2 – WQ3 J3 – WQ4	15 T

JD East consists of 655 m length and 123 m wide including the backup area of 15 ha. for the purpose of storage of transit cargo at the terminal. Currently, these berths handle about 5.2 MTPA.

The overall volume of steel handled at the port is expected to grow to 1.9 MTPA by 2020, 2.5 – 2.9 MTPA by 2025 and 3-5.5 MTPA by 2035 and limestone is expected to grow to 1.5 MTPA by 2020, 1.4 MTPA by 2025 and 1.2 MTPA by 2035. To cater to this future traffic, it is suggested for the conversion of JD East into Multi cargo terminal in phased manner. This project shall happen only if the Supreme Court does not allow handling of dusty cargo at the port and as a consequent proposed coal terminal at JD East berth could not be taken up.

The proposed development would involve the following:

- Jetty repair and replacement works with deepening of JD4 and JD 6 berth to 14 m depth below CD
- Procurement of 2 no. Harbour Mobile Cranes (HMC – 100 T capacity with Grab).
- Adequate no. of fork lifts, mobile cranes, pay loaders, Trailers/dumpers to be leased or provided by Stevedore.
- Yard paving, roads, drainage etc.
- Utilities like water, power, lighting, firefighting etc.

The proposed berths would be able to handle 2 to 3 ships simultaneously which could be handled either by ship's gear or by deploying the mobile harbour cranes. As these berths would mainly handle iron and steel products, aluminium ingots, pig iron, fertilizers, sugar etc., the average handling rate between ship to shore transfer shall be around 8,000 TPH. With mechanisation and development of integrated backup space the cargo would be handled more efficiently with faster turnaround of ships. The overall capacity of the berths would improve to about 6.2 MPTA. The overall capital cost of development is estimated as about Rs. 200 crores.

While JD east can cater to handling of proposed traffic for steel and other dry bulk, the possibility of utilising the BD II berth and the backup space for a fully mechanised fertilizer terminal could also be explored in case the fertilizer traffic picks up as a result of improved coastal shipping.

9.6 Containers

The container traffic also has been stagnating at about 1.5 MTEU for the past few years. This is only about 50% of the available capacity. The reasons are primarily due to the problems in evacuation of the containers and the competition from nearby ports. BCG has identified the problem and has suggested a couple of remedial measures.

One is to encourage the operator of CCTPL to increase the yard equipment to balance the dockside operations and the yard operations so as to ensure the smooth flow of containers. There is also a need to provide additional yard space for CCTPL. Since the iron ore terminal has been decommissioned, coal terminal can be developed at BD II in case the Supreme Court allows it. If a Coal Terminal cannot be developed, then the backup area of BD II may be allotted to CCTPL as additional stack yard.

The second is to develop a common railway yard to increase the volume of evacuation by rail to ease the road congestion. This yard could be developed in the southern side of the port where sufficient area is available for laying additional railway sidings.

9.7 Utilisation of Boat Basin and Timber Pond

9.7.1 Existing Details

The Boat basin/Timber pond is a shallow basin located in the southwest end of Ambedkar dock with a combined water spread area of about 60,000 m^2 out of which 13,000 m^2 constitutes timber pond. The depths in Boat basin vary from 4 m to 8 m which suits the navigational needs of port crafts. The Timber pond is much shallower with depths varying up to 4.0 m below chart datum. However, in the present times it is not of any substantial use. It appears to have been created during the first and second decades of last century.

The Boat basin is primarily used for parking of port crafts and for their afloat repairs. There is a slipway meant for underwater repairs of port crafts like tugs. In addition, there are small slipways meant for repair of small launches in a portion of boat basin called DPC yard as also some ramps for beaching of Catamarans. The Timber pond, an extension of boat basin with water spread having even shallower draft, was meant for handling of timber in the olden days. This activity is however not in vogue for the last over 50 years and was more in use as a shelter for small boats. The layout of boat basin follows a very irregular shape and appears as if it was created and developed based on the instincts and needs from time to time in the first half of last century. The layout is shown in the **Figure 9.9**.

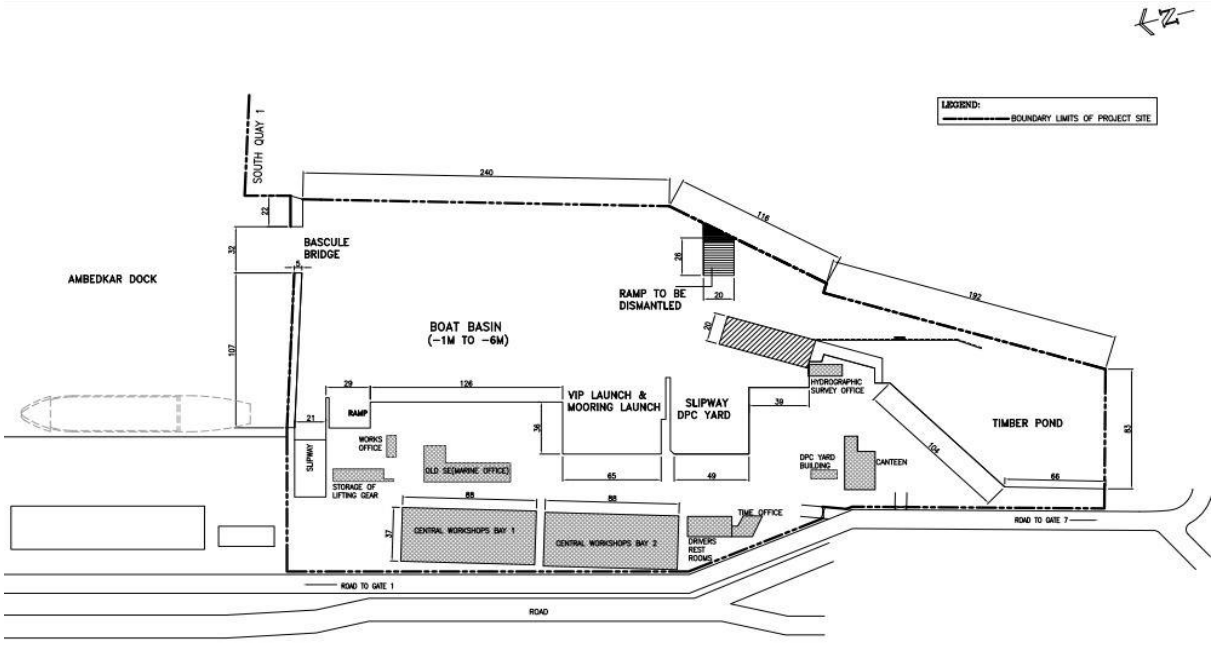


Figure 9.9 Layout of Boat Basin/Timber Pond

There are couple of alternative usages of this prime land and waterfront available to the port. These are discussed below.

9.7.2 Option 1 – Ship Repair Facilities

Chennai port has already got a feasibility report prepared by a consultant for developing ship repair/building facilities at Boat basin/timber pond. Based on the feasibility study, considering the length of the waterfront and the size of the basin area, Ship Repair facility could be developed not only to provide the required service to the shipping industry but also to maximize the Port revenue.

The advantage of the proposed project is the ready-made availability of basic infrastructure like water area, land area, a small slipway, the covered workshop facilities, access road, which could attract a future entrepreneur who can utilise these for start-up phase till the main facilities are built.

Based on the corresponding ship repair numbers and the ship calls to the ports on east coast, the ship repair traffic forecast have been arrived. Based on the above it is estimated that proposed dry docking facilities at Chennai port could share about 25% to 30% of the traffic.

In addition, it may be noted that the Indian vessels are the major sources of revenue for the Colombo dockyard. The main reasons for which the Indian vessels travel to Colombo is congestion at Indian docks as well as prompt repairs available at Colombo free of pre-berthing delays. Approximate number of vessels in the total ship-repair traffic at Colombo was 90, 80, 90, 110 and 80 in the years 2008, 2009, 2010, 2011 and 2012 respectively. It could be well assumed that the proposed dry docking facility could attract about 25% of the traffic diverted to Colombo by way of offering competitive facilities at faster turnaround time at competing rates.

Various alternatives with graving dock options and ship lift options were studied by the consultant, and it could be observed that graving dock option, though could handle larger ship size, and does not offer adequate dry dock days to meet the projected throughput of ship repair and ship building. The ship lift alternative offers the best solution to provide adequate dry and wet berths for ship repair as well as ship building activities duly optimising the limited available backup area. In this alternative, the side transfer arrangement has been proposed instead of longitudinal transfer. This allows for providing total 5 dry berths and also additional area for locating workshop facilities.

The proposed ship repair facilities with Shiplift system are shown in the **Figure 9.10**.

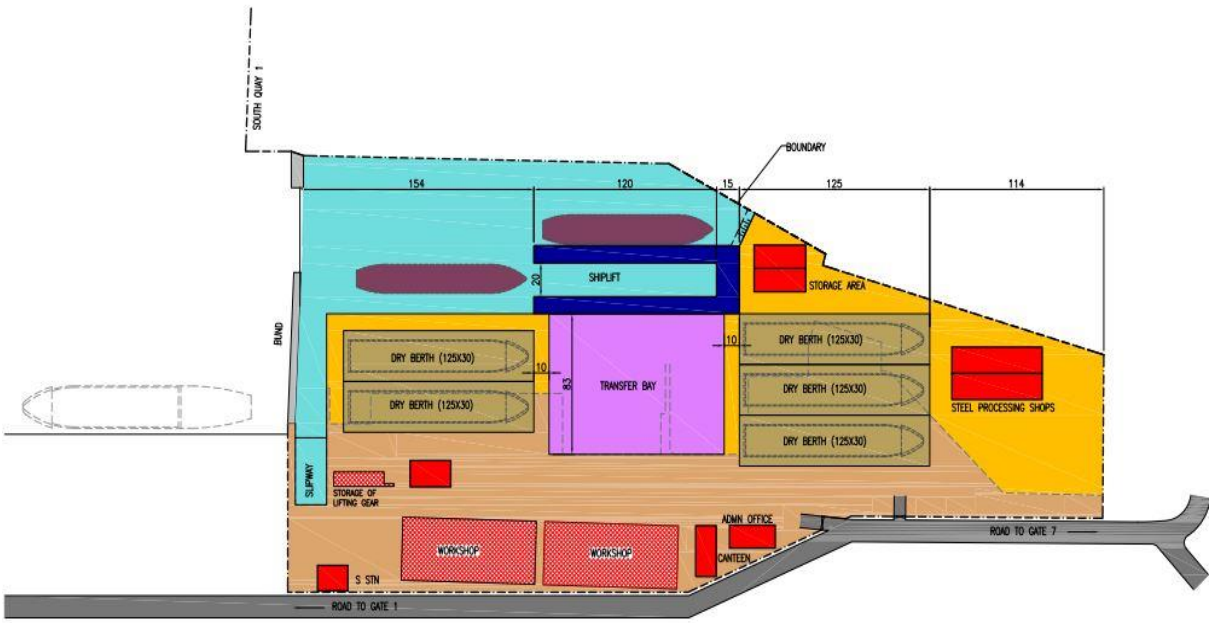


Figure 9.10 Proposed Layout of Boat Basin/Timber Pond – Shiplift

However, this proposal by port did not get a favourable response by the industry due to involvement of very high capital cost and gloom in the ship building industry.

9.7.3 Option 2 – Development of Marina

Considering the location, available water area and nearness to the main city, the Boat Basin and Timber Pond is an ideal location for an urban marina; probably one of the most ideal locations on the whole east coast. Only few issues as below would need to be addressed:

1. The port is not a clean environment and yachtsmen do not like having their yachts covered in grime. However, a properly managed marina will have mechanisms in place to minimise this negative aspect.
2. This area is inside the port security zone. This situation is unacceptable for a marina which, by definition, implies leisure use and visits by family and friends. The obvious solution is to move the ISPS line such that the west side of the Boat Basin and Timber Pond and their onshore areas are no longer subject to this regime. There would be no need to affect the land on the east side of the Basin & Pond because yachtsmen would not need to access that side.
3. Boats would still have to pass through the port's ISPS waters when moving to and from the marina but this should not be a problem because it is a situation that occurs in hundreds of ports worldwide, and anyway such boats will be under visual and radar observation throughout by the port control tower.

To develop this into an international class marina and waterfront, the land on west side has to be suitably planned for:

- Modern yacht club
- Boating-related commercial retail premises (e.g. chandlers, sea school, boat sales, and cafe).
- A boatyard for servicing the yachts.
- Hotels / Restaurants
- Adequate car parking in support of the foregoing
- Extensive landscaping so as to create a pleasant environment.

Figure 9.11 Proposed Layout of Marina at Timber Pond / Boat Basin

9.8 Development of Naval Berth North of Bharathi Dock

There is a requirement from India Navy to get additional berthing and repair facilities for their vessels. It is proposed that an outer harbour to the Chennai port could be developed. The Navy berth can be developed in the shelter of new breakwater extending northward from the existing eastern breakwater of Bharathi Dock for a length of 700 m with a 140 m long protective arm at the northern tip. Naval berth of 550 m length is proposed with backup area of 100 m width developed between the berth and breakwater by reclamation.

The indicative layout plan of the Navy Berth is as shown in **Figure 9.12**.

Figure 9.12 Indicative Layout Plan for Development of Navy Berth north of Bharati Dock

The overall layout can be further refined once the explicit requirements from Navy are known.

10.0 SHELF OF NEW PROJECTS AND PHASING

As part of the Chennai 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 below in **Table 10.1**.

Table 10.1 Ongoing Projects

S. No.	Project Name	Capacity Addition (MTPA)	Investment Required (INR in Crores)	Mode of Implementation
1.	Laying of new railway track at west of western yard I and laying paving block loading Platform	-	13	Port's Funds
2.	Development of Coastal Terminal	1.1	80	Port's funds

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 (INR in Crores)	Mode of Implementation
1.	Development of Bunker Berth at Bharathi Dock	1.0	44	Port's funds
2.	Development of Dry Dock at Timber Pond/Boat basin or Development of Marina	-	500	PPP
3.	Strengthening of JD 4 & 6 berths	-	10	Port's funds
4.	Development of Paved Storage Yards at Chennai Port	-	54	Port's funds

10.3 Projects to be completed by Year 2025

The details of the projects which are envisaged to be completed by year 2025 are given in **Table 10.3**.

Table 10.3 Projects to be completed by Year 2025

S. No.	Project Name	Capacity Addition (MTPA)	Investment Required (INR in Crores)	Mode of Implementation
1.	Conversion of JD East into Multi cargo Berth	1.0	110	PPP
2.	Development of BD II back- up area for Additional Container Storage or Developing BD II berth and backup space as fully mechanised Fertilizer terminal	2.0	100	PPP
3.	SBM Terminal at Chennai	10.0	600	PPP

Appendix 1 - **BCG Benchmarking Study for Chennai Port Trust**

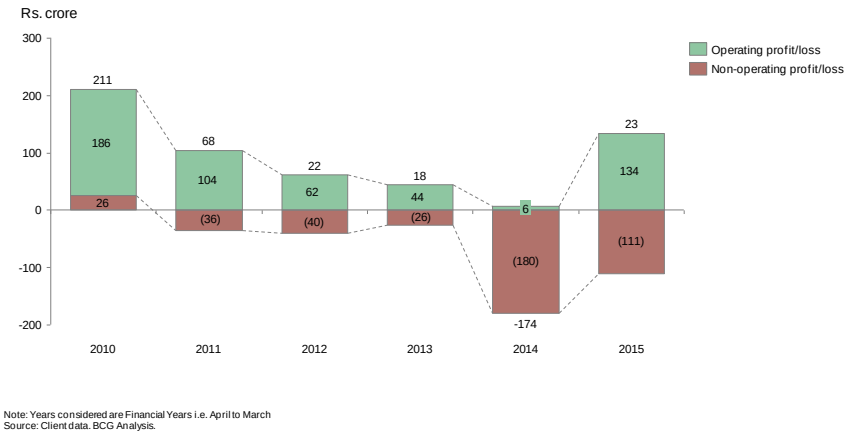
5 Chennai Port Deep-dive

5.1 Port overview

One of the oldest ports in the country, the Chennai port is a legacy port located on the East Coast in Tamil Nadu, India. The Chennai port has been officially operational since 1881, though maritime trade began much earlier in 1639 on the undeveloped shore. Most of the berths are owned and operated by the port- POL berths (BD1 and BD3); general and liquid bulk (NQ); fertilizer and dry bulk (JD1 to JD6); general, RO-RO, liquid and passenger berths (WQ1 to WQ4); only the container berths are on concession to private players PSA and DPW.

Figure 143: Berths and container terminals at Chennai port

Of late, profitability has been a major challenge for the Chennai port. Incurring losses since 2011, the Chennai port suffered significant losses in 2014, amounting to more than Rs. 170 crores., However, there have been signs of recovery with the port turning profitable in 2015.



Note: Years considered are Financial Years i.e. April to March
Source: Client data, BCG Analysis.

Figure 144: Profitability trend of Chennai port

Chennai port's operational expenditure (Opex) has increased by 1% in spite of fall in volumes. The increase in Opex has mostly been driven by the increase in salary and wage expenses. Compared to most other major ports, Chennai port has been able to control increase in operating expenditure.

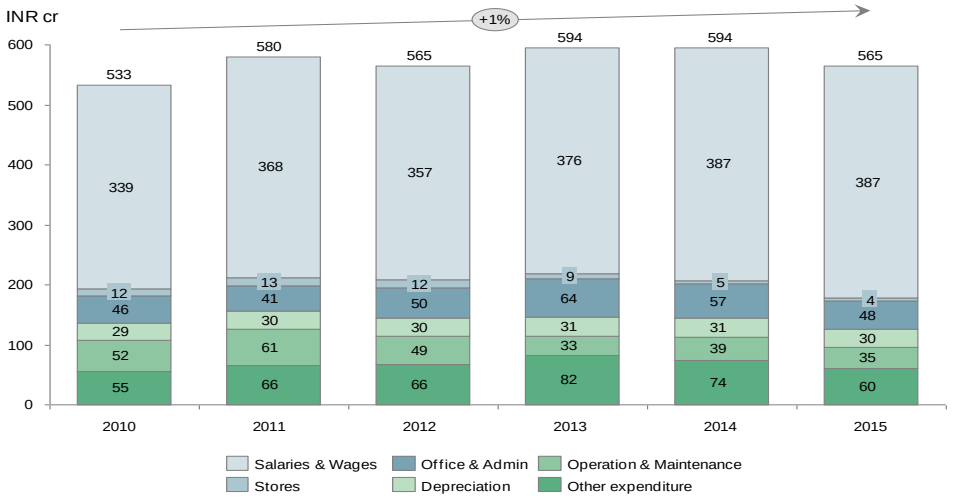


Figure 145: Operational expense trend of Chennai port

The decline in traffic volume has been driven by the disappearance of iron ore and coal. Iron ore export was banned in 2012, while coal was moved out of the city to Ennore because of environmental concerns in 2013. POL & container cargo has also remained flat. As a result the overall traffic volume in the port has declined.

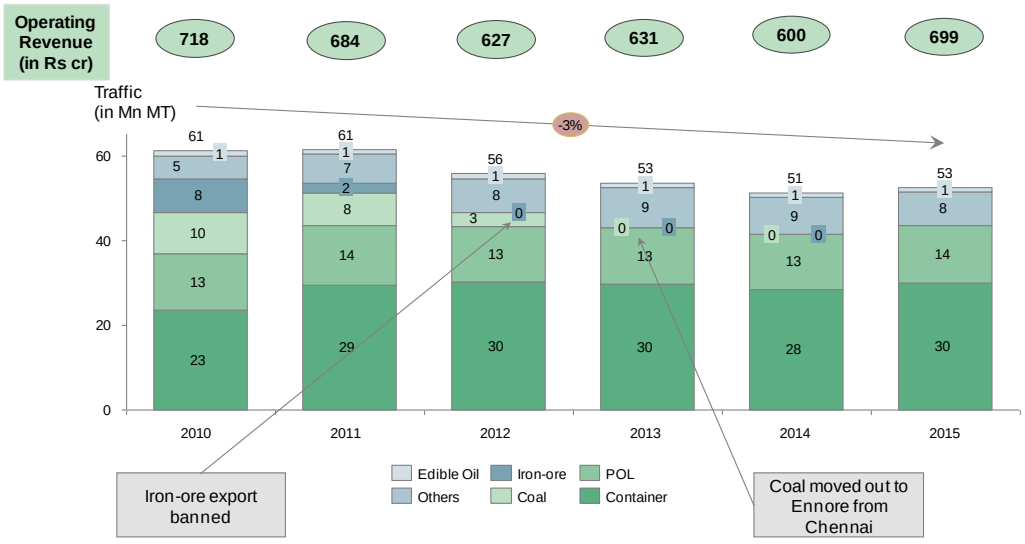


Figure 146: Volume and revenue trends of Chennai port

After shifting coal from the Chennai port in 2013, Ennore and VOC have captured the lion's share of Tamil Nadu's overall growth due to the surge in demand for coal as a result of newly commissioned thermal power plants.

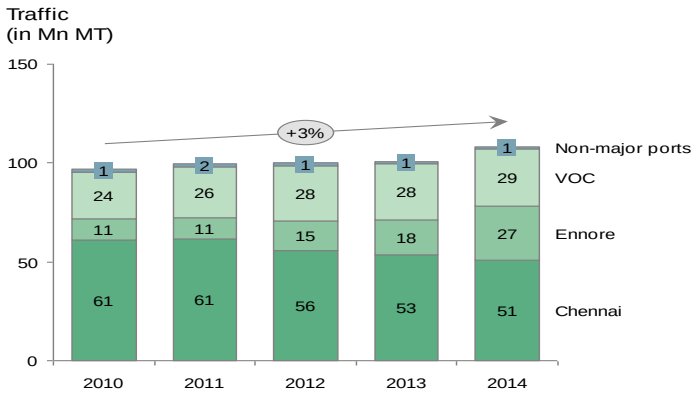


Figure 147: Port-wise traffic trend of the hinterland

A closer look at the traffic shows the key volume-driving commodity in the hinterland to be coal. POL and container cargo have largely remained flat, even for VOC and Ennore. Volume decline for Chennai hence has been inevitable as as it cannot handle coal anymore.

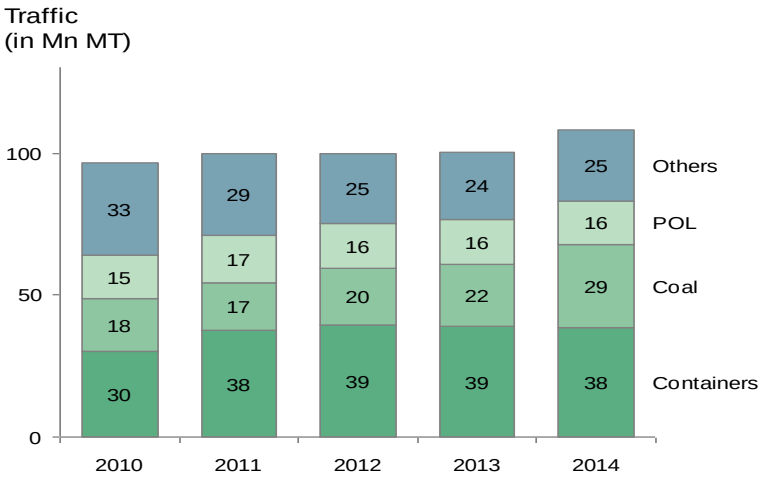
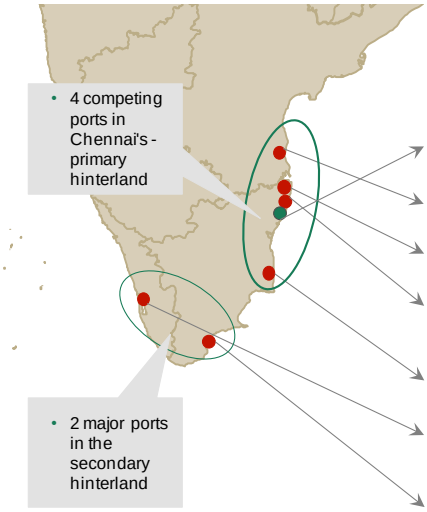


Figure 148: Commodity-wise volume trend of the hinterland

5.2 Key findings and initiatives from deep-dive

Over the last two decades, new ports have emerged around the Chennai port. The major competing ports are Krishnapatnam with 40 MMT traffic volume; Katupalli, which despite low volumes has high potential and has been will potentially be taken over by the Adani Group; Ennore, with approximately 30 MMT traffic volume; and also the Karaikal port in Puducherry. Competitors from the secondary hinterland are the 2 major ports of Cochin and VOC.

It will be critical for Chennai to match the competing ports in terms of productivity and cost efficiency to retain its market share.



Port	Traffic vol. (MMT)	Major commodities moving out from Chennai	Draft (m)	Competitive advantage over Chennai
Chennai	~53	NA	14.5	NA
Krishnapatnam	~40	Container, edible oil	18.5	• Low congestion • Proximity to & edible oil players
Katupalli	~0.1	Container	14	-
Ennore	~30	POL, Coal, Container (planned)	13.5	• Proximity to Chennai's hinterland • Low congestion
Karaikal	~7	Edible oil, food grain	15.5	• Low tax regime
Cochin	~20	Container	14.5	• Proximity to Kerala hinterland
VOC	~30	Container	12.8	• Proximity to Colombo • Low congestion

Source: BCG Analysis

Figure 149: Competition from other hinterland ports

Container traffic across both terminals accounts for almost 40% traffic volumes. The second biggest commodity is POL—both crude and products—amounting to 28% volume, and the third important commodity is edible oil.

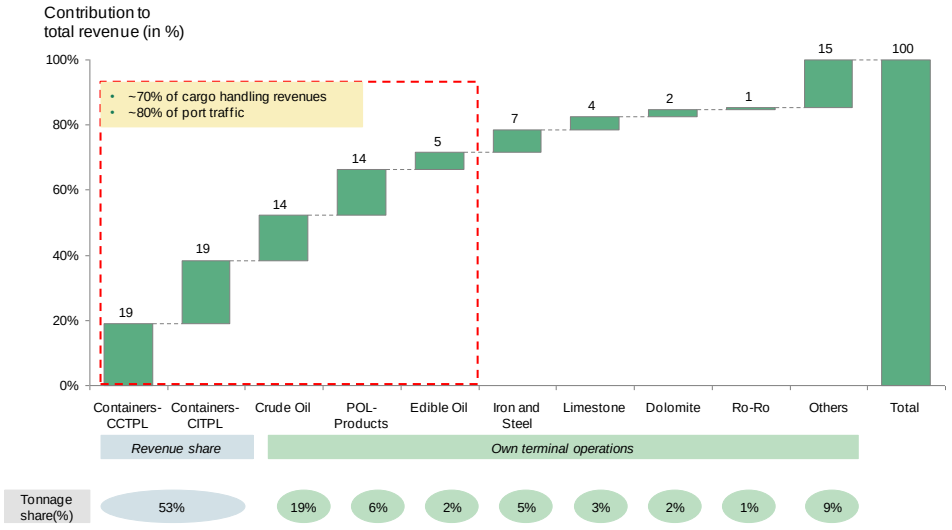


Figure 150: Key commodities handled by Chennai port

5.2.1 Containers

Congestion is the major bottleneck for the Chennai port. Though the berth occupancy for the port is ~50%, the turnaround time for trucks is extremely high. This results in higher logistics cost for the customers using Chennai port for shipping of goods. The higher TAT for truck implies the truck operators charge higher freight rates as seen in the following figure; additionally, the working capital days for the customers also increase.

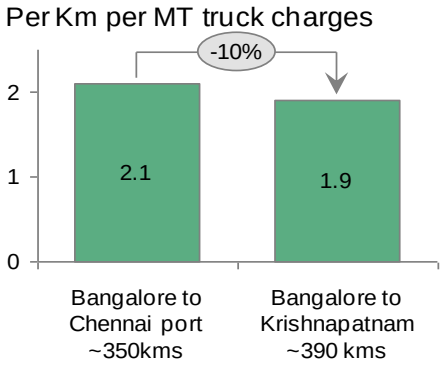


Figure 151: Truck rates charged for Chennai port compared to other ports

Chennai port is located in the city of Chennai. The city administration has barred movement of trailers through the city roads. Only one approach road is available to the port; all trailers, including trailers moving to the CFS in South Chennai, move northward from the port through this road. The approach road itself has multiple congestion points, including the single lane road stretch of ~1km from the port gate. This road also handles large volumes of city traffic. On the other hand, Ennore port, which is located ~20 kms from the Chennai port outside the city, has no such evacuation issues. It has a 4-lane approach road that handles low volume of city traffic, and is located close to the main cluster of CFS in the north of the city. As a result, Ennore will emerge as a strong alternative to the Chennai port once the former comes up with the planned container terminal.

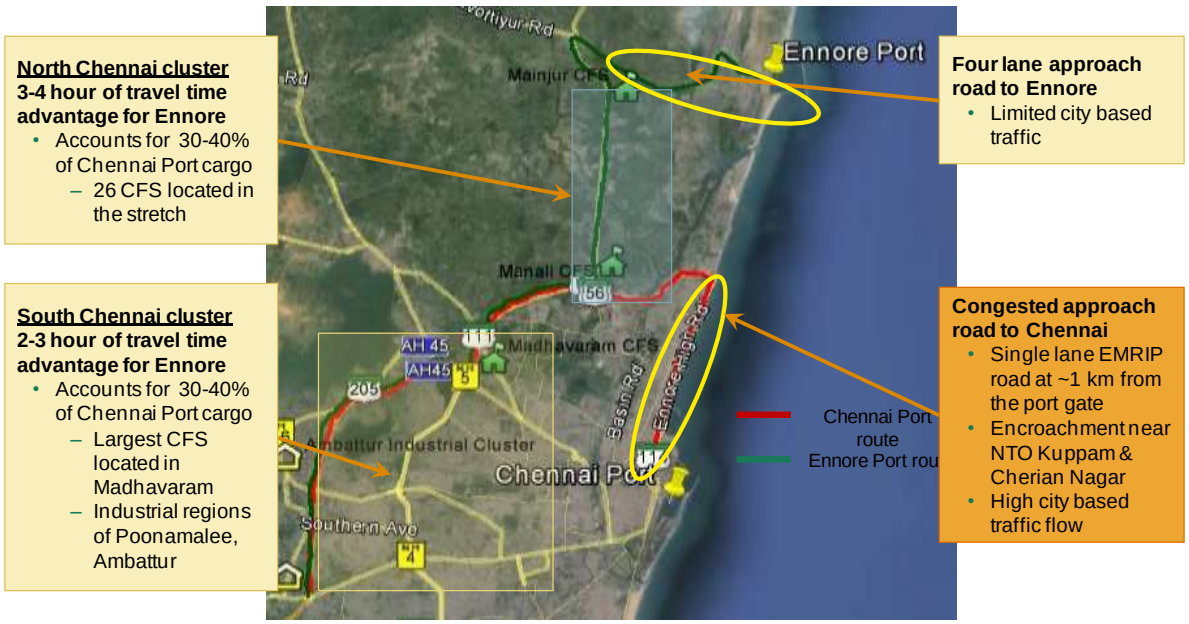


Figure 152: Approach roads to Chennai and Ennore ports

Adani has started developing a 0.7 Mn TEU container terminal at Ennore, expected to be operational by 2016. This capacity will further be expanded by 1.6 Mn TEU in the next 3-4 years. It is likely that Chennai will lose 0.35-0.7 Mn TEU of the current container traffic to Ennore. Losing traffic to Ennore can result in a potential revenue loss of ~Rs. 90 Cr, considering the revenue share at both terminals and Chennai port's stake in Ennore.

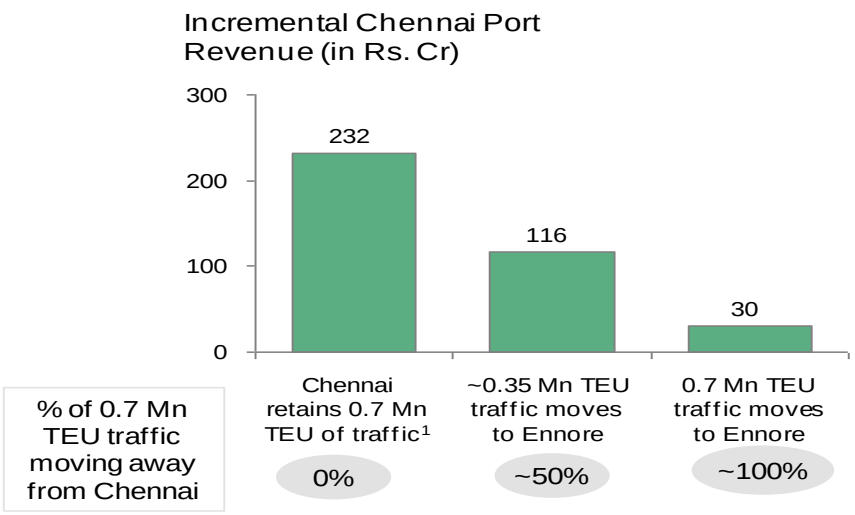
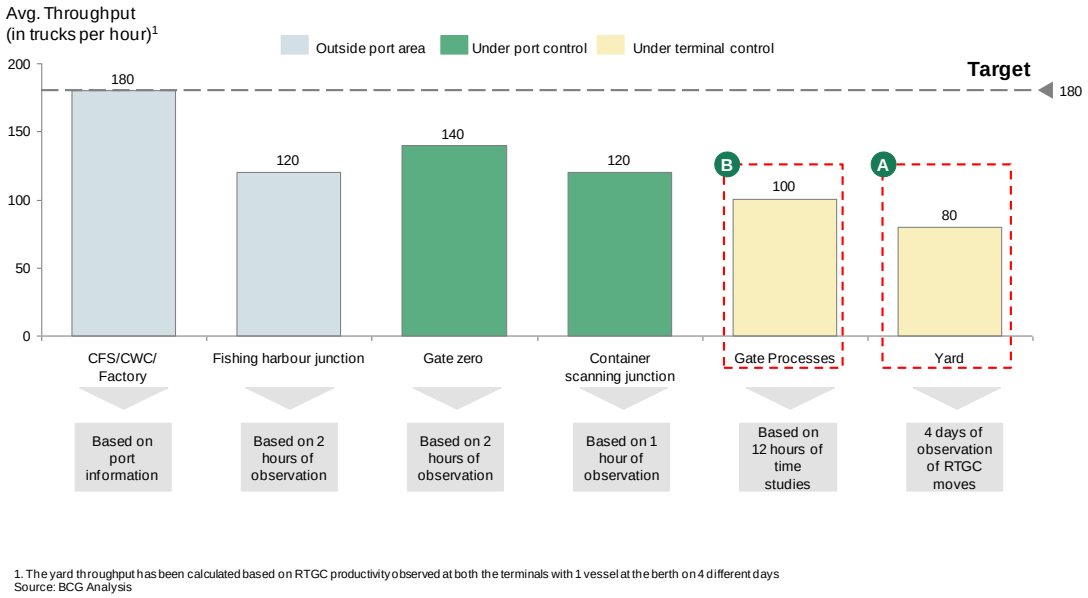


Figure 153: Scenario on Chennai losing container traffic to Ennore

As part of the deep-dive study, trailer movements in the port were studied in depth. The following figure describes the route followed by trailers moving in and out of the port.

Figure 154: Passageway for trucks in Chennai port

Congestion leads to long truck queues at multiple locations in and around the port. It should be noted that truck queues are observed only for the incoming trailers (export trailers). To identify the main points of constraint, a detailed trailer throughput study was done for incoming trailers at all potential constraint points. The following figure summarizes the outcome of the throughput study. All the CFS combined today can send up to 180 trailers/hr. This has been considered the target throughput that the port needs to match to ensure no congestion takes place.



1. The yard throughput has been calculated based on RTGC productivity observed at both the terminals with 1 vessel at the berth on 4 different days
Source: BCG Analysis

Figure 155: Truck throughput analysis at key congestion points

5.2.1.1 Yard Analysis

5.2.1.1.1 Initiative: CHPT 1.1 Monitor and incentivize yard productivity of private terminals

Initiative Overview

Evacuation is a major challenge for the Chennai port with large queues of trailers from the container terminal gates. The throughput analysis of trailers from CFS to the container terminals (CCTPL and CITPL), clearly point to yard productivity as the key constraint on evacuation at the Chennai port. Yards of the two terminals process ~80 trailers per hour on an average, which is often lower than the trailer inflow rate. This results in trailers queuing up at the terminal gates. Improving yard productivity is critical for solving the congestion issue at the port.

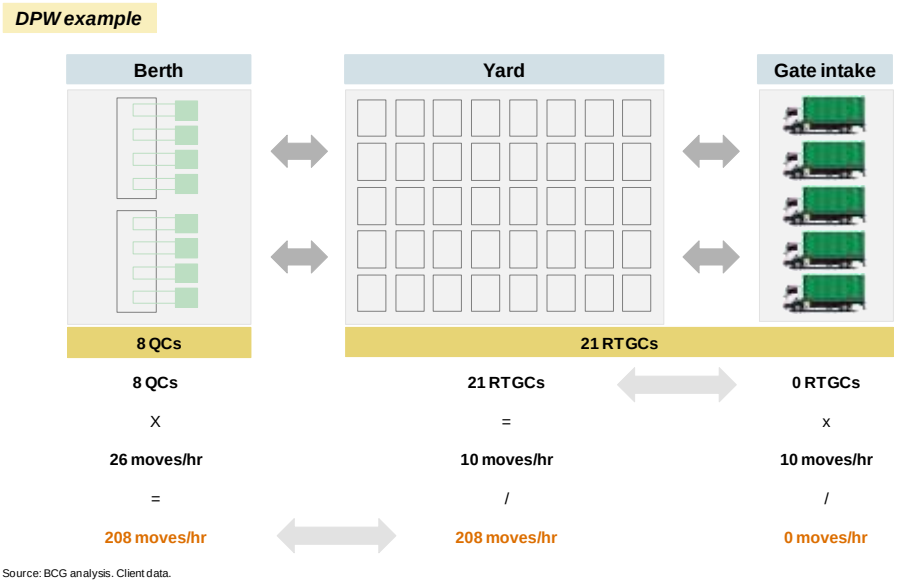
Key Findings

The yard throughput (measured as the number of export TEUs moving in through the terminal gate) is inversely related to berth productivity (measured as the number of TEUs handled at the berths). When a large vessel berths in the terminal, the resources get deployed in the quay side to load/unload containers from the vessel. This results in shortage of resources on the yard side and, hence, the number of containers moved from the export trailers to the yard drops significantly. To cope with this, the terminals proceed to close the export gates to stop further inflow of export trailers to the container yard. This phenomenon can be corroborated from the fact that high berth productivity periods coincide with long duration of gate closures. The following figure correlates berth and yard productivity of CCTPL; similar behavior is also observed for CITPL yard.

1. The correlation factor was found to be -0.47. Data used here is from the DP world terminal.
2. Data for month of June only considered
Source: BCG Analysis. Client data

Figure 156: Relation between berth throughput, gate throughput and gate closures

The higher duration of gate closures during periods of high berth productivity indicate a shortage of equipment at the disposal of the terminal operators. The following figure analyses adequacy of RTGCs in CCTPL. As the ratio of QC to RTGC is similar for both terminals, the following analysis holds true for CITPL as well.



Source: BCG analysis. Client data.

Figure 157: Balance analysis on RTGC availability for yard operations

There are 8 QCs in CCTPL that can operate at a productivity of 26 moves/hr. In a scenario where multiple vessels are berthing in the terminal and all 8 QCs are operational simultaneously, the berth productivity goes up to ~208 moves per hour. The yard of CCTPL has 21 RTGCs, which run at an average productivity rate of 10 moves/hr. Thus all RTGCs cumulatively account for ~210 moves per hour. Hence, in a scenario where 8 QCs are operational, all RTGCs would need to get deployed at the quay side. This clearly points to lack of RTGCs to handle yard operations.

In an average scenario where one vessel has berthed at the terminal, 6-7 RTCGs get employed for moving containers from the export trailers to the yard. The RTGC productivity analysis (as shown in the figure below) takes into account this average scenario.

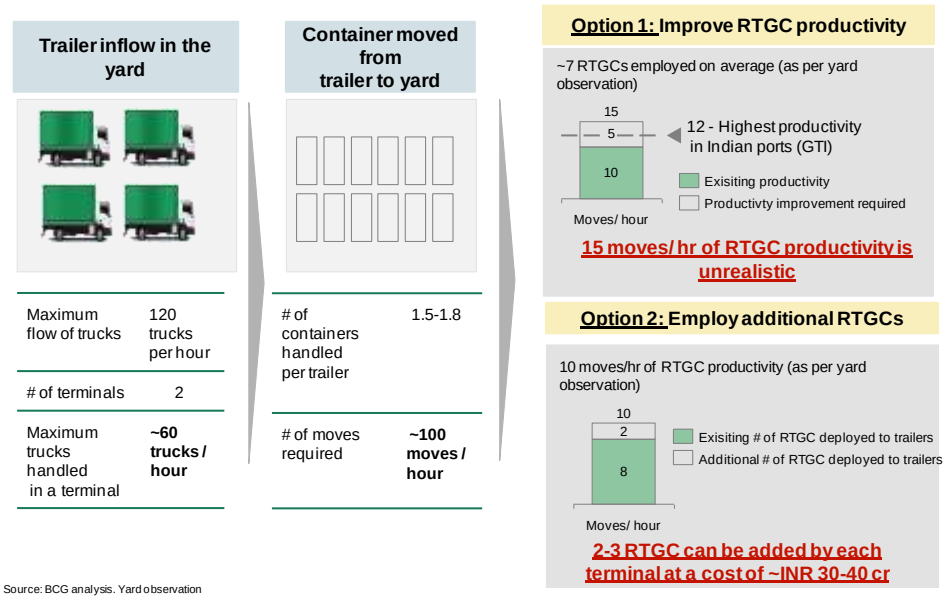


Figure 158: Analysis to identify RTGC requirement

The terminal needs to either boost its RTGC productivity to 15 moves/hr, or employ additional RTGCs. The highest RTGC productivity in India is 12 moves/hr at the GTI terminal in JNPT; achieving 15 moves/hr may not be feasible for the terminals in the Chennai port. Hence, the only feasible option is for terminals to employ additional RTGCs to adequately handle export trailer to yard movements during vessel berthing. Private terminals would require investing Rs. 30-40 Cr each into 2-3 new RTGCs to resolve the productivity gap during peak periods.

Recommendations

The investments in the new RTGCs would need to be made by the private terminals in Chennai. Port's responsibility will be to monitor yard productivity levels, and create adequate incentives for the terminals to invest in additional equipment. The key steps proposed for the port are:

1. Start discussions with DP World and PSA representatives from the CCTPL and CITPL terminal; also, reach out to the global management of DP World and PSA for the same. Align with private terminals on possible timelines for deployment of additional 2-3 RTGCs each.
2. Implement a system for monitoring critical yard and gate performance metrics—trailer throughput and gate closure times. A joint team should be formed with representation from the port (a senior DTM should be part of the committee) and both the terminals (GM operations can be part of the committee). The team would be responsible for reviewing weekly reports on yard productivity and will take the necessary steps to improve yard productivity.
3. The port can explore providing tariff incentives to the terminals leveraging the new TAMP guidelines. This will allow terminals to get additional returns in terms of higher tariff collected by investing in additional RTGCs. The Ministry of Shipping and the TAMP regulators should extend the necessary approvals for the same.

Expected Impact

Addition of 2-3 RTGCs in each terminal would increase the yard throughput of CITPL to ~120 trailers/hr. CCTPL will also reach similar levels if adequate yard space area is provide to the terminal. This will reduce the queue size and waiting times by ~30%, making Chennai port more attractive for handling containers.

Due to the current congestion at the Chennai port, a large volume of container traffic estimated at ~0.3-0.4 Mn TEUs is expected to move out to Ennore when the latter comes up with a container terminal in 2016-17. This would result in an operating surplus loss of Rs. 90 Cr to the Chennai port (and additional revenue loss of Rs. 60-70 Cr for the two private terminals combined). Addition of RTGCs can prevent losing ~Rs. 30-40 Cr of operating surplus to Ennore.

5.2.1.1.2 Initiative: CHPT 1.2 Provide 4-5 Ha of additional yard space to DPW

Initiative Overview

Optimal yard space is critical for maintaining yard productivity. Shortage of yard storage space can lead to inefficiencies in yard management. Shortage of storage space area for containers during peak periods results in gate closures; additionally, sub-optimal yard planning due to small yard area results in higher number of moves for handling containers. The throughput analysis of trailers—from CFS to the container terminals—denotes yard productivity as the key constraint. CCTPL, operated by DPW, has around ~17 Ha of yard space; this yard is utilized to handle 0.7-0.8 Mn TEU of gateway traffic. Shortage of yard space in this terminal is identified as a driving factor for low yard productivity that leads to congestion in the port.

Key Findings

The CCTPL yard has the highest ground slot density among all container terminals in India, including the CITPL terminal in Chennai. In spite of that, the capacity of the yard is only ~14,000 TEUs, which is roughly the same as the weekly volumes handled by CCTPL. Given the high parcel sizes of ~2,000 TEUs handled in Chennai, yard space at the terminal leaves no buffer space for operations.

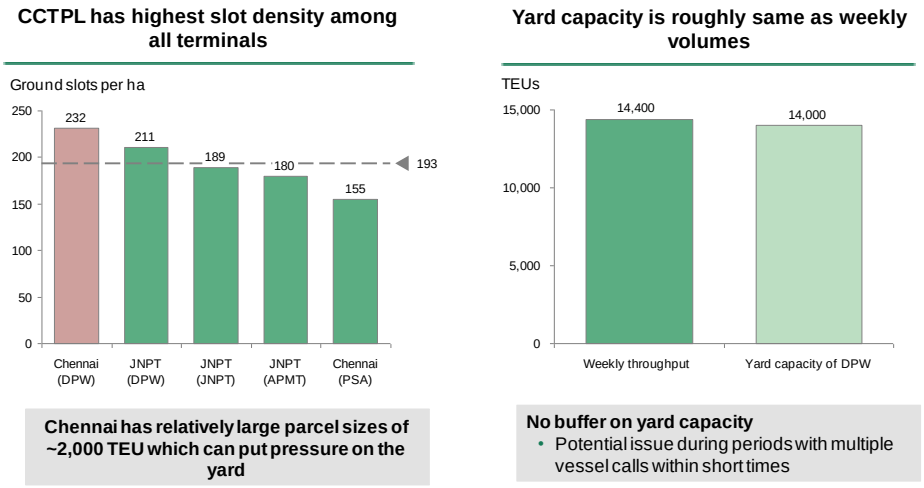


Figure 159: Yard space benchmarking

At present, the CCTPL yard has 3,940 ground slots for containers. The analysis described in the following figure shows that the optimal number of ground slots required in CCTPL is ~4,400. Adding 460 ground slots with an optimal ground slot density of ~200 would require a yard space of ~22 Ha. Hence, 4-5 Ha of additional yard space should be provided to CCTPL for allowing proper yard management.

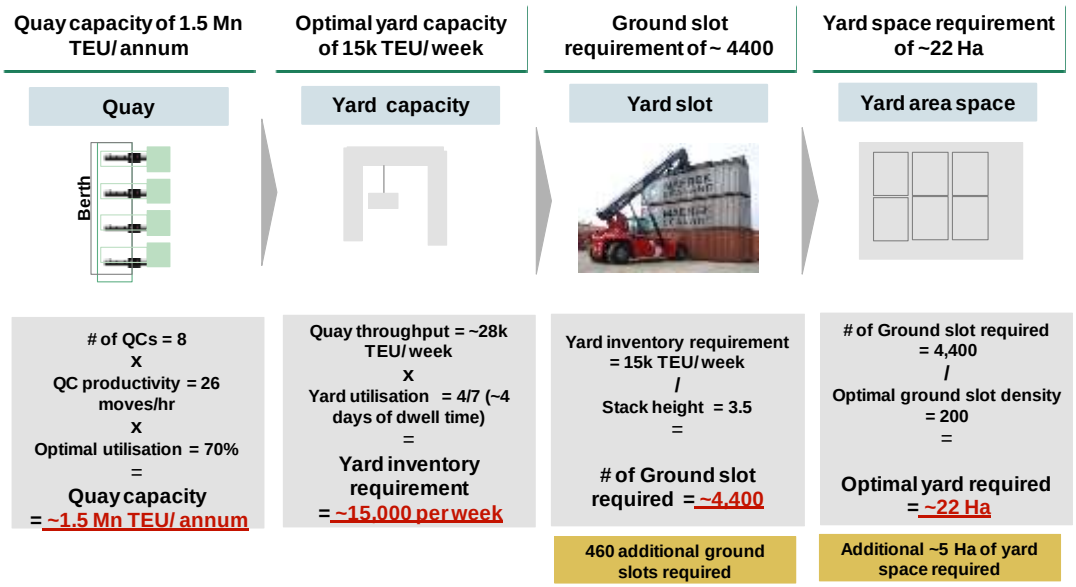


Figure 160: Calculation of yard space required for CCTPL

~4-5 Ha of additional yard space can be provided by utilizing the currently unused space near CCTPL terminal. This area would require minimum alterations before it can be handed over to DPW.

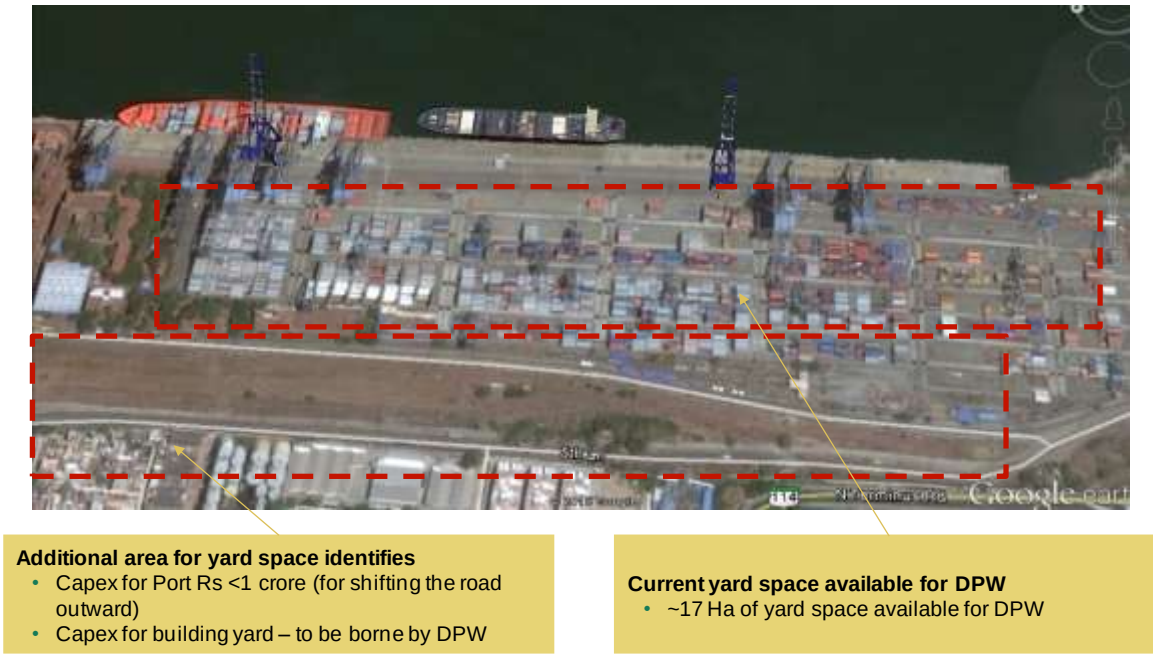


Figure 161: Recommended space for CCTPL yard augmentation

Recommendations

The port should provide CCTPL 4-5 Ha of additional space adjacent to the present yard. The following actions need to be taken for this:

1. Finalize on the mode of transfer of additional land to the terminal. There are two potential options for awarding additional space—the first option involves revising the concession agreement of CCTPL to include awarding additional space to DP World. Redrafting of concession agreement will take time and is a long term solution. To expedite the process of awarding additional space to CCTPL, we suggest an alternate option—CCTPL currently holds ~3 Ha of land near the customs area inside the port. This land is not contiguous with the current CCTPL yard, and can be swapped with an equal area of land near the terminal as suggested in the figure above. This can be completed without altering the concession agreement.
2. Secure commitment from the terminal to invest in developing the yard in the additional space, and guarantee usage of the space for container storage. The port can also negotiate higher gate productivity targets (and higher minimum guaranteed volume) in case a new agreement is drafted.
3. Clear existing structures in the land to be handed over to CCTPL, and develop new terminal boundaries. Explore if a new road needs to be developed around the CCTPL terminal.

Expected Impact

Additional yard space for CCTPL will ease pressure on yard management for the terminal during peak periods. It will also provide buffer space for the terminal, allowing flexibility in yard operations. With the new space, CCTPL's yard capacity would match the 1.5 Mn TEU capacity of its berths.

Due to the current congestion in the Chennai port, a large volume of container traffic estimated at ~0.3-0.4 Mn TEU is expected to move out to Ennore when its container terminal becomes operational in 2016-17. This would result in an operating surplus loss of Rs. 90 Cr to the Chennai port (and additional revenue loss of Rs. 60-70 Cr for the two private terminals combined). Addition of storage space in CCTPL can prevent losing ~Rs. 15-20 Cr of operating surplus to Ennore.

5.2.1.2 Gate analysis

Truck turnaround times inside the port can be substantially improved by streamlining the gate processes at the terminal gates. In the course of the study, detailed time analysis of the gate processes for both the container terminals were carried out. This involved recording observations of truck processing times for all activities at the gate, and identifying processes that record highest processing times.

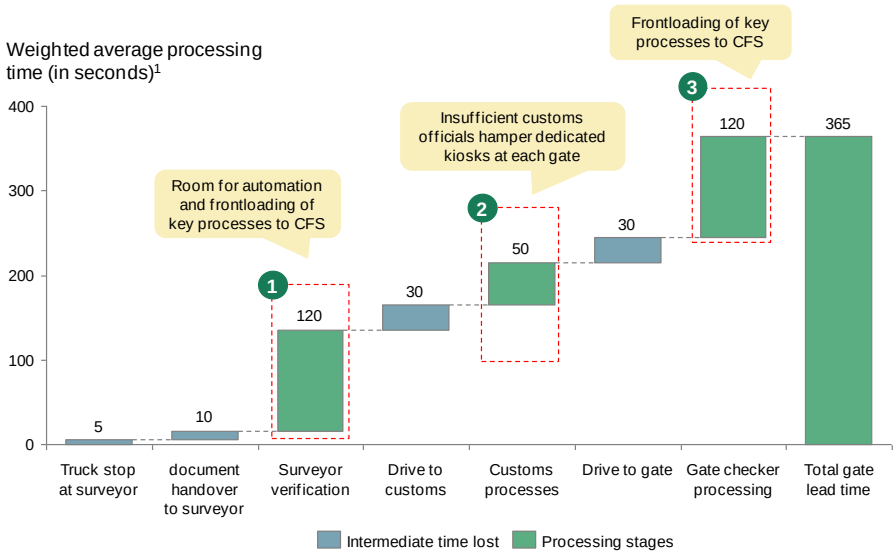
5.2.1.2.1 Initiative: CHPT 1.3 Frontload pre-gate processing and entry of trailer details to CFS

Initiative Overview

The throughput analysis of trailers—from the CFS to the terminal—identified terminal gate processes as the second largest constraint to evacuation. The current throughput potential for the terminal gates is observed to be ~100 trailers/hour (for export trailers for both the terminals combined). If the yard productivity improves to the targeted levels, the gate processes would become the new constraint. To realize the benefit of improvement in yard productivity, the gate throughput must also improve to >120 trailers/hr levels.

Key Findings

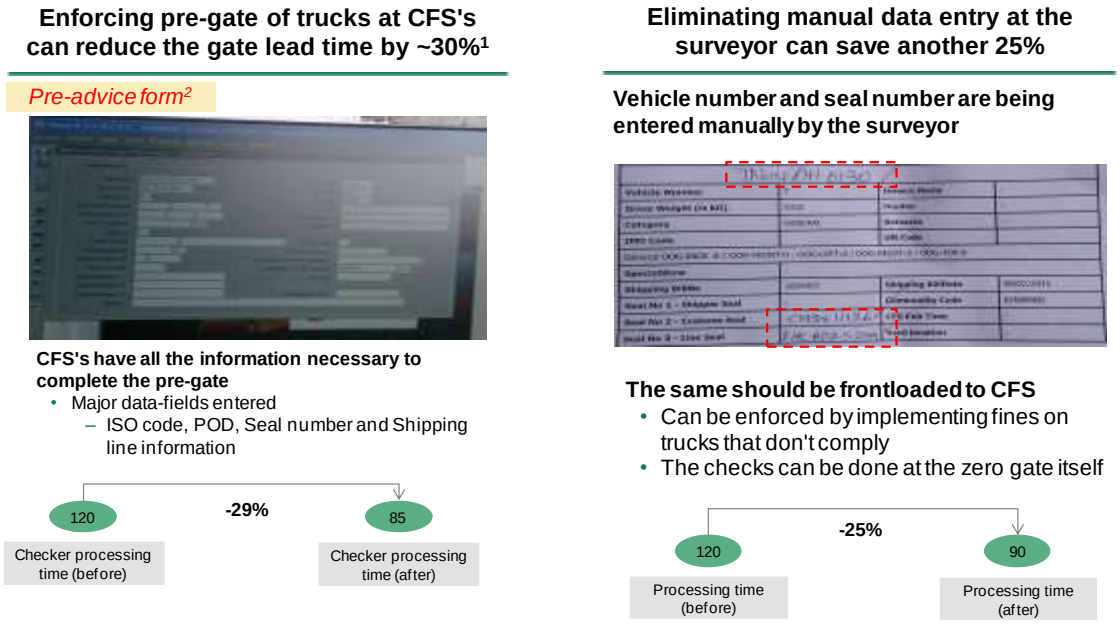
Observations of processing times at the terminal gates reveal that, on an average, it takes ~365 seconds for completion of all gate processes for each trailer. The split of the processing time across different activities at the gate reveal two activities—surveyor verification and gate checker processing take ~240 seconds for completion. The following figure details out the gate processing times:



1. Numbers have been normalized based on 2014-15 traffic figures at PSA and DPW terminals to arrive at the average processing times
Note: Based on time studies conducted at DPW and PSA export gates (~12 hours). No. of trucks observed: 21 at CCTPL and 23 at CITPL
Source: BCG Analysis

Figure 162: Truck flow throughput analysis

As per the current process during the pre-gate check, the gate checker positioned at the terminal gate needs to enter multiple fields of information in the system. The snapshot of the system used in CCTPL is provided in the following figure. The information fields such as ISO code, proof of delivery, seal number, shipping line name, and the vessel specifications are entered by the gate checker. This requires an average time of ~120 seconds. The surveyor is also required to record vehicle number, seal number, etc. At present, the surveyor writes it down in a paper form. The following figure describes these activities in detail:



1. Based on observation of 44 trucks-21 trucks at CCTPL and 23 trucks at CITPL. More than 70% of the trucks get the pre-gate done at the terminal gates
2. Shows the CITPL pre-gate form. CCTPL pre-gate form also requires similar details
Source: BCG Analysis

Figure 163: Activities to be frontloaded to CFS

Recommendations

The data entry process should get shifted to the CFS. All the required information is already available with the CFS and transporters. These details should be entered in the system of the CFS and shared with the port. The gate checker would then only require to cross-check these details instead of entering the data in the system. This system can further get integrated with RFID implementation currently underway at the port. Similarly, the surveyor verification process can also be frontloaded in the CFS, wherein the surveyor would only need to verify the container and seal number as opposed to filling all the details in a paper form at the terminal gate.

To ensure proper implementation of the initiative, the port would need to coordinate among the terminals, the transporters and the CFS. The CFS should agree to enter all relevant details during the CFS clearance process of the trailers. The CFS data should be shared with the terminal and customs (surveyor) electronically.

Expected Impact

The frontloading of the data entry by the gate checker and the surveyor to the CFS would save ~65 seconds of processing time. This would reduce total gate processing time from ~365 seconds to ~300 seconds, a ~20% improvement on processing times. This improvement is expected to improve gate throughput by 20-25 TEUs/ hour.

5.2.1.2.2 Initiative: CHPT 1.4 Automate container verification by installing cameras

Initiative Overview

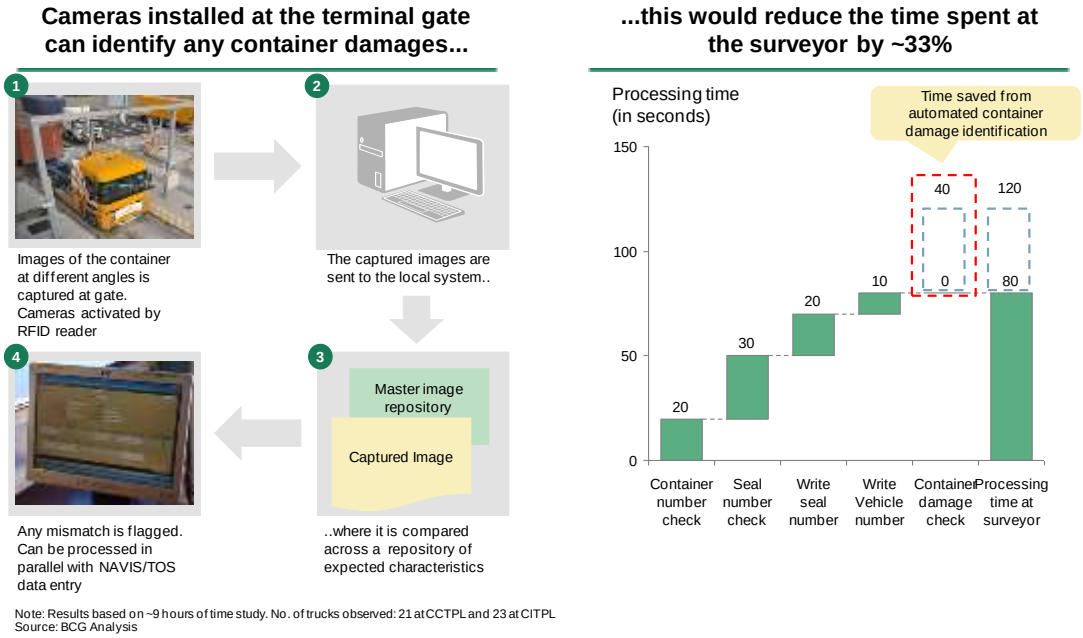
As mentioned earlier, the throughput analysis of trailers from the CFS to the terminal identifies terminal gate processes as the second largest constraint to evacuation. The current throughput potential for the terminal gates is observed to be ~100 trailers/hour (for export trailers for both terminals combined). The gate throughput must improve to >120 trailers/hr levels to avoid being the bottleneck once yard productivity improves.

Key Findings

Observations of processing times at the terminal gates revealed surveyor verification process as the key constraint—it takes ~120 seconds for completion. The surveyor is an employee of the terminal operator who is appointed to assist the customs officer in providing customs clearances at the terminal gate. When the trailer arrives at the terminal gate, the surveyor proceeds to examine the trailer, checking the container body and the container seal for any damages. This requires ~1 min for completion, after which the surveyor notes down information on container seal number, vehicle number, etc., in a paper form. The process of physical examination is a key bottleneck for speedy evacuation.

Recommendations

The physical examination done by the surveyor can be avoided by implementing a camera system at the terminal gate. The cameras would capture images of the container from multiple angles. These images will get shared with a local system that will match them with the repository of reference images. In case a match is not found, it will get flagged in the system. The installation of the camera system, along with the frontloading of data entry to CFS, will reduce dependence on the surveyor.



Note: Results based on ~9 hours of time study. No. of trucks observed: 21 at CCTPL and 23 at CITPL
Source: BCG Analysis

Figure 164: Container damage detection using cameras

Expected Impact

The camera system will save 40 seconds of gate processing time, which currently gets consumed by the surveyor doing a physical check of the container. ~Rs. 5 Cr of capex will be required for the implementation of the system.

Due to the current congestion at the Chennai port, a large volume of container traffic (estimated at ~0.3-0.4 Mn TEU) is expected to move out to Ennore when its container terminal gets operational in 2016-17. This would result in an operating surplus loss of Rs. 90 Cr to the Chennai port (and additional revenue loss of Rs. 60-70 Cr for the two private terminals combined). Reducing truck turnaround times can help protect losing revenue to Ennore.

5.2.1.3 Modal shift

5.2.1.3.1 Initiative: CHPT 1.5 Discount charges on rake operations for Bangalore ICD

Initiative Overview

Modal shift of cargo from road to rail can help reduce pressure on roads for evacuation and, hence, ease congestion at Chennai port. It will help the port circumvent all issues with road infrastructure and traffic congestion outside the port boundary.

At present, 0.07 Mn TEU of container cargo gets evacuated through rail from the Chennai port. Chennai hinterland has four existing ICDs—Bangalore (Whitefield), Tondiarpet, Arakkonam and Irrungatukottai. Out of the four ICDs, only the Bangalore ICD currently has rake services to Chennai. The Bangalore ICD, located at 350 kms from the Chennai port, is also the only long haul service possible from the port. Hinterland analysis for Chennai shows that ~0.7 Mn TEU of traffic originates from hinterland areas at a close proximity to the ICDs. The Bangalore ICD itself can potentially handle 0.25 Mn TEU for the Chennai port.

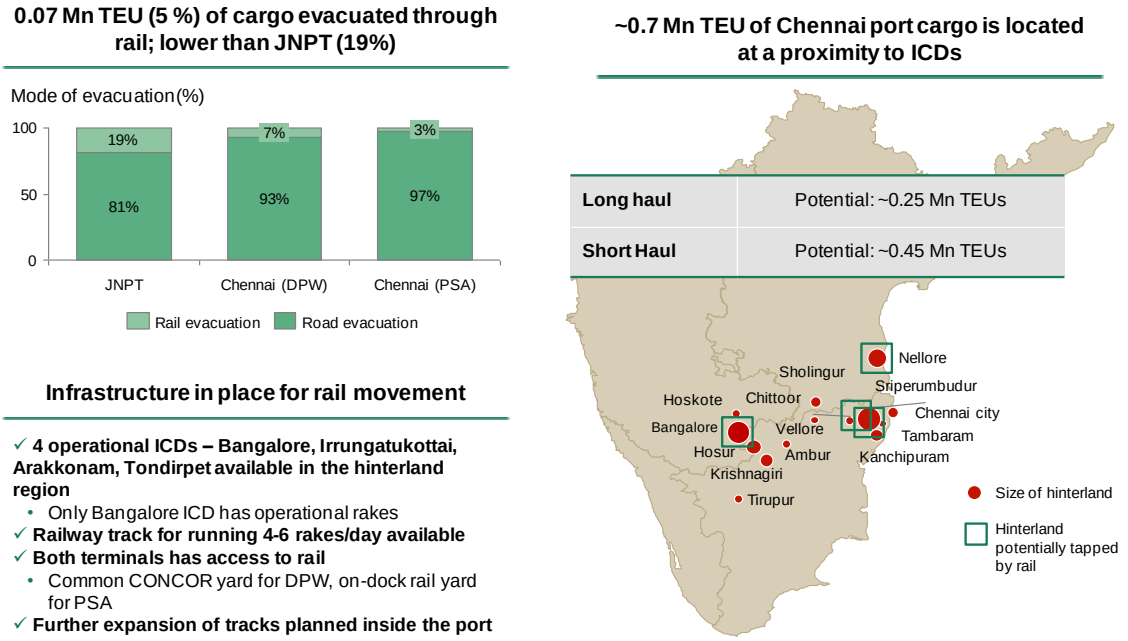


Figure 165: Volume potential for ICDs near Chennai

Key Findings

The logistics cost for moving containers through rail from the Bangalore ICD is higher than the cost of moving containers through road by ~Rs. 2,500 per TEU. This is in spite of the fact that rail freight of Rs. 9,000 is lower than the road freight of Rs. 12,000 in this route. The additional rail yard handling cost, trailer cost for the last mile connectivity, and the mark-up charged by the liners for ICD bound cargo contribute to the difference in logistics cost.

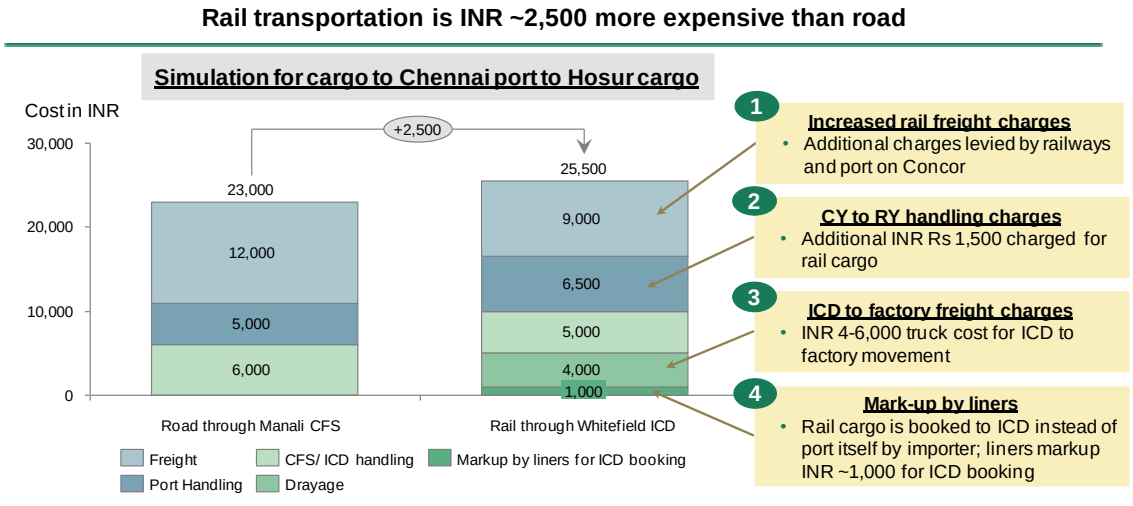


Figure 166: Logistics cost comparison between rail and road

Recommendations

Additional charges are levied on CONCOR for the rake operations by the Chennai port and the railways. All these additional charges add up to ~Rs. 1,300. The port should waive its haulage charge, repositioning charge, and port service charge on rake operations completely. This will result in a loss of Rs. 8-10 Cr for the port, but will be critical for retention of container traffic. The railways also charge an additional ~Rs. 500 as port congestion surcharge. As a limited number of container rakes are plying from the Chennai port, the congestion in rail lines is limited. Hence, there is a strong case for exemption of the port congestion surcharge for container rakes in Chennai port.

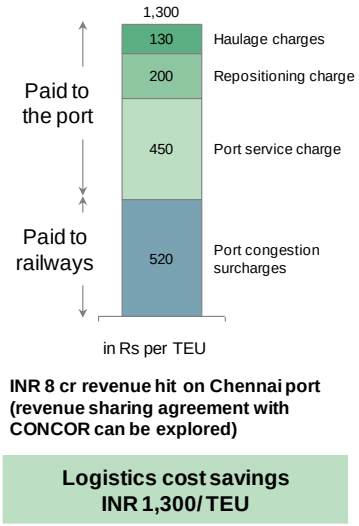


Figure 167: Impact of waiver of port and railway charges

Expected Impact

The initiative will decrease the overall logistics cost difference in rail and road transportation for the Bangalore ICD to ~Rs. 1,200 from ~Rs. 1,300 per TEU. Combined with the following two initiatives, it can result in a shift of 0.25 Mn TEU of the Bangalore ICD's container cargo from road to rail.

5.2.1.3.2 Initiative: CHPT 1.6 Develop common railway yard inside the port

Initiative Overview

Railways charge for movement of rakes with 40-50 wagons. To ensure that the rake operation is economical, CONCOR and other rake operators need to aggregate ~80 containers before moving a rake. Hence, the rake needs to wait till 80 containers get accumulated at the ICD, which also increases the transit time of the containers. This is one of the key limitations of rail movement of container cargo. Any added incentive for faster aggregation of cargo can make rail movement much more economical.

Key Findings

Currently, less than 20% of rakes are mixed rakes in Chennai, i.e., less than 20% rakes carry cargo for both the terminals in Chennai port—CCTPL and CITPL. While CCTPL uses the Annex yard close to their terminal, PSA uses their on-dock rail yard. Moving a rake from the marshaling yard to the two terminal yards requires 8 movements and ~2 hours of additional operations. Hence, currently, mixed rakes are less feasible.

Each rake spends up to 20 hours of waiting time in the container yard waiting for adequate volume of cargo to arrive. A mixed rake that carries cargo for both terminals will allow faster aggregation and, hence, will reduce the waiting time for rakes.

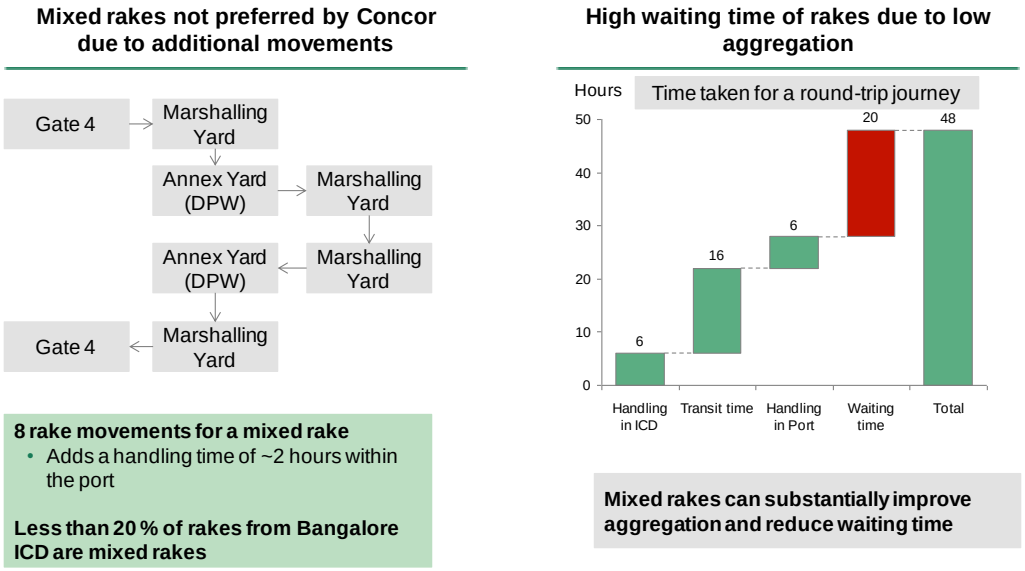


Figure 168: Rake analysis

Recommendations

The port must develop a common rail yard for both the terminals to move their cargo. Preliminary studies in the port have identified land parcel available near the current marshaling yard as the ideal location for building the common container yard. The yard would have space to handle up to 0.75 Mn TEU per year, and would also have adequate equipment to maintain high productivity levels.

The common yard will make running mixed rakes viable. It will reduce the turnaround time for rakes by ~10 hours. This will allow rake operators to run rakes more frequently and, hence, increase the maximum rail throughput by 26%. It will also result in higher savings for the rail operator.

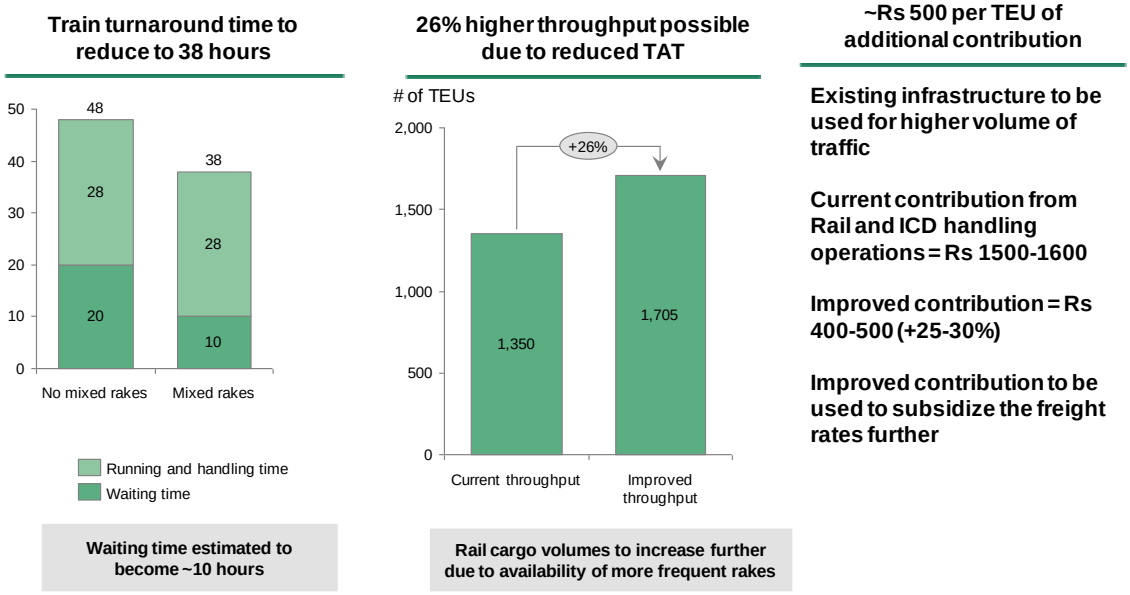


Figure 169: Advantage of mixed rakes

Expected Impact

The development of a common rail yard in the port can save handling rake operation cost up to Rs. 500 per TEU. It would require an investment of ~Rs. 10 cr. The capex can be shared by the port, the rail operator, and even the terminals as it will benefit all the three stakeholders. This initiative, combined with the other two initiatives on modal shift, will lead to a cost savings of >Rs. 2,500 for long rake movements from the Bangalore ICD to Chennai port and, hence, make evacuation through rail more cost effective than evacuation through road. ~0.25 Mn TEU of long haul traffic is expected to shift to rail after implementation of the three initiatives.

5.2.1.3.3 Initiative: CHPT 1.7 Test run rail-road wagons

Initiative Overview

Evacuation by rail requires additional handling of containers. Firstly, at the ICD, it first shifts from the trailer to the rail wagon; secondly, at the port rail yard, it gets shifted from the rail wagon to the trailer. Eliminating the additional handlings can result in cost savings, and lower the requirement for handling equipment such as reach stacker.

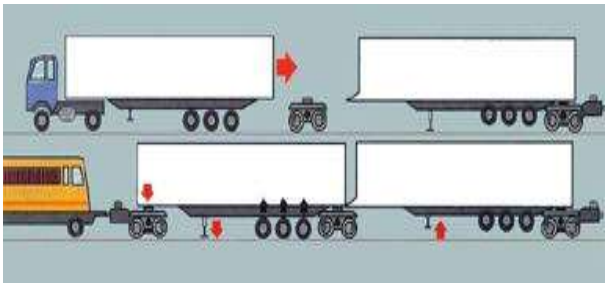
Key Findings

Handling of containers at the ICD and the rail yard of the port results in added cost of Rs. 800–Rs. 1000.

Recommendations

Rail-road wagons or road-railers can be used in place of traditional wagons. This will eliminate the need for additional handlings. Instead, the trailer can directly pull away the road-railers in the railway yard. The following figure describes the operation of road-railers.

Process of operation



1. *Starting at the rear of the train, a trailer is attached to a rail bogie.*
2. *One by one, trailers are raised on their own hydraulic system, bogies attached, and then attached to the car behind.*
3. *Finally a coupler is attached to the first trailer and the train is ready to depart*

Figure 170: Process of operation of road-railers

Road-railers are extensively operated in the US. Multiple services are run by private rail service companies like Triple Crown Services, which is a Norfolk Southern's subsidiary. Other services in the US are run by Union Pacific, BNSF etc. In Canada, Canadian National (CN) run roadrailer services. Roadrailers are also used in Austria and Brazil.

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The road-railers are relevant for lighter cargo and hence are suited for 60-70% of Chennai's cargo including cargo handled by auto companies, paper importers etc. The road-railer concept is relatively new to India. It is currently getting tested by Kirloskar. Chennai port would provide an excellent opportunity to test-run road-railers. The investment into road-railers should be borne by rail operators; port would need to provide infrastructure support to run the road-railers. In the initial phase, the port would need to subsidize road-railer operations by waiing off rail related charges.

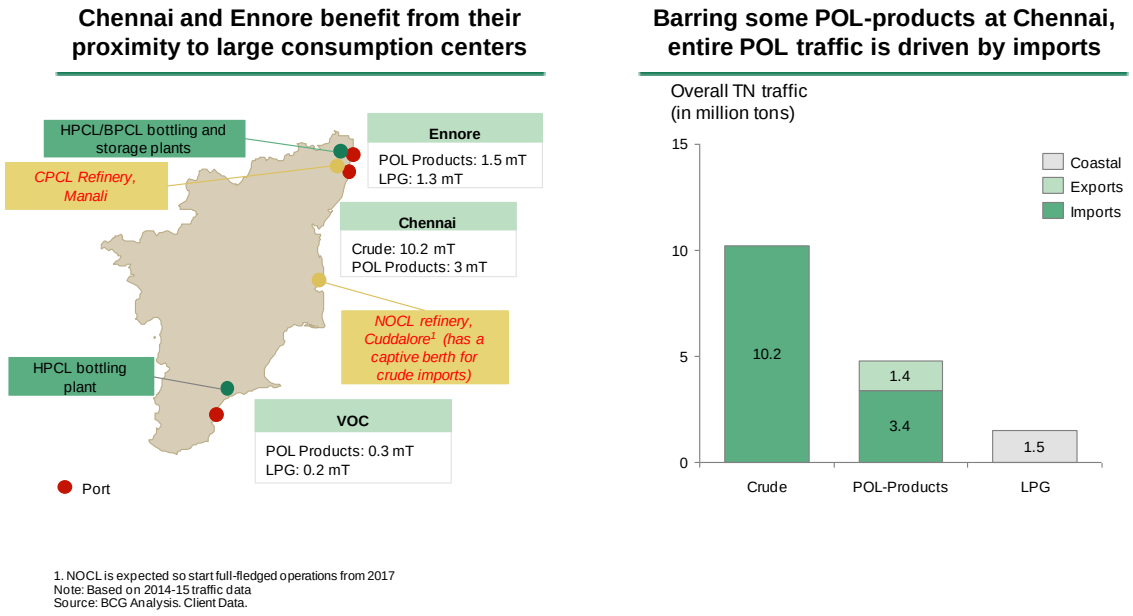
Expected Impact

The usage of road-railers can save handling cost up to Rs. 800 per TEU. This initiative, combined with the other two initiatives, will lead to a cost savings of >Rs. 2,500 for long-rake movements from the Bangalore ICD to the Chennai port and, hence, make evacuation through rail more cost effective than evacuation through road. ~0.25 Mn TEU of long haul traffic is expected to shift to rail after implementation of the three initiatives.

5.2.1.3.4 Initiative: CHPT 2.1 Facilitate construction of new POL-products pipeline

Initiative Overview

The POL traffic of T.N. hinterland is primarily being served by the Chennai and Ennore ports. Chennai currently handles 10 Mn MT of crude and 3 Mn MT of POL products. Ennore handles 1.5 Mn MT of POL products and 1.3 Mn MT of LPG. The crude volume in Chennai is handled for the CPCL refinery located at Manali near Chennai port. The POL products handled at both Chennai and Ennore is stored at the HPCL and BPCL storage facilities near Ennore. The HPCL bottling plant near VOC and the upcoming NOCL refinery at Cuddalore will not get served through Ennore. Chennai port can aim to be the key POL handling port in South India since pipeline cargo can be handled at the port without any impact of congestion issues that affect the port.



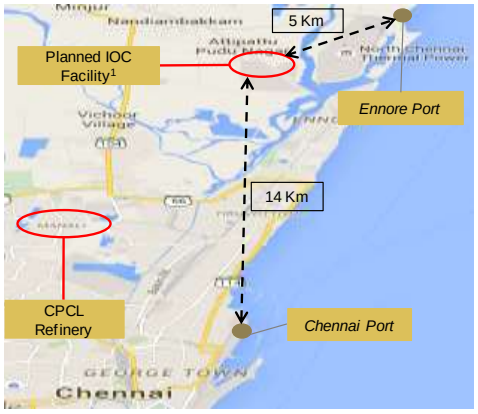
1. NOCL is expected so start full-fledged operations from 2017
Note: Based on 2014-15 traffic data
Source: BCG Analysis. Client Data.

Figure 171: POL traffic from Chennai port hinterland

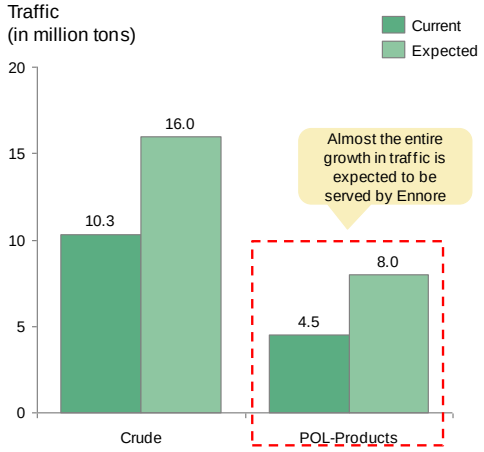
Key Findings

Due to environmental concerns, the union ministry had advised the oil handling companies to shift their POL product storage facilities from Tondiarpet near the Chennai port to locations near the Ennore port. As a result, all three oil-handling companies have either shifted or are in the process of shifting their storage facilities near the Ennore port. Indian Oil Corporation is developing 128 acres of land for its terminal and nine acres for the pipeline corridor from the Ennore port. BPCL and HPCL are also developing 98 acres and 5 acres of land respectively to construct their storage facilities. It is likely that the POL product traffic will move to Ennore from Chennai.

Planned storage capacity is much nearer to Ennore port.....



.....and hence is expected to drive the traffic of POL-products at Ennore

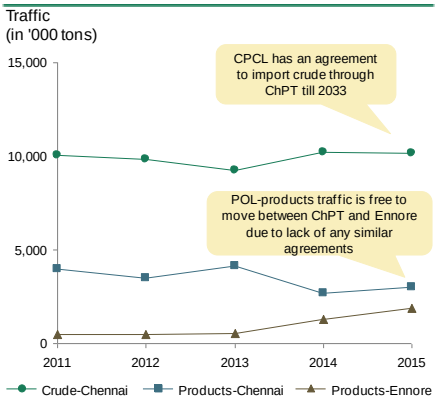


1. The new facility is expected to be operational up by mid to late 2017
Source: BCG Analysis. IOC data.

Figure 172: Outlook on POL traffic growth in the hinterland

On the other hand, POL crude is entirely handled for Chennai Petroleum Corporation Limited (CPCL). CPCL has a long contract with the Chennai port that will run till 2033. CPCL's existing facility near Manali is planned for an expansion. The crude oil import for CPCL is expected to increase to 16 Mn MT from the current volumes of 10.3 Mn MT. Chennai port will handle this additional traffic when the capacity expansion of CPCL refinery takes place. The port has also started work on expansion of the existing 30" pipeline to 42" pipeline for handling additional cargo.

Crude traffic has stayed with Chennai due to legal agreement with CPCL



Voice of Customer[1] indicates further POL-products traffic shift to Ennore

Our storage facility is near Ennore and the cost of moving products on trucks from Chennai was much higher than the additional vessel charges at Ennore due to higher TAT

-Manager, HPCL

Our new facility would come up near Ennore and we are planning to move around 2 million tons of products' traffic to Ennore port.
-Manager, Indian Oil Corporation

1. Sample size of 7 managers from 3 different organizations-IOC, HPCL and BPCL
Note: Ennore POL traffic in 2010 was 0.
Source: BCG Analysis. Chennai Port traffic data. Ennore port traffic data.

Figure 173: Trend of POL traffic handled by Chennai

Ennore currently handles the POL product traffic through a single berth. This results in high pre-berthing waiting time for vessels. The vessel turnaround time for Ennore is 8.6 days, which is nearly two times the turnaround time at the Chennai port. The Ennore berth is also a new facility developed by a BOT operator. The operator charges high CRC and VRC in order to recover the investment made in the berth. The overall cost for handling POL products in Ennore is higher than Chennai by ~Rs. 180/kl.

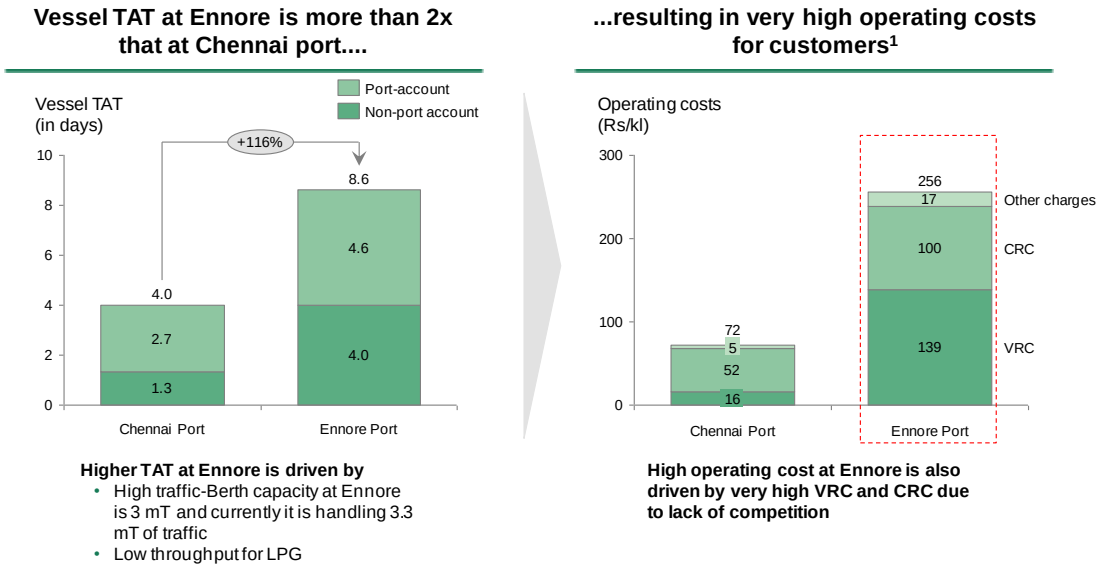


Figure 174: High TAT and high operating cost for POL handling at Ennore

Chennai is a better facility to handle POL product traffic due to lower cost and lower turnaround time. However, the distance between the newly located storage facility and the Chennai port makes handling of POL product in Chennai infeasible in the absence of a pipeline.

Recommendations

To ensure Chennai is capable of handling POL product traffic from storage facilities located close to Ennore, a 16 km pipeline needs to be constructed from the Chennai port. The laying of the pipeline will require regulatory approvals and environmental clearances. It must be noted that a 14 km pipeline for crude POL from the Chennai port to the CPCL refinery has already been approved. The POL product pipeline will also follow the same route till Manali, and will then be extended to the location of the storage tanks.

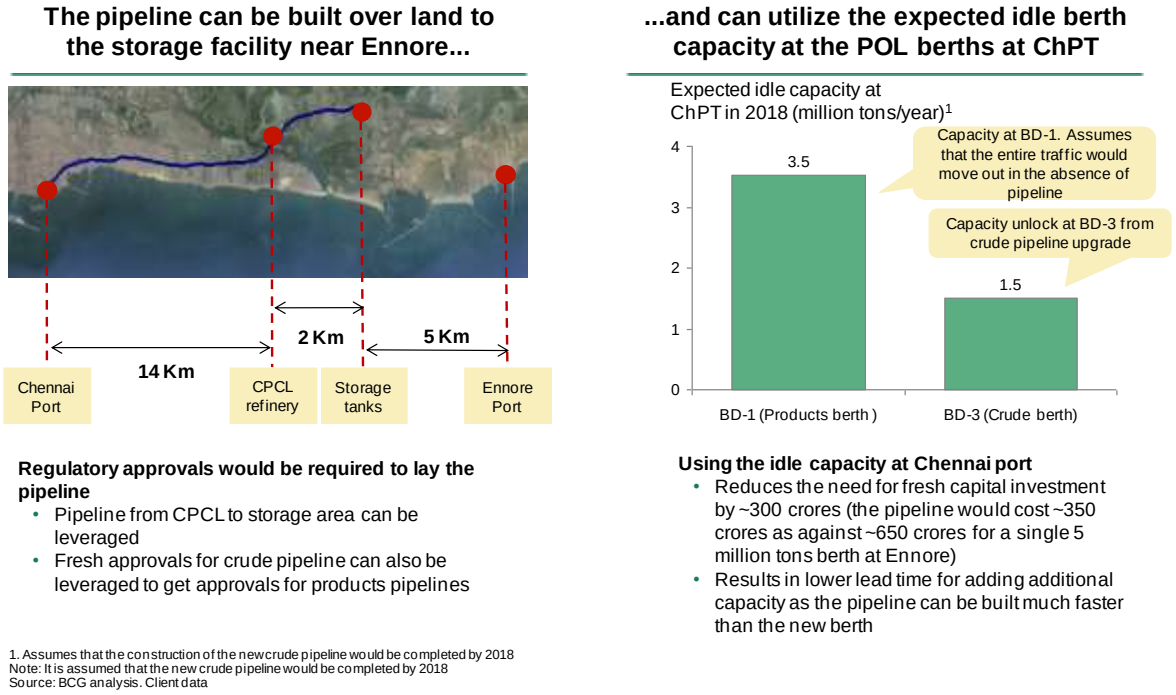
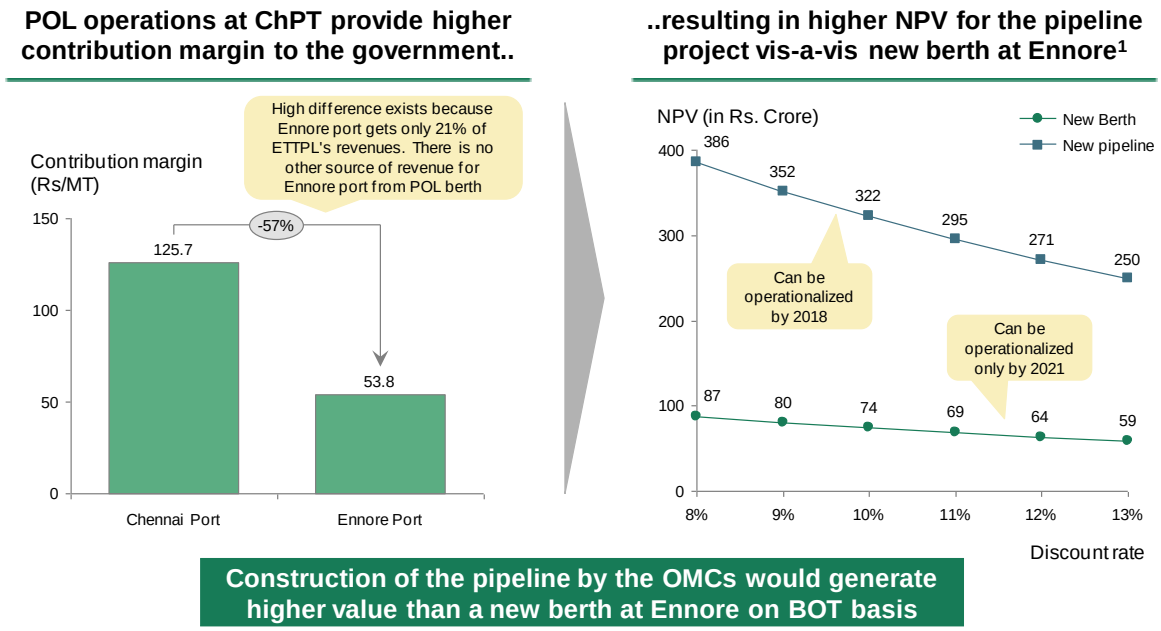


Figure 175: Construction of pipeline from Chennai to storage facility

The Chennai port will have a capacity for handling 5 MTPA POL products without any further expansion of berths. This capacity is readily available and does not require any further investment.

Expected Impact

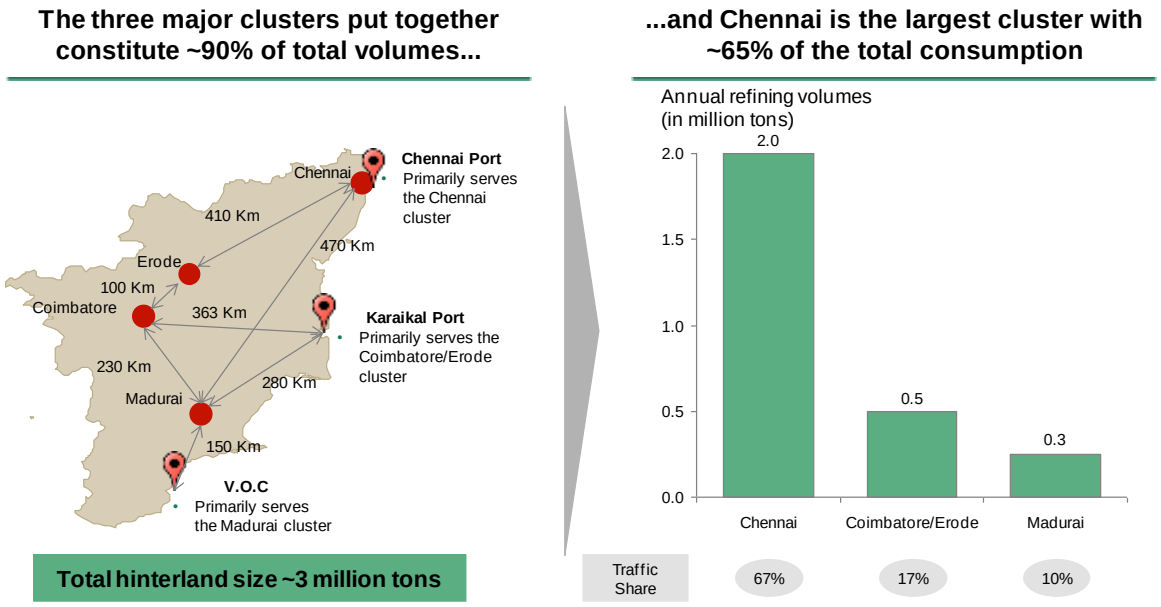
The pipeline would require an investment of ~Rs. 300 crores. This investment will be made by the oil-handling firms. Alternatively, new berths can be added in Ennore. Cost of construction of a new berth will be ~Rs. 650 crores. The investment in this berth is supposed to be made by IOCL. As summarized in the figure below, the POL operations in Chennai will offer a higher contribution of ~Rs. 70/MT than the BOT operator-run berth at Ennore to the respective port. The IRR is higher for construction of the pipeline as compared to development of a new berth.



1. The NPV is calculated at different discount rates as the cost of capital for Chennai port is not available. However, as is evident, this would not result in any change in the inference. NPV calculation also assumes that the pipeline can be complete and can start operating as early as 2018 whereas the newberth can only be operationalized earliest by 2021. This is one of the other factors resulting in higher NPV for the pipeline project
Source: BCG analysis. Client data

Figure 176: Financial impact of construction of the pipeline

5.2.2 Edible Oil



Note: Market size estimates are based on interaction with the 5 largest importers at Chennai port
Source: BCG analysis. Client data

Figure 177: Edible oil clusters in T.N.

5.2.2.1 Initiative: CHPT 3.1 Match the port charges to competition for edible oil

Initiative Overview

Chennai has been losing edible oil cargo to the competitor ports over the last 5 years. In 2011, Chennai had a volume share of 65%, which has now declined to 33%. The biggest gainer in that period has been Krishnapatnam, which has grown its edible oil cargo volumes by nearly 4 times over the last 5 years. This growth has been primarily driven by the Chennai edible oil cluster. Chennai can target to win back some share of the edible oil traffic that has moved to Krishnapatnam.

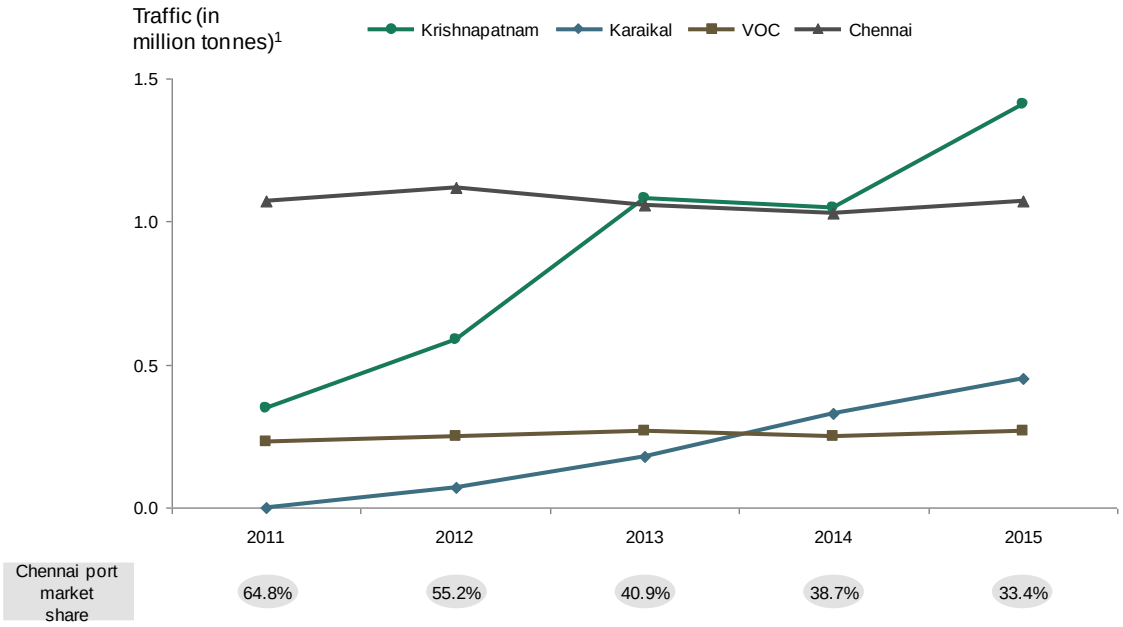


Figure 178: Loss of Chennai's market share to competitors

Key Findings

Krishnapatnam is farther from the plant locations than Chennai, therefore, it has higher logistics cost. Krishnapatnam has compensated for the higher logistics cost by lowering the port charges on edible oil. The following figure shows that port charges for Krishnapatnam is ~Rs. 35 per MT lower than Chennai. Overall cost of handling edible oil in Chennai is costlier by Rs. 15 per MT, which translates to ~Rs. 2 lakhs per ship for an average edible oil carrier. Higher cost and evacuation issues in Chennai have made customers move to Krishnapatnam.

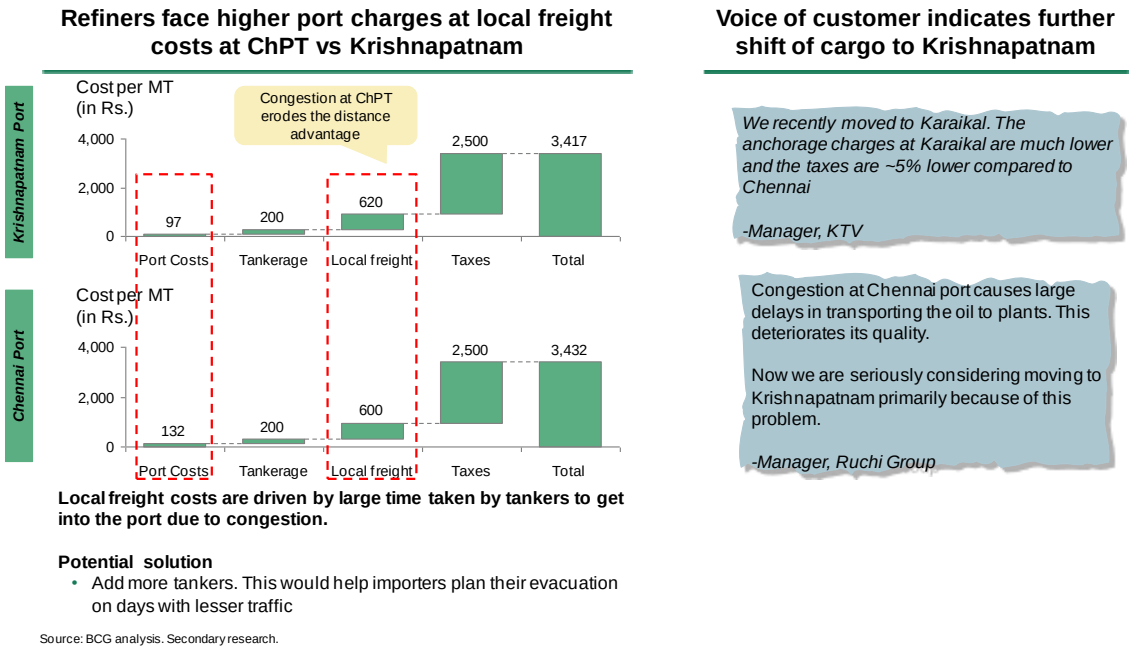


Figure 179: Comparison with Krishnapatnam

Recommendations

Krishnapatnam has developed a practice of benchmarking their charges to the port charges in Chennai. This allows Krishnapatnam to offer lower prices to customers who can shift their traffic from Chennai to Krishnapatnam. Chennai port should also assign a team to track prices charged by Krishnapatnam and other ports. The pricing of port charges should be revised based on what competitors are charging the customers for the same cargo. In case of edible oil, Chennai port must reduce its port charges by more than Rs. 15 per MT to attract additional volumes to the port.

Expected Impact

The reduction of port charges is expected to unlock a volume of 0.33 Mn MT of edible oil volumes from the Chennai cluster. Reduction in port charges will reduce the revenue gained per ton from Rs. 151 to Rs. 136. This will have a net impact of ~Rs. 3 Cr value increase for the Chennai port. This is summarized in the figure below:

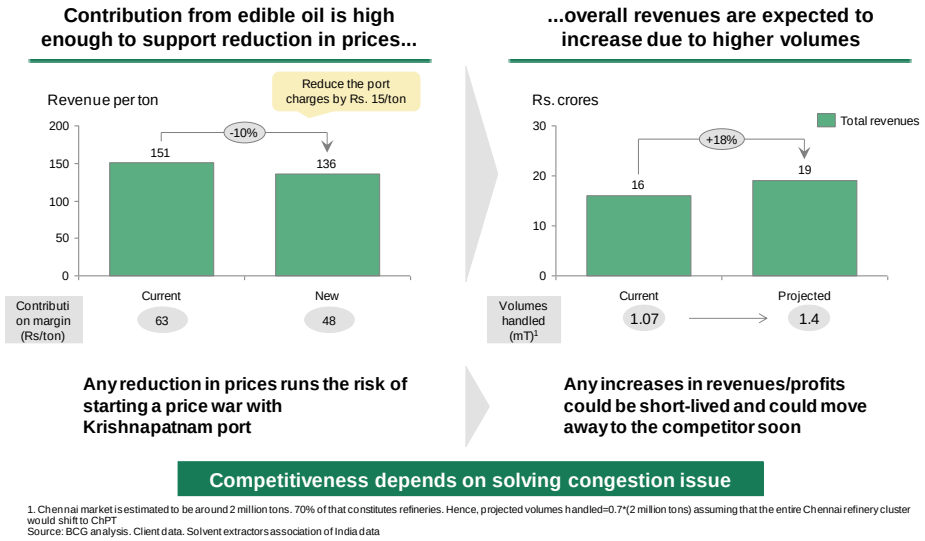


Figure 180: Potential impact of reduction of port charges

5.2.2.2 Initiative: CHPT 3.2 Start edible oil rakes between Chennai and Madurai

Initiative Overview

At present, VOC handles ~0.3 Mn MT of edible cargo from the Madurai cluster. Chennai can aim to capture a share of the Madurai cluster cargo in the short term.

Key Findings

Madurai is farther from the Chennai port than the VOC port. The freight charge for carrying edible oil from Madurai to Chennai is estimated to be around Rs. 1,300 per MT as compared to the freight charge of Rs. 700 per MT from Madurai to Chennai. The higher freight charges make it infeasible for customers in the Madurai cluster to use the Chennai port.

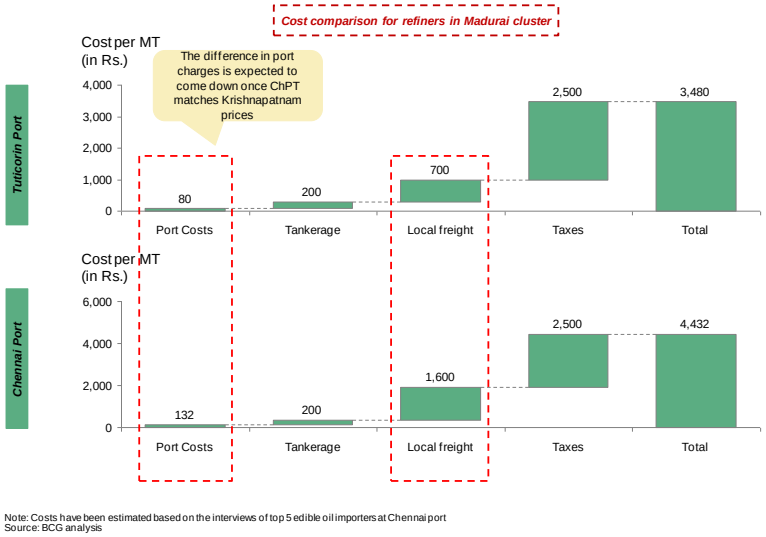


Figure 181: Logistics cost comparison with VOC

Recommendations

Running edible oil rakes from Madurai to Chennai can reduce the freight cost by Rs. 900 per MT. This will reduce the overall logistics cost of handling edible oil at the Chennai port to match that of the VOC port. Railways require a minimum of 6 rakes per month to start the service. This translates to a volume of ~15,000 MT per month. Madurai cluster can attract >20,000 MT of edible oil volume per month, which would require a monthly service of 8-9 rakes.

Moving edible oil in rakes will require storage of edible oil at the port till the adequate quantity gets aggregated for filling one rake. It will be critical to develop adequate local storage facilities (tankers) at the port. Long-term land leases should be awarded to attract customers to invest in their tank farms at the port. This would require change in the current law that prohibits long-term leases within the custom bound area of the port.

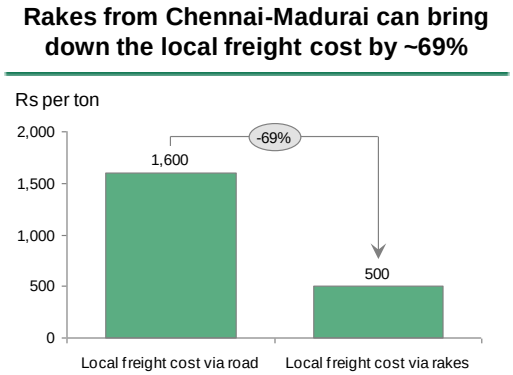


Figure 182: Impact of running edible oil rakes between Chennai and Madurai

Expected Impact

Running rakes to Madurai is expected to bring added volume of ~0.3 Mn MT of edible oil. This will add a value of up to Rs. 1 crore to the Chennai port.

Figure 183: Plan for Tuticorin-Aruppukkottai line

5.2.3 Fertilizer

5.2.3.1 Initiative: CHPT 4.1 Facilitate investment in mechanized fertilizer bagging plant

Initiative Overview

As per the Madras High Court's order in 2011, Chennai port had been advised to concentrate on handling clean cargo. Ever since, Chennai port has taken multiple initiatives to increase their clean cargo volumes. Fertilizer has been a high volume clean cargo handled across Indian ports. India imports both fertilizer raw materials (such as phosphate rocks) and finished fertilizers. Chennai port has handled around ~0.2 Mn MT of finished fertilizer cargo in 2015, and can further grow fertilizer volumes by attracting importers to use Chennai port due to better productivity.

Key Findings

The hinterland of Chennai port accounts for ~2.4 Mn MT of fertilizer volumes. Chennai's share of the hinterland volumes is less than 10%. Chennai has historically never been favored for fertilizer handling by the fertilizer importers. The private ports of Krishnapatnam and Karaikal account for around 75% of the total fertilizer handling of the overall fertilizer import, which has declined over the years due to restrictions on fertilizer movement subsidies. Chennai is at a proximity to the high fertilizer consumption districts of Kanchipuram, Tiruvannamalai, Krishnagiri, etc. Chennai is also the closest port for consumption centers accounting for 0.5-0.7 Mn MT of fertilizer consumption. Hence, Chennai can potentially capture a large volume share of the hinterland cargo.

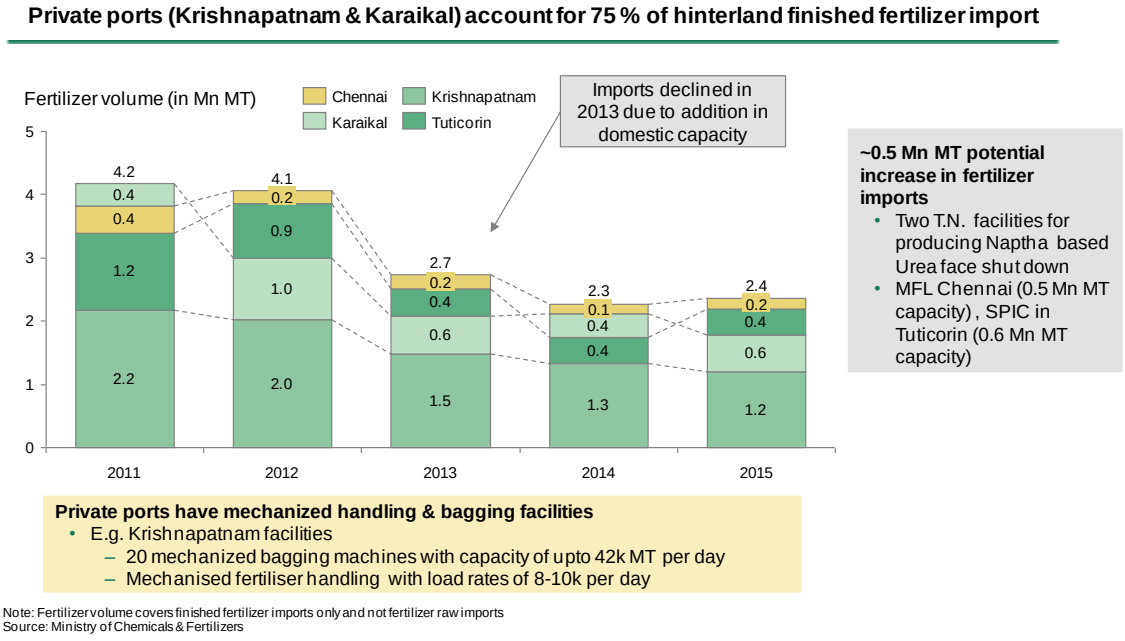


Figure 184: Share of hinterland fertilizer cargo

The private ports have developed mechanized handling and bagging facilities for fertilizers. The load rate of Krishnapatnam port is 8,000-10,000 MT per day per berth as compared to ~5,900 MT per day per berth in Chennai. Krishnapatnam also has a bagging plant housing 20 mechanized bagging machines with capacity of up to 42,000 MT per day.

Recommendations

Productivity of fertilizer handling facility at the Chennai port can be improved by mechanization of fertilizer handling facility at the port. Mechanized unloading of fertilizer from ships to conveyor belts can increase productivity by ~40% to match Krishnapatnam's productivity levels. To complement mechanical handling, the Chennai port should look to create mechanical bagging facility. As Chennai can realistically capture 0.5-0.7 Mn MT of fertilizer cargo, the port should aim to attract investment for development of a bagging plant of capacity 0.5 Mn MT. Chennai is also well connected by rail network to the hinterland areas and distribution centers. Evacuation of rail can be explored further. The bagging plant must be located in the vicinity of the existing rail yard.

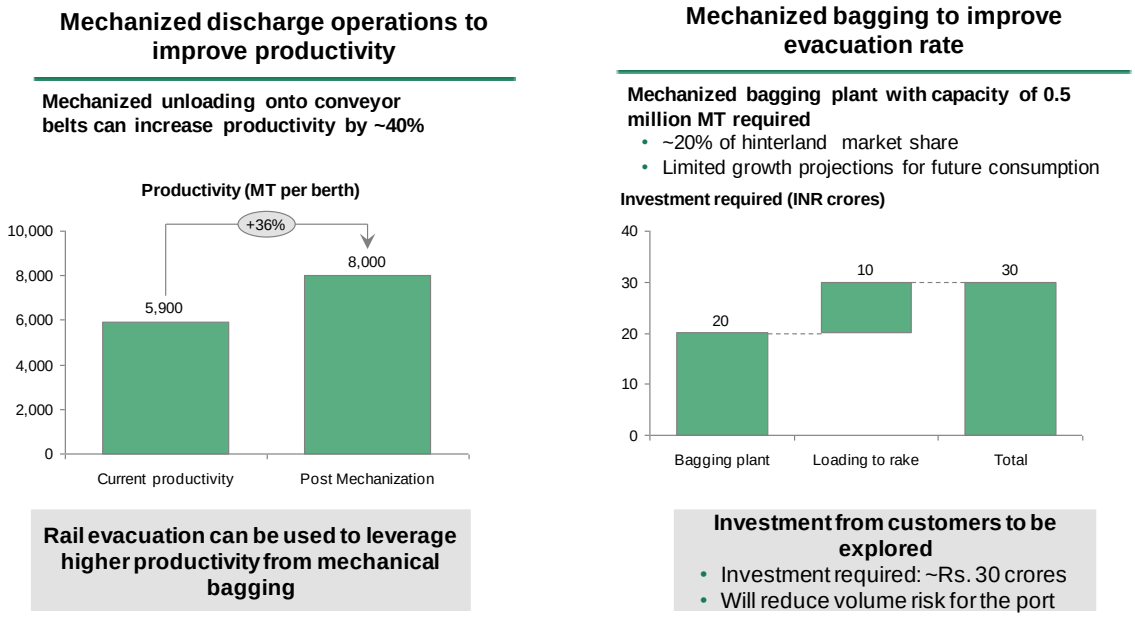


Figure 185: Mechanization of fertilizer handling

The port should reach out to the fertilizer importers for seeking investment in the fertilizer plant. The port will be required to offer land on long term lease and other related infrastructure – access to road and prefereably rail for the plant at a subsidized rate.

Expected Impact

The investment required for developing the mechanized facility to handle fertilizers is around Rs. 30 crores. The port can invest in developing the facility, but this would result in all the volume risk being borne by the port. Instead, the port should explore opportunities to have a private investor develop the bagging plant at the port. Added value from the additional fertilizer traffic is estimated to be around Rs. 2 Cr.

Appendix 2 – **Port Capacity Analysis of Chennai Port**

Port capacity analysis of Chennai Port

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Background 1
Objective 1
Current Situation 2
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Rated capacity of Chennai port 4
Productivity of port 5
    Under-utilized projects 5
    Upcoming capacity 5
Traffic projections and future capacity 6
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ANNEXURE 3 – Detailed calculations for berth-wise capacity ratings 10

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Port capacity analysis of Chennai Port Background

BACKGROUND

Ministry of Shipping introduced in 2016 the Berthing Policy for Dry Bulk Cargo for Major Ports[1] (henceforth referred to as "berthing policy document for dry bulk") provides a standardized framework for calculation of capacity norms for berths handling dry bulk cargo. The approach is based on the specific commodity being handled along with the equipment available on the berth. The current document extends the guidelines to cover other cargo types in addition to dry bulk (containers, break bulk and liquid) to provide a more comprehensive framework for calculation of the port capacity. The approach followed for rating of different types of berths are provided in Annexure 2 of the document.

OBJECTIVE

- To rate the current capacity of port based on guidelines provided in Berthing Policy for Dry Bulk Cargo for Major Ports, 2016. To calculate the total cargo handling capacity based on capacity rating of all berths handling different types of commodities including container, liquid and general cargo (break bulk and dry bulk).
- To streamline and maintain consistency in the capacity rating process across the major ports
- To calculate the total cargo handling capacity based on ongoing and priority projects to decide a course of action on future capex investment

1 Notified on June 16, 2016

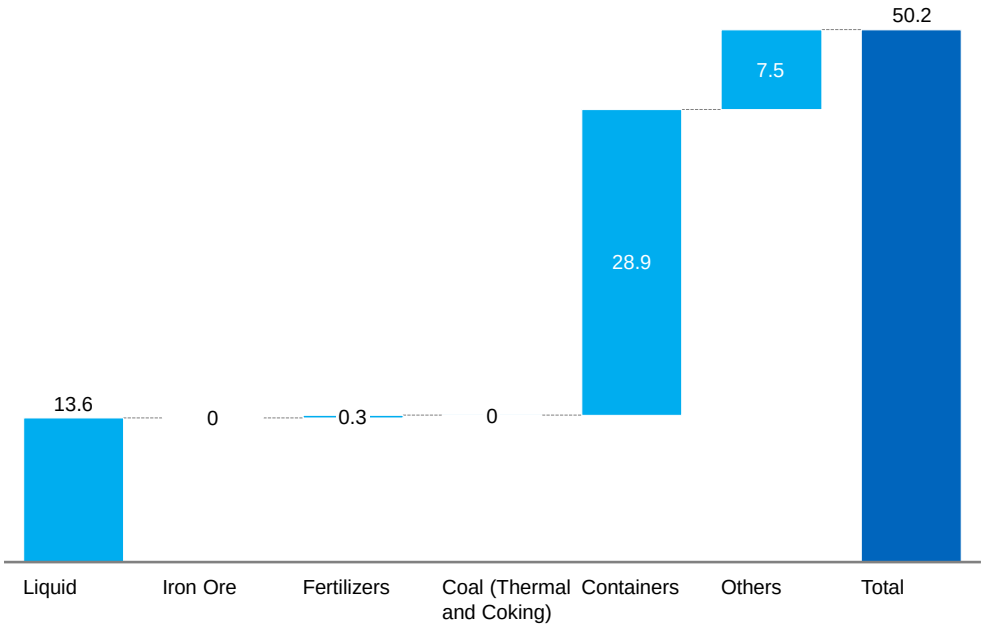
CURRENT SITUATION

In FY 16-17, Chennai port handled 50.2 Mn tons of traffic and witnessed an overall occupancy of ~50%. The major commodities handled are containers and liquid cargo (majorly P.O.L.), which make up >80% of the total traffic. The commodity split of the traffic in FY16-17 was:

EXHIBIT 1

Traffic handled at Chennai Port between April 2016 and March 2017

MTPA

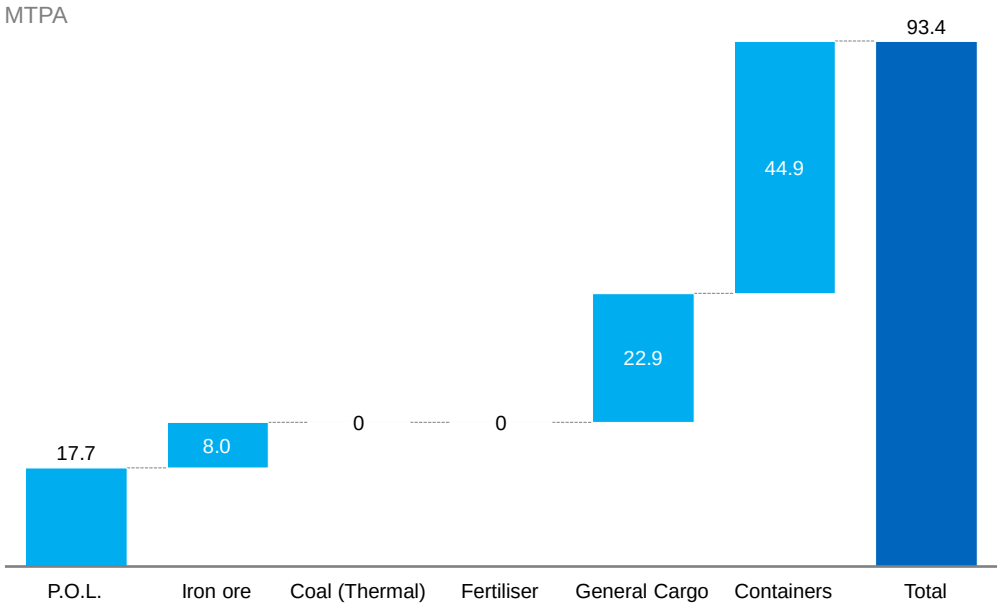


As per the capacity published by the Ministry of Shipping, Chennai port's capacity is 93.4 MTPA[2] with the following commodity-wise split:

[2] As of March 31, 2017

EXHIBIT 2

Commodity wise capacity of Chennai port as on March 31, 2017
(as published by Ministry of Shipping)



KEY DEFINITIONS

The definitions of key terminology used in the document:

- Rated capacity: Rated capacity refers to the annual traffic that can be handled by port with all equipment running at highest possible productivity and 100% occupancy

$$Rated\ capacity = f(100\%\ berth\ occupancy, sustainable\ average\ equipment\ productivity)$$

- Usable capacity: Usable capacity is at 70% (in case of non-containerized cargo) and 85% (in case of containerized cargo due to pre-determined scheduling) of rated capacity to reflect sustainable occupancy rates
- Productivity index: Productivity index reflects the productivity performance of the port and is defined by the following equation:

$$Productivity\ index\ (PI) = \frac{Annual\ traffic\ handled}{Rated\ capacity \times Current\ ccupancy}$$

- Expandable capacity: Refers to additional berth capacity that can be augmented through equipment upgradation or installation of new equipment.

The following exhibit provides and illustrative example,

Example of productivity index calculation
Traffic handled = 30 MTPA Current occupancy = 50% Rated capacity = 100 MTPA PI = 30/(100 × 50%) = 0.6

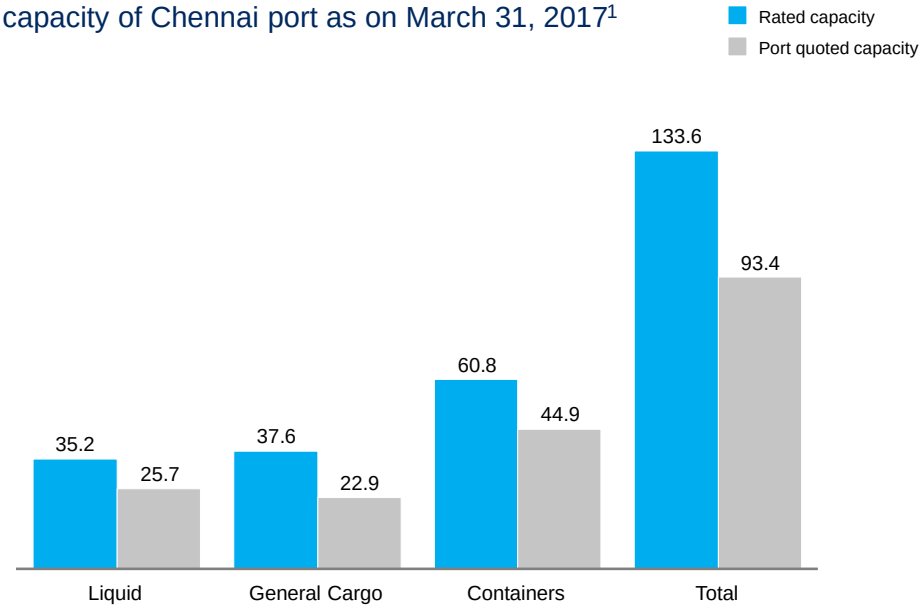
RATED CAPACITY OF CHENNAI PORT

Based on the guidelines provided in Annexure 2, the rated capacity[3] of Chennai port comes out to 133.6 MTPA. The commodity split of rated capacity is as follows:

EXHIBIT 3

Rated capacity of Chennai port as on March 31, 2017[1]

MTPA



1 Included Port Quoted Iron Ore in Liquid as BD2 handles Edible Oil instead of iron ore,

The detailed calculation methodology is provided in Annexure 3. The usable capacity based on sustainable occupancy rate of 70% (for non-containerized cargo) and 85% (for containerized cargo) is 102.6 MTPA while the productivity index is of the port ~0.74

[3] As on March 31, 2017

PRODUCTIVITY OF PORT[4]

The commodity-wise productivity index of the port is shown below:

Commodity	Rated capacity (MTPA)	Port Quoted (MTPA)	Traffic FY16-17 (MTPA)	Occupancy	Productivity Index
General Cargo	37.60	22.92	7.58	55%	0.39
Liquid	35.22	17.67	12.63	68%	0.53
Container	60.77	44.85	23.77	35%	1+

The productivity index for general cargo berths and liquid berths is low (< 0.5) and have scope for improvement.
Overall Turn Round Time (TRT) increased by 10% from FY16 to FY17 driven by increase in liquid bulk and dry bulk. The increase in TRT is driven by two factors - Increase in PBD (dry bulk and liquid bulk) and increase in parcel size (observed across dry bulk and liquid bulk)

The berth-wise productivity index is as follows:

Commodity	Berths	Rated (MTPA)	Traffic (MTPA)	Occupancy	Productivity Index
General Cargo	NQ	1.04	0.16	66%	0.24
	WQ 1-4	8.28	1.04	49%	0.26
	CQ	2.21	0.34	45%	0.34
	SQ 1-2	4.00	0.61	61%	0.25
	JD 1-6	22.07	5.91	56%	0.48
Liquid	BD1	6.71	2.01	62%	0.48
	BD2	2.83	0.88	75%	0.41
	BD3	25.69	9.97	68%	0.57
Container	SCB1-3	29.50	16.35	48%	1+
	CTB1-4	31.27	12.47	25%	1+

Under-utilized projects

There are no underutilized projects at the port.

Upcoming capacity

Expandable capacity

There are no equipment upgradation/installation projects.

[4] Berth-wise traffic has been sourced from the port's vessel call logs, berth-wise occupancy has been sourced from the port's presentation at Goa review meeting held on May18-19, 2017

Ongoing projects (new berth construction)

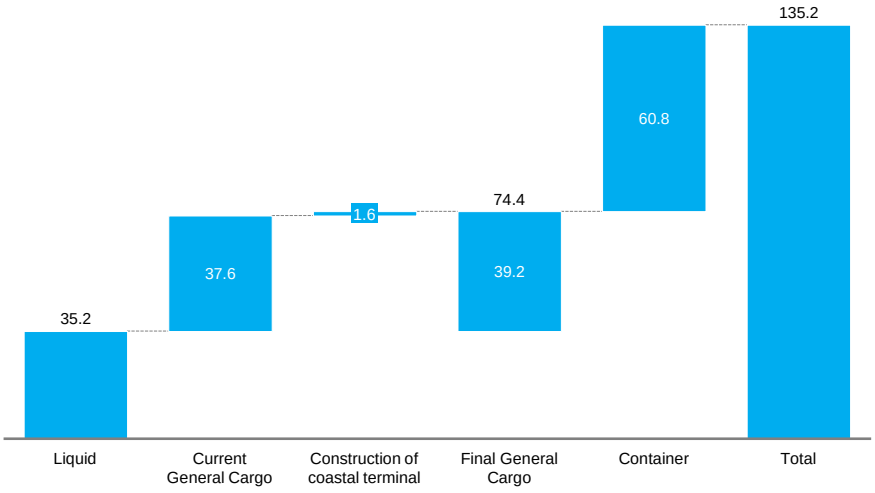
Projects	Cargo	MTPA
Construction of coastal terminal	General cargo	1.62

Based on the above projects, the port capacity is projected to have a total rated capacity of 135.2 MTPA. The commodity wise split-up will be as follows:

EXHIBIT 4

Commodity-wise capacity after implementation of ongoing and upcoming projects

MTPA



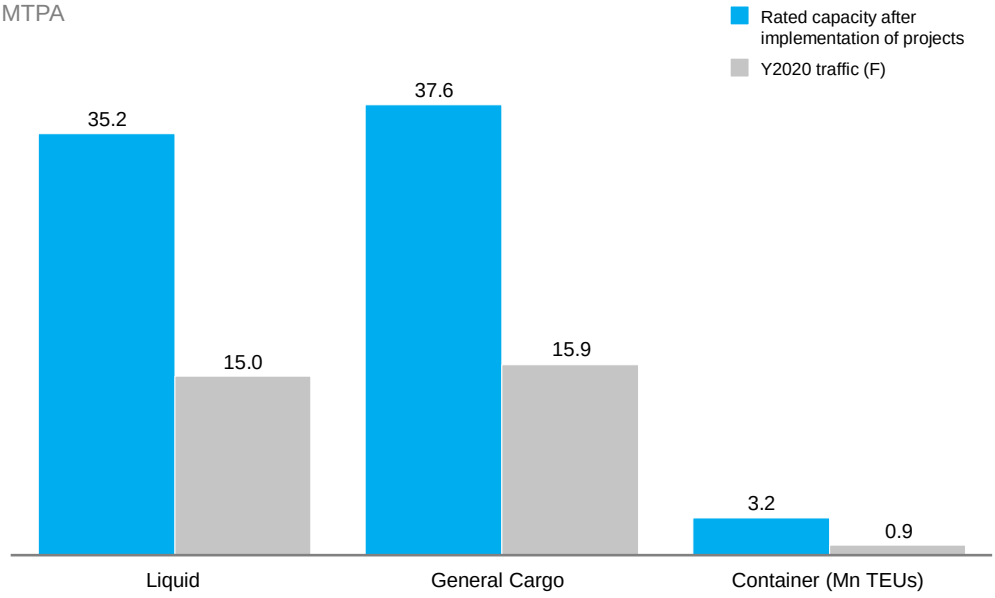
TRAFFIC PROJECTIONS AND FUTURE CAPACITY

The traffic projections for 2020 are as follows:

EXHIBIT 5

Port capacity after completion of current and ongoing projects can easily handle projected Y2020 traffic

MTPA



In view of the current and upcoming capacity, Chennai Port need not invest in any additional capex for capacity creation beyond the upcoming and ongoing projects.

ANNEXURE 1 – Equipment List Considered

The following equipment and their berth mapping has been considered for the calculation of rated capacity as of March 31, 2017

Berth	Berth Equipment, as on March 31, 2017
NQ	1 Ship Gear
WQ1	1 Ship Gear for Edible Oil 2 Ship Gear for POL
WQ2	1 Ship Gear for POL 2 Ship Gear for General Cargo
WQ3,4	3 Ship Gears
CQ	3 Ship Gears
SQ1	2 Ship Gears (General Cargo), 4 Ship Gears (Dry Bulk)
SQ2	1 Ship Gear for POL 3 Ship Gear for General Cargo
JD1	4 Ship Gears
JD2	4 15MT ELL
JD3	4 Ship Gears
JD5	4 Ship Gears / 2 Ship Gears
JD6	4 Ship Gears
SCB 1-3	7 RMQCs
CTB 1-4	7 RMQCs

ANNEXURE 2 – Re-rating methodology

The re-rating methodology as given in the Berthing Policy for Dry Bulk Cargo for Major Ports, 2016 has been modified and extended to cover cargo types in addition to dry bulk.

Dry Bulk

The guidelines and methodology laid out in the Berthing Policy for Dry Bulk Cargo for Major Ports have been used for calculating the throughput norms for harbor mobile cranes (HMCs), ELL cranes and ship gear.
For fully mechanized ship unloaders/loaders (e.g. gantry grab unloaders) the following methodology has been adopted,

$$Capacity\ (MTPA)\ = N \times TPH \times E \times H \times D$$

where,
N refers to number of ship unloaders/loaders
TPH refers to rated capacity in tons per hour
E refers to efficiency, taken at 60% for unloaders, 75% for loaders
H refers to number of hours in a day, taken as 22.5
D refers to number of days in an year, taken as 365

Containers

$$Container\ terminal\ capacity\ (MTPA) = N\ \times T \times H \times D \times M$$

where,
N refers to number of Quay cranes on berth
T refers to average tons/TEU, taken as 16
H refers to number of hours in a day, taken as 22.5
D refers to number of days in an year, taken as 365
M refers to number of moves/hour, taken as 25

Breakbulk

Rated capacity for break bulk handling by HMCs and ELL cranes is taken at 45% of rated capacity for dry bulk handling

Liquid

For a liquid berth with no liquid arm, capacity is calculated using weighted average of productivity for different liquids handled on the berth in last financial year.

For a liquid berth with liquid arm,

$$Liquid\ berth\ capacity\ (MTPA) = N\ \times E\ \times TPH \times H \times D$$

where,
N refers to number of liquid arms on berth
E refers to the efficiency of liquid arm taken as 70%
TPH refers to weighted average of rated handling (tons per hour) rate for different liquids handled at the berth
H refers to number of hours in a day, taken as 24
D refers to number of days in an year, taken as 365

ANNEXURE 3 – Detailed calculations for berth-wise capacity ratings

1) NQ

S. No.	Particulars	Unit	POL	Edible Oil
1.	Traffic	MTPA	0.12	0.04
2.	Parcel size	T	6000	8000
3.	No. of Ship Calls per Annum	No.	20	5
4.	Handling Rate	TPD	2,700	7,200
5.	Time Required at Port Per Ship			
a.	Handling Time	Days	2.22	1.11
b.	Berthing / De-berthing & Miscellaneous Time	Days	0.25	0.25
	Total Time per Ship	Days	2.47	1.36
6.	Total Berth Days Required	Days	49	7
			56.25	
7.	Berth Days Available per Berth	Days	365	
8.	Number of Berths		1	
9.	Berth Capacity	100%	1.04	

2) WQ 1

S. No.	Particulars	Unit	General Cargo	POL
1.	Traffic	MTPA	0.2	0.16
2.	Parcel size	T	8000	6000
3.	No. of Ship Calls per Annum	No.	25	27
4.	Handling Rate	TPD	5,400	3,600
5.	Time Required at Port Per Ship			
a.	Handling Time	Days	1.48	1.67
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25	0.25
	Total Time per Ship	Days	1.73	1.92
6.	Total Berth Days Required	Days	43	51
			94	
7.	Berth Days Available per Berth	Days	365	
8.	Number of Berths		1	
9.	Berth Capacity	100%	1.39	

3) WQ 2

S. No.	Particulars	Unit	General Cargo	POL
1.	Traffic	MTPA	0.09	0.04
2.	Parcel size	T	8000	6000
3.	No. of Ship Calls per Annum	No.	11	7
4.	Handling Rate	TPD	5,400	3,600
5.	Time Required at Port Per Ship			
a.	Handling Time	Days	1.48	1.67
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25	0.25
	Total Time per Ship	Days	1.73	1.92
6.	Total Berth Days Required	Days	19	13
			32	
7.	Berth Days Available per Berth	Days	365	
8.	Number of Berths		1	
9.	Berth Capacity	100%	1.47	

4) WQ3

S. No.	Particulars	Unit	General Cargo
1.	Traffic	MTPA	0.52
2.	Parcel size	T	25,000
3.	No. of Ship Calls per Annum	No.	21
4.	Handling Rate	TPD	8,100
5.	Time Required at Port Per Ship		
a.	Handling Time	Days	3.09
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25
	Total Time per Ship	Days	3.34
6.	Total Berth Days Required	Days	69
7.	Berth Days Available per Berth	Days	365
8.	Number of Berths		1
9.	Berth Capacity	100%	2.73

5) WQ 4

S. No.	Particulars	Unit	General Cargo
1.	Traffic	MTPA	0.20
2.	Parcel size	T	20,000
3.	No. of Ship Calls per Annum	No.	10
4.	Handling Rate	TPD	8,100
5.	Time Required at Port Per Ship		
a.	Handling Time	Days	2.47
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25
	Total Time per Ship	Days	2.72
6.	Total Berth Days Required	Days	27
7.	Berth Days Available per Berth	Days	365
8.	Number of Berths		1
9.	Berth Capacity	100%	2.68

6) CQ

S. No.	Particulars	Unit	General Cargo
1.	Traffic	MTPA	0.38
2.	Parcel size	T	6,000
3.	No. of Ship Calls per Annum	No.	63
4.	Handling Rate	TPD	8,100
5.	Time Required at Port Per Ship		
a.	Handling Time	Days	0.74
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25
	Total Time per Ship	Days	0.99
6.	Total Berth Days Required	Days	63
7.	Berth Days Available per Berth	Days	365
8.	Number of Berths		1
9.	Berth Capacity	100%	2.21

7) SQ1

S. No.	Particulars	Unit	General Cargo	Other Dry bulk
1.	Traffic	MTPA	0.25	0.25
2.	Parcel size	T	8,000	25,000
3.	No. of Ship Calls per Annum	No.	31	10
4.	Handling Rate	TPD	5,400	18,000
5.	Time Required at Port Per Ship			
a.	Handling Time	Days	1.48	1.39
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25	0.25
	Total Time per Ship	Days	1.73	1.64
6.	Total Berth Days Required	Days	54	16
			70	
7.	Berth Days Available per Berth	Days	365	
8.	Number of Berths		1	
9.	Berth Capacity	100%	2.59	

8) SQ2

Particulars	Unit	General Cargo	POL
Traffic	MTPA	0.05	0.13
Parcel size	T	8,000	12,000
No. of Ship Calls per Annum	No.	6	11
Handling Rate	TPD	8,100	3,600
Time Required at Port Per Ship			
Handling Time	Days	0.99	3.33
Berthing / Deberthing & Miscellaneous Time	Days	0.25	0.25
Total Time per Ship	Days	1.24	3.58
Total Berth Days Required	Days	8	39
		47	
Berth Days Available per Berth	Days	365	
Number of Berths		1	
Berth Capacity	100%	1.41	

9) JD1

S. No.	Particulars	Unit	Dry Bulk
1.	Traffic	MTPA	0.59
2.	Parcel size	T	25,000
3.	No. of Ship Calls per Annum	No.	24
4.	Handling Rate	TPD	12,849
5.	Time Required at Port Per Ship		
a.	Handling Time	Days	1.95
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25
	Total Time per Ship	Days	2.20
6.	Total Berth Days Required	Days	52
			52
7.	Berth Days Available per Berth	Days	365
8.	Number of Berths		1
9.	Berth Capacity	100%	4.16

10) JD2

S. No.	Particulars	Unit	Limestone	Other Dry bulk
1.	Traffic	MTPA	1.51	1.01
2.	Parcel size	T	40,000	25,000
3.	No. of Ship Calls per Annum	No.	38	40
4.	Handling Rate	TPD	14,605	11,867
5.	Time Required at Port Per Ship			
a.	Handling Time	Days	2.74	2.11
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25	0.25
	Total Time per Ship	Days	2.99	2.36
6.	Total Berth Days Required	Days	113	95
			208	
7.	Berth Days Available per Berth	Days	365	
8.	Number of Berths		1	
9.	Berth Capacity		4.42	

11) JD3

S. No.	Particulars	Unit	Dry Bulk
1.	Traffic	MTPA	0.54
2.	Parcel size	T	45,000
3.	No. of Ship Calls per Annum	No.	12
4.	Handling Rate	TPD	12,691
5.	Time Required at Port Per Ship		
a.	Handling Time	Days	3.55
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25
	Total Time per Ship	Days	3.80
6.	Total Berth Days Required	Days	46
7.	Berth Days Available per Berth	Days	365
8.	Number of Berths		1
9.	Berth Capacity	100%	4.33

12) JD4

S. No.	Particulars	Unit	General Cargo	Dry Bulk
1.	Traffic	MTPA	0.30	0.39
2.	Parcel size	T	8,000	25,000
3.	No. of Ship Calls per Annum	No.	38	16
4.	Handling Rate	TPD	5,400	18,000
5.	Time Required at Port Per Ship			
a.	Handling Time	Days	1.48	1.39
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25	0.25
	Total Time per Ship	Days	1.73	1.64
6.	Total Berth Days Required	Days	65	26
			90	
7.	Berth Days Available per Berth	Days	365	
8.	Number of Berths		1	
9.	Berth Capacity		2.78	

13) JD5

S. No.	Particulars	Unit	General Cargo	Dry Bulk
1.	Traffic	MTPA	0.32	0.58
2.	Parcel size	T	8,000	25,000
3.	No. of Ship Calls per Annum	No.	40	23
4.	Handling Rate	TPD	5,400	18,000
5.	Time Required at Port Per Ship			
a.	Handling Time	Days	1.48	1.39
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25	0.25
	Total Time per Ship	Days	1.73	1.64
6.	Total Berth Days Required	Days	69	38
			107	
7.	Berth Days Available per Berth	Days	365	
8.	Number of Berths		1	
9.	Berth Capacity	100%	3.06	

13) JD6

S. No.	Particulars	Unit	Dry Bulk
1.	Traffic	MTPA	0.75
2.	Parcel size	T	25,000
3.	No. of Ship Calls per Annum	No.	30
4.	Handling Rate	TPD	10,000
5.	Time Required at Port Per Ship		
a.	Handling Time	Days	2.50
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25
	Total Time per Ship	Days	2.75
6.	Total Berth Days Required	Days	83
			83
7.	Berth Days Available per Berth	Days	365
8.	Number of Berths		1
9.	Berth Capacity	100%	3.32

14) BD1

S. No.	Particulars	Unit	Crude	POL
1.	Traffic	MTPA	0.19	1.81
2.	Parcel size	T	50,000	16,000
3.	No. of Ship Calls per Annum	No.	4	113
4.	Handling Rate	TPD	63,000	23,625
5.	Time Required at Port Per Ship			
a.	Handling Time	Days	0.79	0.68
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25	0.25
	Total Time per Ship	Days	1.04	0.93
6.	Total Berth Days Required	Days	4	105
			109	
7.	Berth Days Available per Berth	Days	365	
8.	Number of Berths		1	
9.	Berth Capacity	100%	6.71	

15) BD2

S. No.	Particulars	Unit	POL
1.	Traffic	MTPA	0.86
2.	Parcel size	T	8,000
3.	No. of Ship Calls per Annum	No.	108
4.	Handling Rate	TPD	10,238
5.	Time Required at Port Per Ship		
a.	Handling Time	Days	0.78
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25
	Total Time per Ship	Days	1.03
6.	Total Berth Days Required	Days	111
7.	Berth Days Available per Berth	Days	365
8.	Number of Berths		1
9.	Berth Capacity	100%	2.83

16) BD3

S. No.	Particulars	Unit	POL	Crude
1.	Traffic	MTPA	0.25	9.70
2.	Parcel size	T	16,000	100,000
3.	No. of Ship Calls per Annum	No.	16	97
4.	Handling Rate	TPD	23,625	94,500
5.	Time Required at Port Per Ship			
a.	Handling Time	Days	0.68	1.06
b.	Berthing / Deberthing & Miscellaneous Time	Days	0.25	0.25
	Total Time per Ship	Days	0.93	1.31
6.	Total Berth Days Required	Days	14	127
			141	
7.	Berth Days Available per Berth	Days	365	
8.	Number of Berths		1	
9.	Berth Capacity	100%	25.69	

16) SCB 1-3

S. No.	Particulars	PSA Terminal
1.	Annual Throughput weight - TEUs per annum	759,672
2.	Parcel size (TEUs)	2,000
3.	No. of Ship Calls per Annum	380
	Rated Crane Capacity	25
	Crane Efficiancy factor	1.0
	TEUs handling per day per Crane	726
4.	Handling Rate - TEUs/day	
	1 cranes per berth - 100% efficiency (factor 1.0)	726
	2 cranes per berth - Factor (1.0 +1.0)	1,451
	3 cranes per berth - Factor (1.0 +1.0+0.9)	2,104
	4 cranes per berth - Factor (1.0 +1.0+1.0 +0.33)	2,416
5.	Time Required at Port Per Ship (Days)	
	Number of Cranes per Berth (1 to 4 Cranes/berth)	4
a.	Handling Time	
	Ship Cargo Handling Time	0.83
b.	Berthing / Deberthing & Miscellaneous Time	0.17
	Total Time per Ship (Days)	0.99
6.	Total Berth Days Required	378
7.	Berth Days Available per Berth	365
8.	Berth Occupancy Calculated	103%
9.	Number of Berths	3
11.	Berth Capacity (TEUs per annum)	2,202,404

Berth	Capacities (Mn TEUs)
SCB 1	527,200
SCB 2	495,972
SCB 3	505,157
Total	1,528,329

17) CTB 1-4

S. No.	Particulars	CTB
1.	Annual Throughput - TEUs per annum	770,021
2.	Parcel size (TEUs)	2,200
3.	No. of Ship Calls per Annum	350
	Rated Crane Capacity	25
	Crane Efficiancy factor	1.0
	TEUs handling per day per Crane	726
4.	Handling Rate - TEUs/day	
	1 cranes per berth - 100% efficiency (factor 1.0)	726
	2 cranes per berth - Factor (1.0 +0.75)	1,270
	3 cranes per berth - Factor (1.0 +1.0+0.9)	2,104
	4 cranes per berth - Factor (1.0 +1.0+0.9 +0.9)	2,757
5.	Time Required at Port Per Ship (Days)	
	Number of Cranes per Berth (1 to 4 Cranes/berth)	2
a.	Handling Time	
	Ship Cargo Handling Time	1.73
b.	Berthing / Deberthing & Miscellaneous Time	0.25
	Total Time per Ship (Days)	1.98
6.	Total Berth Days Required	694
7.	Berth Days Available per Berth	365
8.	Berth Occupancy Calculated	190%
9.	Number of Berths Proposed	4
10.	Berth Occupancy Proposed	100%
11.	Annual Throughput Estimated(TEUs per annum)	1,620,179
12.	Container Quay Length(m)	885
13.	Container Throughput per meter berth	1,831
14.	Total Quay Canes Provided	7

Berth	Capacity (Mn TEUs)
CTB 1	366,142
CTB 2	366,142
CTB 3	366,142
CTB 4	521,753
Total	1,620,179