MASTER PLAN FOR NEW MANGALORE PORT

Master Plan for New Mangalore Port

Prepared for

Ministry of Shipping / Indian Ports Association

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1.0 INTRODUCTION

1.1 Background

The Sagarmala initiative is one of the most important 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.

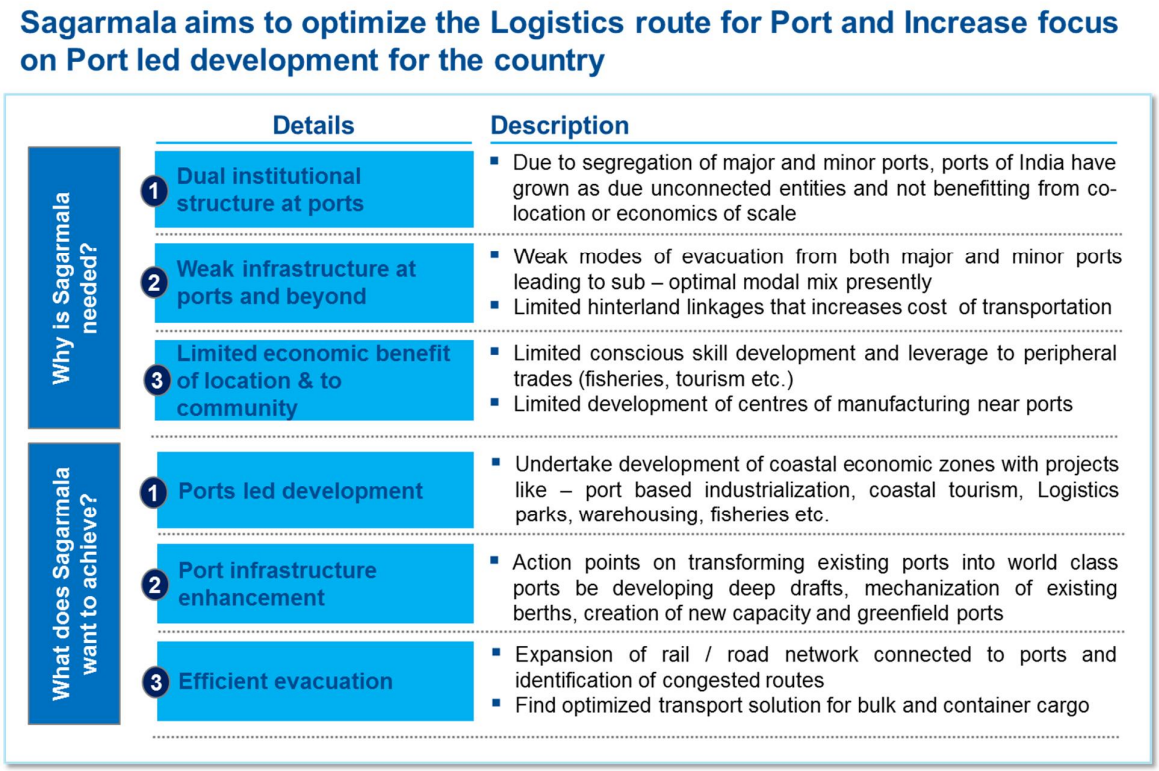


Figure 1.1 Aim of Sagarmala Development

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 from 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**.

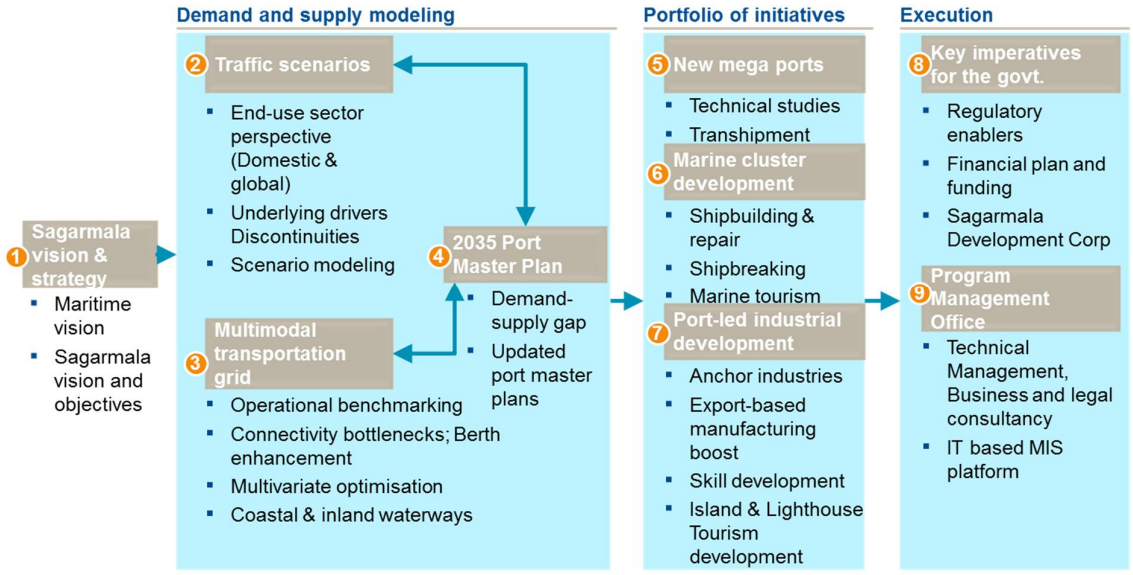


Figure 1.2 Governing Principles of Approach

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

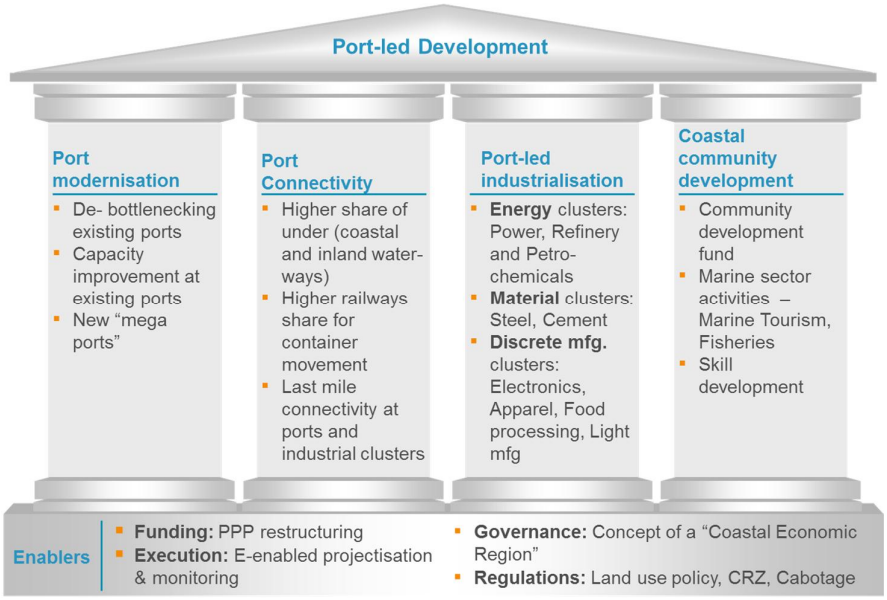


Figure 1.3 Port Led Developments

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

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

1.3 Present Submission

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

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

2.0 THE PORT AND SITE CONDITIONS

2.1 New Mangalore Port

New Mangalore Port was declared as 9th Major Port on May 4, 1974. It is located on the West Coast of India and out of 12 major ports of India; it is the only major Port in the state of Karnataka.

The coordinates of port are Latitude 12° 55' North and Longitude 74°48' East (**Figure 2.1)**.

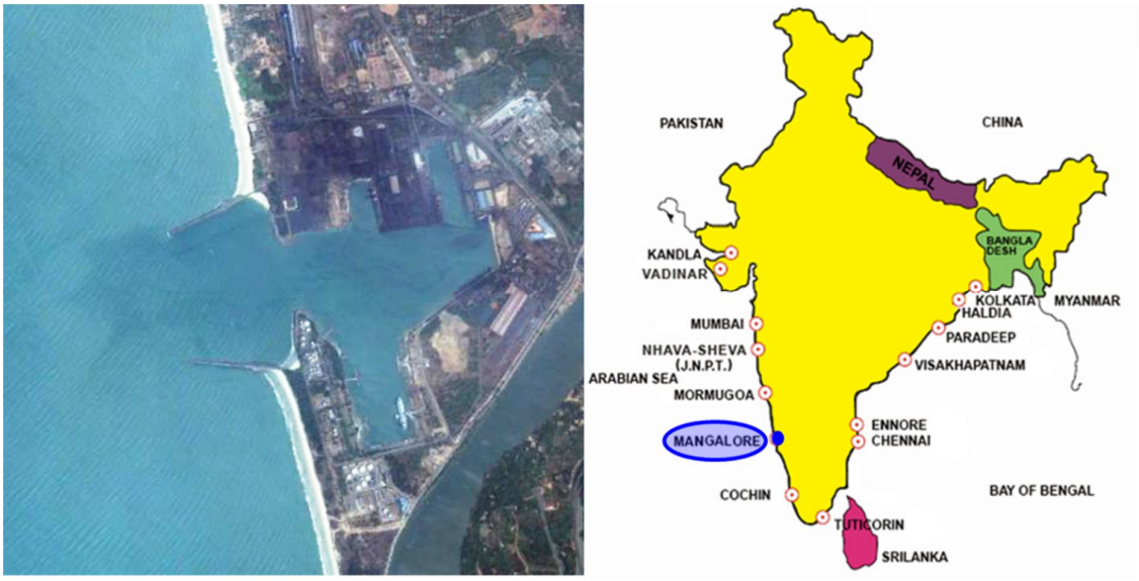


Figure 2.1 New Mangalore Port Location

New Mangalore Port is a lagoon type harbour with a long approach channel artificially created by dredging. The Port is a modern all-weather port situated at Panambur, Mangalore (Karnataka state in south India), on the West Coast of India, 170 nautical miles south of Mormugao and 191 nautical miles north of Cochin Port.

The port comprises three dock systems viz. Eastern Dock arm, Oil Dock arm and the western dock arm; it has in all 15 berths. The maximum draft available is 14.0 m at some of these berths. The port is approached through a 7.5 km long channel with water depths in the outer channel being 15.4 m and that of the inner channel being 15.1 m. The Port has a total land area of approximately 822 ha and water spread area of 120 ha.

2.2 Rail and Road Connectivity

2.2.1 Road Connectivity

The Port is connected with 3 National Highways. The main road networks connecting the hinterland to Mumbai Port are as follows:

- **NH-66 connecting Kochi – Mangalore – Goa – Mumbai**

  The National Highway NH 66 stretches from Kochi to Mumbai linking many important cities and towns in its route. The south bound cargo utilizes this route. NH 66 is a four lane road and part of the stretch is two lane roads which are being widened to 4 lanes with a provision to expand to six lanes to accommodate future expansions.

- **NH-75 connecting Bangalore – Hassan - Mangalore**

  The NH 75 connects directly Mangalore to Bangalore via Hassan. This road serves the requirement of eastern and southern Karnataka. National Highway 75 is getting widened and upgraded to the 60-meters wide, 4-lane highway.

- **NH-50 connecting Mangalore – Shimoga – Chitradurga – Bijapur – Sholapur**

  NH 50 aligned north-east connects Mangalore to Sholapur. The north bound traffic utilises this route. This highway is a 2 lane highway which is undergoing upgradation to 4 lanes.

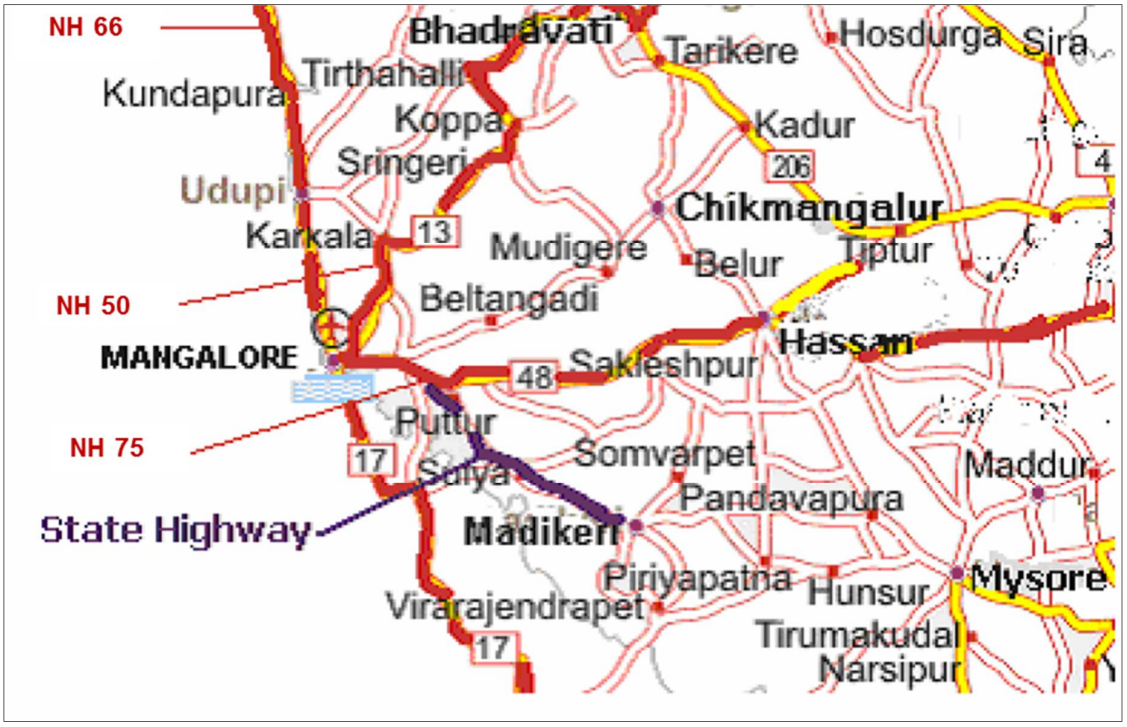


Figure 2.2 Road Connectivity to New Mangalore Port

2.2.2 Rail Connectivity

New Mangalore Port is connected to the Indian Railway Network through Southern Railway, South Western Railway and Konkan Railway. The Railway Marshalling Yard at Panambur, inside the New Mangalore Port, is a part of the Southern Railway. This is connected to the Konkan rail network at Thokur providing access to Mumbai via Coastal Karnataka and Goa and to the South Western railway at Kankanady providing access to the Karnataka heartland and Bangalore and Mysore via Hassan and to Kerala through the southern railway. The rail connectivity to New Mangalore Port is as shown in **Figure 2.3**.

Figure 2.3 Rail Connectivity to New Mangalore Port

2.3 Site Conditions

2.3.1 Meteorology

The climate at Mangalore is governed by the monsoons. During the months June-September, the south-west monsoon occurs. The later period is often indicated as the post-monsoon period.

2.3.1.1 Winds

Wind in Mangalore during monsoon months of June, July and August are predominantly from south-west and west with a maximum intensity of 5 on the Beaufort scale.

2.3.1.2 Rainfall

The average annual rainfall is approximately 3,467 mmm. The rainfall is concentrated in the SW monsoon (June, July, August and September). During this period, the average rainfall is as much as 84% of the total annual rainfall. The maximum rainfall is observed to be in July (1,102.7 mm), and it decreases gradually to 1.9 mm in February.

2.3.1.3 Temperature

Mangalore experiences moderate temperature throughout the year. The temperature varies from 22° C to 36° C. The low temperature occurs during south west monsoon in December and January. The hottest months are from March to May. The mean temperature in the hottest month, before the onset of SW monsoon, is from 33° C to 37° C and lowest temperature recorded is 16.7° C.

2.3.1.4 Visibility

Generally visibility is excellent except for a few days during monsoon. During SW monsoon, thick haze develops in Mangalore with a maximum of 3 no. of foggy days.

2.3.1.5 Cyclones

While the average frequency of cyclonic storms in the Arabian Sea is about one per year, there have been years when two or three such storms have occurred. There have also been years without any storms. The maximum wind speed so far recorded has not exceeded 62 kmph (16.9 m/s), except once during 1965 when the maximum speed recorded was 97 kmph (26.9 m/s).

2.3.1.6 Relative Humidity

The humidity is high throughout the year. From June to September during monsoon the humidity ranges from 90% to 100%. From October to January it comes down to 50% to 70%. During summer months of February to May average humidity is about 60%.

2.3.2 Oceanography

2.3.2.1 Waves

The predominant direction of waves at open sea in the vicinity of Mangalore Port during the monsoon months of June, July and August is W and SW whereas the predominant direction during the fair weather months is NW and N. Analysis of the data collected from ships in and around Mangalore revealed that 0.4% of the waves have a height of 4.9 meters above. The wave heights in the non-monsoon months are much less.

Inside the harbour, generally clam conditions prevail throughout the year as is well protected from outside waves by long breakwater on either side of the outer approach channel.

2.3.2.2 Tides

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

	Level wrt CD (m)
Highest High Water Spring (HHWS)	+1.68
Mean Highest High Water (MHHW)	+1.48
Mean Lowest High Water (MLHW)	+1.26
Mean Sea Level (MSL)	+0.95
Mean Lowest Low Water (MLLW)	+0.26
Lowest Low Water Spring (LLWS)	+0.03

2.3.2.3 Currents

The currents along the coast during SW monsoon (from February to September) are generally towards S (from 160° to 200°). During the northeast monsoon (from November to January) the currents are found to be towards N (from 0° to 40° and 320° to 360°).

In the approach channel region covered by breakwater, the current direction lags 6° to 8° behind the coastal currents. The current in the lagoon area further lags behind the approach channel current by another 6°. The subsurface current on an average leads the surface current by 10° to 15°. The magnitude of the current outside the lagoon area during the monsoon season is about 1 to 1.5 knots has been experienced by pilots.

2.3.2.4 Littoral Drift

Seasonal drift distribution has indicated that during NE monsoon, littoral drift is towards N, whereas during SW monsoon and non-monsoon period the drift is towards S. The northwards drift is comparatively less than the southward drift. The average littoral drift in the region is of the order of 0.58 lakh cum towards south during southwest monsoon and non-monsoon period and 0.08 lakh cum towards N in NE monsoon. The average net littoral drift is 0.5 lakh cum per year towards S.

Major portion of siltation in the port occurs during the monsoon months of June to September every year. The quantity of maintenance dredging is of the order of 5 million cum per annum.

2.3.3 Geotechnical Data

As per the available soil investigation data, inside the lagoon at existing turning circle several rock patches exists in the shallow portion which is approximately in the range of -15 m CD to -17 m CD. Soil in this location is composed of medium to stiff clay at the top layers and ends with rock stratum of hard granite rock with approximately 100 MPa. From the entrance of the lagoon area between the seawalls towards the approach channel up to 1.5 km the soil composition is medium sand and stiff clay with hard rock starting from a depth of -18 m CD. In the approach channel beyond 1.5 km from the mouth of the lagoon area silty clay material is prominent. As the top layer of the approach channel comprises of a very weak soil slopes of 1:6, 1:10 & 1:20 has been assumed after dredging in the lagoon, breakwater area and in the outer channel areas.

The rock blasting has to be carried out as hard rock patches are starting from a depth of -15 m CD inside the lagoon and from -18 m CD from the mouth of the lagoon up to 1.5 km towards the approach channel.

2.3.4 Topography

The New Mangalore Port located on the alluvial plain, is about 10 km north of the mouth of Gurupur and the Netravathi Rivers. The old port of Mangalore is located at the confluence of these two rivers and is roadstead port. This port is operational only during the fair weather season viz. 15th September to 15th May.

The hinterland of new Mangalore port consists of flat land, rolling and hilly areas. The flat land is mainly utilised as paddy fields and Mangalore city is located in the rolling area.

3.0 DETAILS OF EXISTING FACILITIES

3.1 General

Presently, NMPT handles various POL (IOC/BPCL) , Crude Oil (MRPL), LPG, Fertilizer, Wooden Logs, Edible Oil, Coal, Liquid Ammonia, Phosphoric Acid, Cement, Mechanical Cargos, Limestone, Containerised cargo , Iron Ore Pellets, Iron Ore Fines, Granite stone. All the dry bulk cargo comprising of Coal, Iron Ore, pellets, Gypsum, Food grains etc., are mainly handled through Road and rail network at the marshalling yard. This section discusses facilities at NMPT in detail.

New Mangalore Port has 3 docks.

- Eastern dock arm
- Western dock arm
- Oil dock arm

The location of these docks is shown in the following **Figure 3.1**.

Figure 3.1 Location of the Three Docks of NMPT

The eastern dock comprises of 7 multipurpose berths and western dock with 2 berths. A deep draft multipurpose berth exists between eastern and western dock area. The southern arm comprise of 5 jetties to handle liquid bulk and POL.

The layout plan and locations of various berths are shown in the following **Figure 3.2**.

Figure 3.2 Existing Facilities at New Mangalore Port

3.2 Navigational Channel, Turning Circle

Length of Channel	-	About 7.5 km
Depth of Outer Channel	-	-15.4 m CD
Width of Channel	-	245 m (Side slopes of the navigational channel measures 1:20 from start of the channel up to the breakwater line and 1:10 in the zone from line connecting the breakwater ends and base line).
Turing Circle diameter	-	570 m
Depth of Harbour Basin	-	-15.1 m CD (Side slopes are maintained to 1:6).

3.3 Breakwaters

Two number of rubble mound breakwaters, one each on north and south, with length of 770 m each have been constructed in three stages on either side of the approach channel with an in between distance of 1,362 m at the root. The breakwaters terminate at a depth of about -6.0 m CD.

3.4 Existing Facilities at New Mangalore Port

3.4.1 Berth Details

NMPT has 1 SBM and 15 berths (**Table 3.1**), out of which berth 1 to berth 9 and berth 18 are multi-purpose berths and berth 13 to 17 are handling bulk liquids, POL, Chemicals, LPG and LNG. SBM is dedicated for MRPL to handle crude traffic. Berth 9 is a captive coal berth dedicated to UPCL.

Table 3.1 Berth Details at New Mangalore Port

S. No.	Old Berth No.	Revised Berth No.	Type of Berth	Designed / Actual depth (m)	Quay Length (m)	Max. LOA (m)	Max. DWT (m)	Capacity in MTPA
1.	Berth 1	Berth 1	General & Bulk Cargo /Container / Passenger Vessel	7.0	125	90	4,000	0.75
2.	Berth 2	Berth 2	General & Bulk Cargo / Container /Passenger Vessel	10.50	198	190	30,000	0.90
3.	Berth 3	Berth 3	General & Bulk Cargo / Container /Passenger Vessel	10.30	198	190	30,000	1.4
4.	Berth 4	Berth 4	General & Bulk Cargo /Container /Passenger Vessel / Liquid Ammonia / Phosphoric Acid	9.50	198	190	30,000	1.0
5.	Berth 5	Berth 5	General & Bulk Cargo /Container /Passenger Vessel / Bulk Cement /Edible Oil	9.50	198	190	30,000	2.8
6.	Berth 6	Berth 6	General & Bulk Cargo / Container / Passenger Vessel	9.50	198	190	30,000	1.5
7.	Berth 7	Berth 7	General & Bulk Cargo / Container /Passenger Vessel	9.50	200	190	30,000	1.65
8.	Berth 14	Berth 8	General & Bulk Cargo / Container /Passenger Vessel	14.0	350	300	90,000	6.6
9.	Berth 15	Berth 9	Coal (UPCL)	14.0	300	230	90,000	5.40
10.	Berth 9	Berth 13	LPG/ POL	10.50	330	235	45,000	4.5
11.	Berth 10	Berth 14	Crude Oil / POL	14.00	320	245	85,000	6.5
12.	Berth 11	Berth 15	Crude Oil / POL	14.00	320	245	85,000	6.5
13.	Berth 12	Berth 16	POL / Chemical / Edible Oil	12.50	320	230	50,000	5.87
14.	Berth 13	Berth 17	Crude Oil / POL / LPG / Chemical	14.00	350	245	85,000	7.80
15.	Berth 8	Berth 18	Iron Ore / General & Bulk Cargo	12.50	300	245	60,000	6.60
16.	SPM	SPM	Crude Oil	-	-	-	300,000	18

3.4.2 Berths at Eastern Dock Arm (Berths 1 to 7)

The eastern dock arm has 7 berths. Out of these, berth 1 is a shallow berth with a draft of -7 m CD and is used to handle general cargo and passenger vessels. General cargo is handled in Berth 2 & 3 and is having a dredged depth of 10.5 m.

Berth 4 handles general cargo, phosphoric acid and liquid ammonia. Berth 5 handles general cargo, palm oil, edible oil, cement. Berth 6 & 7 handles bulk cargos. These berths have a dredged depth of -9.5 m CD.

3.4.3 Berth 8

This berth is a deep draft multipurpose handling general cargo. The berth has the dredged depth of -15.1 m CD. About 7 acres of land just behind Berth 8 has been designated for storage for this berth.

3.4.4 Berths at Western Dock Arm (Berth 9)

Berth 9 is a captive berth for Udupi Power Corporation Limited. It is a fully mechanized berth which includes grab unloaders, conveyor belt system connected to stackyard and rail loading silo at the western side marshalling yard. This berth has a capacity of handling 5.4 MTPA which is currently handling about 2.7 MT as per the existing requirement. The area of the stackyard is approximately 5.2 ha.

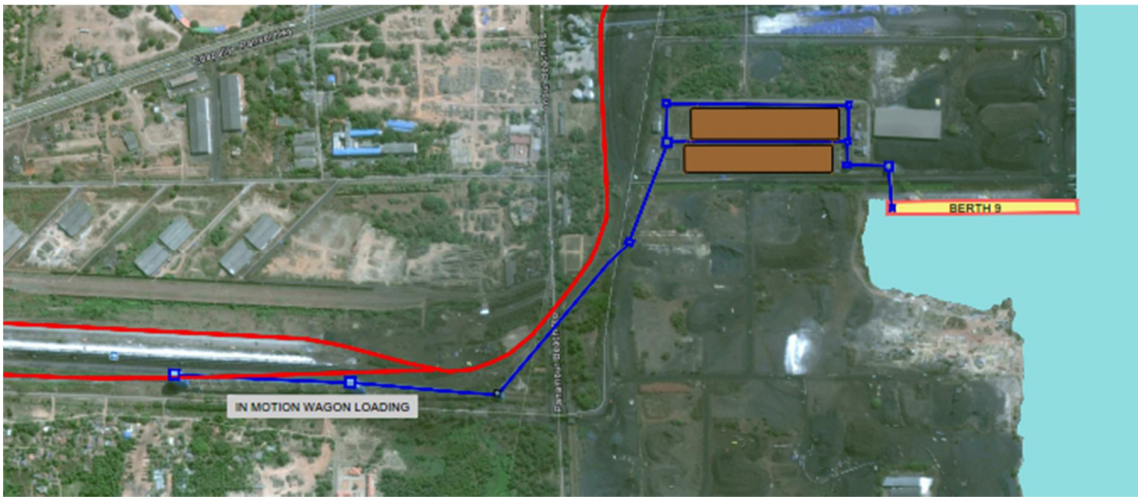


Figure 3.3 Mechanised Coal Handling Arrangement at Berth 9

The berth is equipped with 2 gantry type grab unloaders of 1,600 TPH capacity, associated conveyors of 3,200 TPH and one stacker and one stacker cum reclaimer of 3,200 TPH capacity. The storage yard is connected to the 2 in motion wagon loading system for rail evacuation. The stackyard has the storage capacity of 1.8 lakh T.

3.4.5 Berths at Oil Dock Arm (Berth 13 to 17)

All these berths are dedicated oil berths. POL products are transported through pipeline for MRPL and other oil firms.

3.4.6 Berth 18

This berth is designated for handling Iron ore for Kudremukh iron ore plant and has a capacity of 6.6 MTPA for importing iron ore and exporting pallets.

3.4.7 Offshore Single Buoy Mooring

MRPL have set up a single buoy mooring at about 17.5 km offshore at about 30 m water depth for handling Very Large Crude Carriers up to 330,000 dwt for handling the crude oil imports for their refinery. This has been constructed with an understanding and long relationship with the port. This is connected through submarine pipelines to Booster Pumping Station on the onshore within the NMPT limits and utilizing 0.3 MT capacity of ISPRL's Mangalore Cavern (of 1.5 MT total capacity) as intermediate storage to receive and transfer crude oil from SPM to refinery tankages. The submarine pipeline is of 48" diameter.

3.4.8 Storage Facilities

The port has storage facilities, in the form of an open storage area and closed storage area such as warehouses and silos.

Storage facilities comprise of covered storage area in the form of transit sheds, warehouses and open storage area and tanks for liquid cargo area as presented in **Table 3.2** and **Table 3.3**.

Table 3.2 Details of the Storage Facilities for General Cargo and Containers

Storage Shed	No. of Plots/Sheds	Area (sqm)	Capacity (T)
Transit Shed	2	7,752	19,380
	2	7,000	17,500
Over Flow Sheds	2	7,200	18,000
	1	7,150	16,000
Warehouses	15	53,204	132,720
Container Yard	-	40,000	-
Open Storage for other cargo	-	120,504	-

Few of the sheds are pretty old at this port and in order to augment the closed storage three new storage sheds of 35,000 m^2 with a storage capacity of 10,500 T are currently under construction.

Table 3.3 Details of Storage Facilities for Liquid Cargo

S. No.	Owned By	No.	Area (sqm)	Capacity
1.	IOC	25	99,472	113,000 KL (POL products)
2.	IMC	19	23,878	52,000 KL (Chemicals)
3.	IPWC	8	16,619	52,845 KL (Molasses & Edible Oil)
4.	Universal Agro Exports	3	14,164	128,000 KL (Edible Oil)
5.	MCF	1	12,733	10,000 T (Liquid Ammonia)
6.	MCF	2	12,733	16,000 T (Phosphoric acid)
7.	Mangalore Liquid Impex	2	6,836	7,500 T (Edible Oil)
8.	Ultra Tech	3 (silo)	11,700	15,000 T (Cement)

There are 63 bulk liquid storage tanks including 3 silos for cement storage, out of which 55 storage having the capacity of 154,133 KL and 8 having the capacity of 44,000 T.

3.4.9 Cargo Handling Equipment

S. No.	Description of Equipment	Rated Capacity	No.
1.	Hindustan 2021 Front End Loader	Bucket Capacity of 1.53 m^3	1
2.	Marine Unloading Arm for handling Liquid Ammonia (M/s. Connex, West Germany)	700 TPH Test Pressure Allowable 38 Bars	1 Unit
3.	Handling Equipment for Phosphoric Acid: *Note: The units are installed , operated and maintained by M/s. Mangalore Chemicals & Fertilizers Ltd.*	Working Pressure: 25 bars Diameter : 8“	-
4.	Mechanical Iron Ore Loading Equipment at Kudremukh Iron Ore Berth *Note: This unit is installed, operated and maintained by M/s. KIOCL*	6000 to 8000 TPH	-
5.	Unloading arms for handling Crude & POL products at two OIL jetties (6 nos.in each jetty) (M/s. Nigata Engg. Co. Ltd. Japan) *Note: These unloading arms have been installed, operated and maintained by MRPL.*	Crude: Crude/LSHS/FO: MS/HSD/SKO/ATF: **Total:** Capacity:2000 m^3 /hr Design Pressure: 32 kg/cm^2	2 2 2 **6**
6.	Unloading Arm for handling LPG at the existing oil jetty (M/s. Kanon Loading Equipment, Netherlands) *Note: The unloading arm is installed, operated and maintained by M/s. HPCL.* Another unloading arm has also been installed by M/s. ELS Gas	Capacity: 160-305 m^3/hr: 80-153 m^3/hr: Design Pressure:31 kg/cm^2 Operating Pressure:16-22 kg/cm^2	1 1

3.5 Harbour Craft Facilities

For effective operations and management, the port has good fleet of harbour tugs, pilot and survey vessels. Port owns 5 tugs, 5 mooring launches and 3 pilot launches.

Table 3.4 Details of Floating Crafts

S. No.	Description	Capacity	No.
1.	Tugs	32 T BP	2
		50 T BP	1
		50 T BP	2 (hired)
2.	Pilot Launches	2 × 650 BHP	1
		2 × 600 BHP	1
		2 × 400 BHP	1 (hired)
3.	Mooring Launches	108 BHP	1
		110 BHP	1
		140 HP	2

3.6 Port Railways

New Mangalore Port is connected to the Indian railways network through Southern, South Western and Konkan railways. The marshalling yard located on the northern side of the port at Panambur is operated by the Southern railway (**Figure 3.4**). The yard has 14 broad gauge lines (Line 5 to Line 10), out of which 6 lines of the port are utilised for Receipt and Dispatch of cargos. The marshalling yard is connected to Mangalore Chemicals and Fertilisers Ltd.

Within the secured port boundary there is only 1 rail line (Line 4) running parallel to the boundary wall extended to the dead end of berth 1 to 7 and there are no rail tracks in use on/ for any of the existing terminals. This line is utilised for loading of coal and limestone.

Line 1 to 4 is utilised by KIOCL. Line 11 to 13 is utilised by UPCL for coal loading. MCF has one take off point from the extended coal/ limestone loading line.

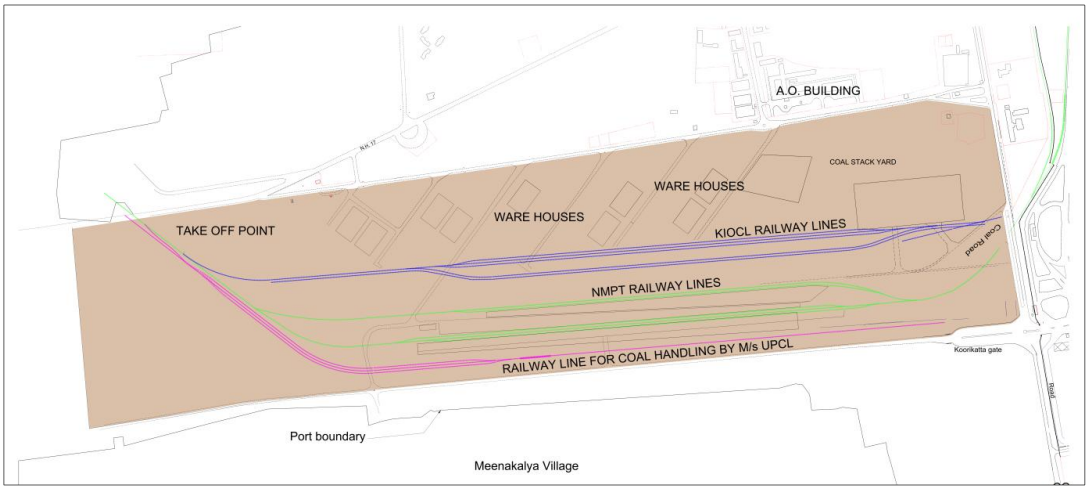


Figure 3.4 Port Internal Rail Connectivity

3.7 Internal Road Connectivity

All cargo is transported by trucks within in the port boundary, due to the lack of rail connectivity at various terminals. Within the secured port boundary wall, there is only one rail track in use which is used for loading coal and limestone. All the terminals are well connected with the internal road network as shown in **Figure 3.5**.

The port has a truck parking area outside the port boundary of 12,000 m^2.

Figure 3.5 Port Internal Road Connectivity

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 (MTPA)

Commodity	2010-11	2011-12	2012-13	2013-14	2014-15
Liquid Bulk	22.49	23.30	25.31	25.61	24.23
Dry Bulk	8.20	8.48	10.75	12.65	11.31
Break Bulk	0.29	0.52	0.29	0.35	0.11
Containers	0.57	0.64	0.69	0.75	0.92
Grand Total	**31.55**	**32.94**	**37.04**	**39.36**	**36.57**

4.2 BCG Benchmarking Study

BCG, as part of their benchmarking study, has looked into the operation of the berths and has suggested various measures for improving the performance. The report of BCG pertaining to New Mangalore Port is given in the **Appendix 1**. Subsequently some of the recommendations were revisited and the final key observations of the study are as follows:

- NMPT has average berth occupancy of 36%. Berth occupancy on general cargo berths is low and only berth 8 is highly utilized. Berth 8 handles mostly coal and fertilizer cargo and is equipped with 2 Private MHCs. Berth occupancy on POL berths is moderate and SPM is 35% occupied.
- Net profits have been declining since 2012 due to higher berthing and mooring costs, and lower cargo handling revenue.
- Cargo volumes decreased by ~2 MT in 2014–2015 due to decrease in iron ore and POL.
- Berth productivity for containers at NMPT is significantly lower than other container handling ports.
- Fertilizer volumes at NMPT have decreased by 30% since 2008-09.

4.2.1 Key Recommendations

As per BCG Report productivity at New Mangalore Port may be improved by following measures:

- Hinterland connectivity
- Install a mobile harbour crane for container handling on a PPP mode to increase productivity by 50%.
- Improving Service level of containers & providing equipment at berth no. 8 for handling containers.
- Setup an LNG terminal in NMPT.
- Setup a mechanized facility for fertilizer handling.
- Reduce overtime cost in marine equipment through 3-shift deployment.

4.2.1.1 Hinterland Connectivity

Hinterland connectivity from NMPT has been the major hindrance in attracting container cargo. Western Ghats have limited hinterland connectivity to customers in Mysore, Madikeri, Hassan, Shimoga and Bangalore.

- 4-lane highway to Mysore via Madikeri is under improvement and is now capable of handling trailers for 40 feet containers.
- Connectivity to Hassan has significantly improved by strengthening of the Shiradi Ghat section.
- 6 lanes of Bangalore Mysore NH 275 have been approved in 2014.
- Rail connectivity to Bellari and Hospet region to improve significantly post construction of missing link from Hubli and Ankola.

4.2.1.2 Install Mobile Harbor Crane for Container Handling

Installation of a quay crane or MHCr to increase productivity by 50%.

- Significant investment required in setting up MHCr and the private party that will setup the MHC needs to recover the investment from cargo volumes. IRR calculations suggest that the crane operator will be able to recover a healthy IRR of 20% on his investment of 40 crores if container traffic reaches 1.5 Lakh TEUs per year.
- Berth productivity will increase from 17 moves per hour to 25 moves per hour, and yard efficiency will ensure seamless feeding at the berth.

Basis the above recommendations port has already planned for privatisation of berth 8 for handling containers.

4.2.1.3 Providing Equipment at Berth No. 8 for Handling Containers

Yard occupancy at NMPT is 95% and is significantly higher than recommended utilization of 75%. On certain days the occupancy is above 100%. This is evident from containers lying on the berth and on the roadside. There is a need to allocate additional yard space of 20,000 sqm to support the increased traffic volumes of 1.5 lakh TEUs per year.

Currently, port owns three reach stackers that are operated by a private party. There is a requirement of 3 RTGC/reach stackers per crane operating at the berth to improve service level of containers.

- 1 RTGC to load the export container.
- 1 RTGC to unload the import container.

At the given time, there are at least 2 vessels cranes operating on the berth and, hence there is a requirement of 6 RTGCs/reach stackers. Since the port currently owns 3 reach stackers, it should invite a third party to invest and operate 3 additional reach stackers. Recommendations are as below:

1. Allocate additional yard space for the container storage.
2. Installing 3 additional reach stackers.

4.2.1.4 Setup an LNG Terminal in NMPT

- MRPL + OMPL: ONGC's two entities have a combined demand of 0.6 MT per year.
- Mangalore Chemicals and Fertilizers operate on Naphtha and have upgraded their equipment to consume LNG. There is a demand of ~0.4 MT per year in the existing plant. Additionally they are planning to setup a new plant of 1 MT of Urea which shall require additional 0.5 MTPA of LNG every year.
- Tannirbhavi Power plant which was recently shifted to Kakinada will return back to Mangalore if an LNG terminal was to setup. The demand from the power plant is expected to be close to 0.4 MTPA.
- Smart City: Mangalore has been declared as a smart city which increases the power requirement of the city and it is expected that an additional demand of 0.4 MTPA will be created.

Setting up of a ~2-2.5 MT LNG terminal at NMPT will result in additional revenues of ~Rs. 25 crores per year to the port.

4.2.1.5 Setup a Mechanized Facility for Fertilizer Handling

Mechanizing the fertilizer handling will avoid double handling and reduce total handling costs by ~ 40% making NMPT attractive for fertilizer imports. Port should setup a mechanized berth on a PPP basis. Shore off loaders to discharge fertilizer on a conveyor which will transport it to silos from where it will be fed into a hopper for the mechanized bagging plant.

Total cost of handling fertilizer from discharge to rake loading is ~Rs. 710/T. There are two inefficiencies in the process driving the cost high:

- Double handling due to lack of storage and bagging facilities inside the port.
- Labour involvement in manual bagging and stitching

NMPT should setup a mechanized berth for fertilizer handling on a PPP basis to reduce handling costs and attracting more cargo. New berth to have following handling process:

- Mechanized discharge from shore off loader to a conveyor belt.
- Conveyor belt to feed fertilizer into Silo storage facilities located inside the port.
- Silo storage to feed directly into hoppers of mechanized bagging plant.

Post mechanization the handling costs of fertilizers will go down from Rs. 710/T to Rs. 430/T. The ~40% cost saving will be an incentive for fertilizer importers, and cargo volumes will grow to ~1 MT per year from current 0.65 MT.

4.2.1.6 Reduce Overtime Cost in Marine Equipment Through 3-Shift Deployment

Migrating to 3-shift deployment for tugs, pilot launches and mooring boats will eliminate overtime for marine equipment. Hence, outsourcing mooring activities and migrating to a 3-shift deployment will result in overtime cost savings of ~Rs. 4.3 crores. However implementation of this recommendation is subject to the decision of high court to whom labour unions have approached.

4.3 Capacity Assessment of Existing Facilities

4.3.1 General

The capacity of existing berths is assessed assuming the mix of cargo being currently handled at these berths and the corresponding parcel sizes.

Another factor that is important in arriving at the berth capacity is the allowable Berth occupancy which is expressed as the ratio of the total number of days per year that a berth is occupied by a vessel (including the time spent in peripheral activities) to the number of port operational days in a year. High levels of berth occupancy will result in bunching of ships resulting in undesirable pre-berthing detention. For limited number of berths and with random arrival of ships, the berth occupancy levels have to be kept low to reduce this detention. The norms generally followed for planning the number of berths in modern port to minimise the pre-berthing detention are given in **Table 4.2**.

Table 4.2 Recommended Berth Occupancy

No. of Berths	Recommended Berth Occupancy Factor
1	60 %
2	65 %
3 & above	70 %

4.3.2 Cargo Handled at Various Berths

The available berths and the cargo handled at each of these berths during FY 15 are presented in **Table 4.3** below:

Table 4.3 Cargo Handled at Various Berths at NMPT

Cargo Handled	Liquid Bulk (T)	Dry Bulk (T)	Break Bulk (T)	Containers (T)
Berth 1	-	1,159	3,035	-
Berth 2	-	369,723	9,153	95,226
Berth 3	-	233,722	11,822	548,321
Berth 4	182,305	7,500	2,996	42,597
Berth 5	310,397	335,630	48	-
Berth 6	166,428	181,035	53,295	76,913
Berth 7	-	418,129	25,225	77,498
Berth 8 (18)*	-	2,002,846	-	-
Berth 9 (13)	1,095,554	-	-	-
Berth 10 (14)	4,987,587	-	-	-
Berth 11 (15)	6,316,474	-	-	-
Berth 12 (16)	992,946	-	-	-
Berth 13 (17)	334,520	-	-	-
Berth 14 (8)	-	5,019,976	4,725	80,577
Berth 15 (9)	-	2,725,636	-	-
SPM	9,853,340	-	-	-
Total	**24,239,551**	**11,295,356**	**110,299**	**921,132**

() – Number is bracket indicates old berth numbers

4.3.3 Productivity at Berths

4.3.3.1 Bulk, Break Bulk and Container Cargo

Based on the above, the average parcel size of bulk, break bulk and container cargo handled at port and average handling rate are assessed as shown in **Table 4.4**.

Table 4.4 Details of Bulk, Break Bulk and Container Cargo Handled at Port

S. No.	Cargo Type	Cargo	No. of Ships	Total Cargo Handled (T)	Average parcel size (T)	Working Time at Berth (Days)	Average Handling Rate (TPD)
1.	**Breakbulk**	Steel plates/ mach.	17	14,960	880	18	831
		Granite	3	10,528	3,509	5	2,106
		Machinery	11	14,295	1,300	12	1,191
		Timber	7	68,366	9,767	46	1,486
2.	**Container**	Container	103	921,132	8,943	195	4,724
3.	**Dry Bulk**	Soda ash	2	2,859	1,430	5	527
		Iron ore	36	1,550,049	43,057	100	1,550
		M.O.P	13	275,603	21,200	41	6,722
		Urea	6	314,733	52,456	56	7,676
		Ammonium sulphate	1	17,500	17,500	2	8,750
		Coal	158	8,177,578	51,757	410	19,945
		D.A.P	2	43,936	21,968	13	3,380
		Maize	1	6,600	6,600	6	1100
		Sulphur	2	27,500	13,750	6	4,583
		Cement	39	3,32,130	8,516	107	3,104
		Bentonite powder	1	28,500	28,500	4	7,125
		Rock phosphate	3	54,860	18,287	13	4,220
		Bauxite	2	84,100	42,050	6	14,017
		Gypsum	6	3,40,872	56,812	26	13,110
		Limestone	1	27,500	27,500	3	9,167
		Building material	1	2,150	2,150	3	717

4.3.3.2 Liquid Cargo

Currently, the port is handling liquid ammonia, phosphoric acid, crude, palm oil, sunflower oil, LPG, POL, crude, mix-xylene, butylene acrylic, methanol, sulphuric acid, benzene, para xylene. The proportion of handling of these cargoes is as shown in **Figure 4.1**.

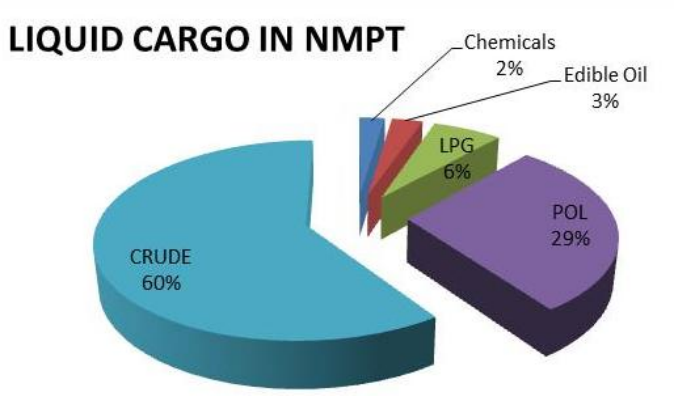


Figure 4.1 Liquid Bulk Traffic Share at NMPT

It may be noted that major portion of this cargo is crude for MRPL refinery. The average parcel size of liquid cargo handled at port and average handling rate are assessed as shown in **Table 4.5**.

Table 4.5 Liquid Cargo Handling at Oil Berth

S. No.	Cargo Type	Cargo	No. of Ships	Total Cargo Handled (T)	Average Parcel Size (T)	Working Time at Berth (days)	Average Handling Rate (TPD)
1.	**Liquid Bulk**	Liquid Ammonia	12	47,979	3,998	7	6,854
2.		Phosphoric acid	14	1,34,326	9,595	16	8,395
3.		Crude palm oil	76	631,810	8,313	125	5,055
4.		Palm oil	6	31,287	5,215	8	3,911
5.		Sunflower oil	3	13,941	4,647	2	6,971
6.		LPG	136	1,520,608	11,099	341	4,459
7.		POL	180	6,819,944	37,889	341	20,000
8.		Crude	128	14,170,894	110,710	204	69,465
9.		Mix-xyline	1	10,448	10,448	1	10,448
10.		Butylene acrylic	4	2,302	576	1	2,302
12.		Methanol	11	38,862	3,533	6	6,477
13.		Sulphuric acid	1	7,100	7,100	1	7,100
14.		Benzene	10	55,614	5,561	10	5,561
15.		Para xylene	25	264,441	10,578	33	8,013
16.		Sty. Monomer	11	12,731	1,157	5	2,546

4.3.3.3 Productivity at Berths

The cargo throughput of New Mangalore port in FY 15 is 35.78 MTPA, ~10% less than that of the previous year (as per NMPT data). Of the aggregate traffic of 555.1 MTPA handled in the preceding fiscal by all the major ports combined, the port accounted for about 6.4%.

The New Mangalore port handles liquid bulk as its major cargo which accounts for 66% of the total traffic.

Presently, New Mangalore Port handles dry cargo at its 10 general cargo berths and 5 oil jetties to handle liquid bulk viz., crude, POL, LPG, edible oils and chemicals. Both these facilities have a combined capacity of 77.77 MTPA, which includes dry handling design capacity of 28.6 MTPA and liquid cargo handling design capacity of 49.17 MTPA. Against this capacity, a total of 36.57 MTPA was handled at New Mangalore Port resulting in lower berth occupancy in FY 15 as depicted in **Figure 4.2** and **Figure 4.3**

The average productivity for various berths have been assessed as indicated in **Table 4.6**.

Table 4.6 Average Productivity of Cargo Berths at NMPT

Cargo Handled	Liquid Bulk	Dry Bulk	Break Bulk	Containers	Average Productivity (TPD)	Average Parcel size (T)
Berth 1	-	1,159	3,035	-	599	1,049
Berth 2	-	369,723	9,153	95,226	5,926	16,348
Berth 3	-	233,722	11,822	548,321	5,630	12,404
Berth 4	182,305	7,500	2,996	42,597	6,539	6,923
Berth 5	310,397	335,630	48	-	3,778	8,731
Berth 6	166,428	181,035	53,295	76,913	4,303	9,951
Berth 7	-	418,129	25,225	77,498	6,593	17,960
Berth 8 (18)	-	2,002,846	-	-	13,442	42,614
Berth 9 (13)	1,095,554	-	-	-	4,603	15,216
Berth 10 (14)	4,987,587	-	-	-	29,512	56,040
Berth 11 (15)	6,316,474	-	-	-	29,108	54,452
Berth 12 (16)	992,946	-	-	-	5,516	7,134
Berth 13 (17)	334,520	-	-	-	7,117	9,041
Berth 14 (8)	-	5,019,976	4,725	80,577	16,849	48,622
Berth 15 (9)	-	2,725,636	-	-	30,973	77,875
SPM	9,853,340	-	-	-	77,585	1,38,779
Total	**24,239,551**	**11,295,356**	**110,299**	**921,132**	**17,200**	**35,432**

The berth occupancy as indicated by the port is presented in **Figure 4.2** and **Figure 4.3**.

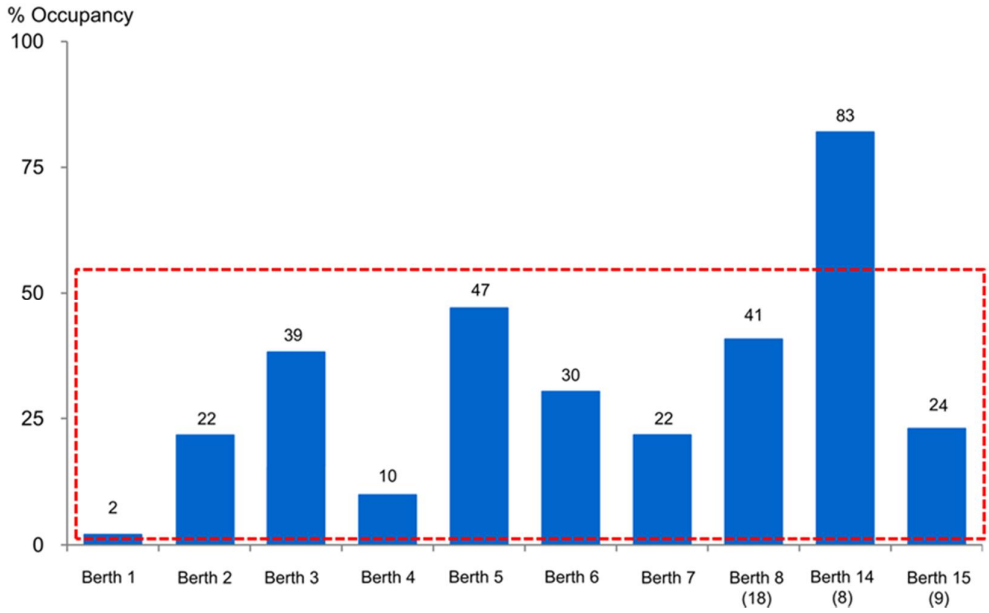


Figure 4.2 Berth Occupancy Details of Dry Cargo Berths

It may be noted from the above analysis, that except berth 14 (8) rest all of the multipurpose berths are highly underutilised with an average occupancy of ~25%.

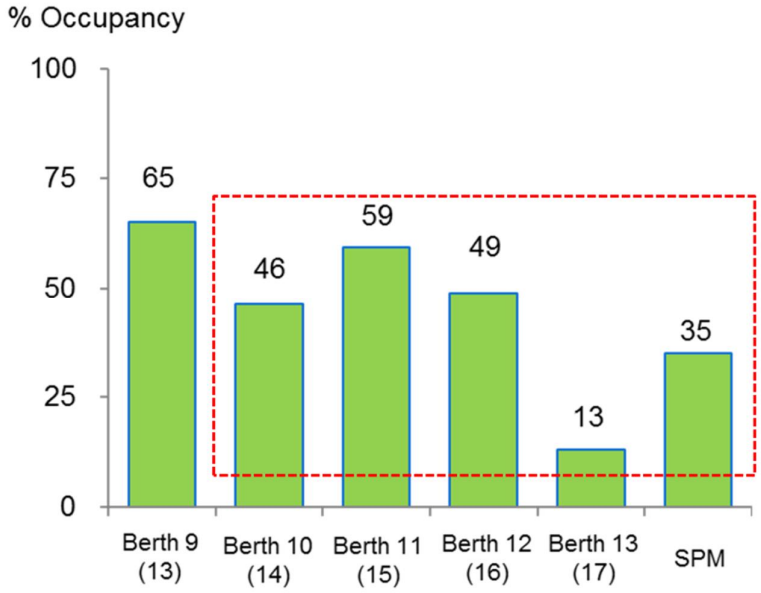


Figure 4.3 Berth Occupancy Details of Liquid Bulk Berths

Similarly for handling liquid cargo, except berth 13, all the liquid handling berths including the SPM have the spare capacity for utilisation.

5.0 DETAILS OF ONGOING AND PLANNED DEVELOPMENTS

5.1 Mechanisation of Berth 12

At present there are not many projects that are being taken up by New Mangalore Port Trust for improving the capacity of the port, except that of the mechanisation of berth 12 (**Figure 5.1**) with a capacity to handle 6.7 MTPA of bulk cargo.

Figure 5.1 Mechanisation of Berth 12

The concession has been awarded to the consortium of M/s. Chettinad Builders Private Limited on revenue sharing basis. This project is taken up on the PPP mode of development for a 30 year period.

The port would provide the berthing facilities and storage area while the concessionaire shall develop the top side facilities, equipment for handling the cargo. The estimated investment for mechanization and development of the backup area of 25 ha (21.4 ha behind the berth and 2.85 ha. in the rail marshalling yard for loading operations) would be around INR 469.46 crores.

5.2 Deepening of Port

The existing infrastructure in the port can cater to vessels up to 90,000 DWT. The existing north and south breakwaters are approximately 770 m each which protects the lagoon area for safe handling operations as well as restrict the littoral drift and also provide the adequate stopping distance to ships. The eastern arm dock can cater to vessels up to a maximum size of 30,000 DWT. General cargo, liquid ammonia; phosphoric acid, bulk cement and edible oil are the main commodities which are handled in this area. Cruise vessels which call upon New Mangalore Port are also handled in this area.

The western dock arm caters to bulk cargo traffic. Udupi Power Corporation Limited has a captive coal berth which can handle panamax vessels of up to 80,000 DWT. This berth has been designed for panamax ships only and would need significant cost and down time to be upgraded to handle cape size ships.

Further most of the crude oil, which require VLCC and Suezmax size vessels, can be handled at the SPM developed by Mangalore Refinery and Petrochemicals Limited, while POL products can be handled at existing berths.

The technical feasibility assessment was carried out for handling 180,000 DWT vessels having a draft of 18 m at the port. It was observed that this would involve lot of dredging of rock having strength of more than 100 MPa. This type of rock cannot be dredged but blasting (controlled) would be needed at a very high cost (capex of over INR 2,700 crores) and would be very time consuming (over 4.5 years).

Further, it was observed that only two existing berths (existing multipurpose berth–8 and future berth beside the Kudremukh iron ore berth–18) could be benefitted as other berths are not designed for this draft. As there is no significant traffic growth in bulk traffic expected, deepening in the lagoon and channel for handling 180,000 DWT vessels does not prove to be a feasible option.

6.0 TRAFFIC PROJECTIONS

6.1 General

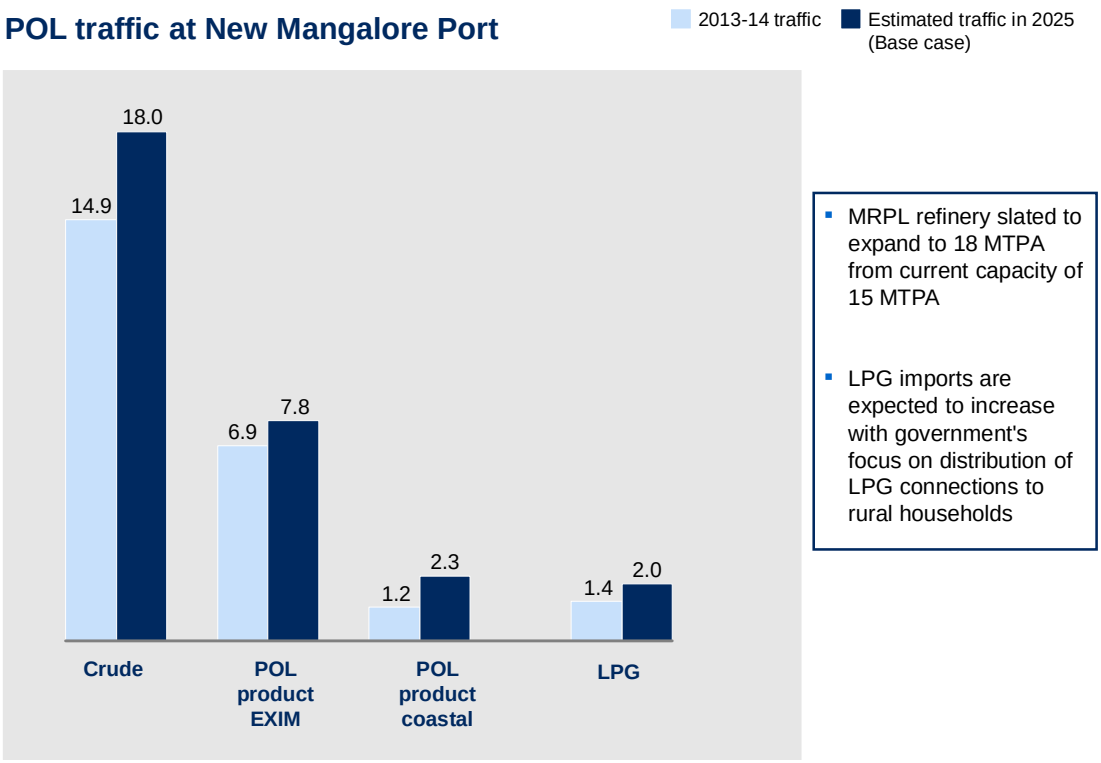
NMPT is the only major port in Karnataka located in southern part of Karnataka. The port has 15 berths - 9 general cargo berths, 5 for POL and 1 for coal - UPCL. Total traffic handled by the port in 2014-15 was ~37 MTPA, with POL accounting for ~63% of total traffic. Cargo traffic is expected to increase to ~44 MTPA by 2020 and 53-63 MTPA by 2025.

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

6.2 Major Commodities and their Projections

6.2.1 POL

NMPT currently handles ~23 MTPA of POL. ONGC is the captive customers for POL, handling 15 MTPA of crude imports and 8 MTPA of refined products exports. NMPT has the highest productivity in POL amongst Indian ports. Over the last years, POL volumes have reduced by 1 MTPA due to reduction in MRPL's refined product exports. Going forward, MRPL refinery is slated to expand to 18 MTPA from the current capacity of 15 MTPA. LPG imports are expected to increase with government's focus on distribution of LPG connections to rural households. Cumulatively, the POL volume is expected to reach 25 MTPA by 2020 and 30-33 MTPA by 2025. The split of 2013-14 POL traffic and the projected volumes in 2025 is shown in **Figure 6.1**.



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

Figure 6.1 POL Traffic Forecast for New Mangalore Port

6.2.2 Coal

NMPT handles 8.2 MTPA of coal, primary customer being Udupi Power plant which is based on imported thermal coal. Shutting down of coal handling in Chennai port has also provided some spill over traffic to NMPT. There is limited opportunity for additional coal volumes at NMPT, mainly because of the connectivity issues to Bellari and Hospet (Shiradi Ghat). Due to this, it is more economical to transport coal through Krishnapatnam and Mormugao. Going forward coal volume is expected to reach ~12 MTPA by 2020 on the back of Udupi power and import substitution, and 13-14 MTPA by 2025.

6.2.3 Containers

NMPT currently handles ~63,000 TEUs with most of the cargo getting transhipped from other ports. Karnataka is the only hinterland for the port. The cargo handled at the port is majorly coffee exports from the hinterland and cashew imports. There is potential to increase the container volumes from Mysore, Bangalore, Hassan and Bellari, provided the connectivity is improved and mechanized facility is installed. Due to poor connectivity, most of the container traffic moves to Chennai port. Going forward, the container traffic is expected to marginally increase to 0.1-0.12 MTEUs by 2025 driven by growth of the hinterland.

COMMODITY TRAFFIC | CONTAINER

Mangalore is the only hinterland for Mangalore port

Primary hinterland of port

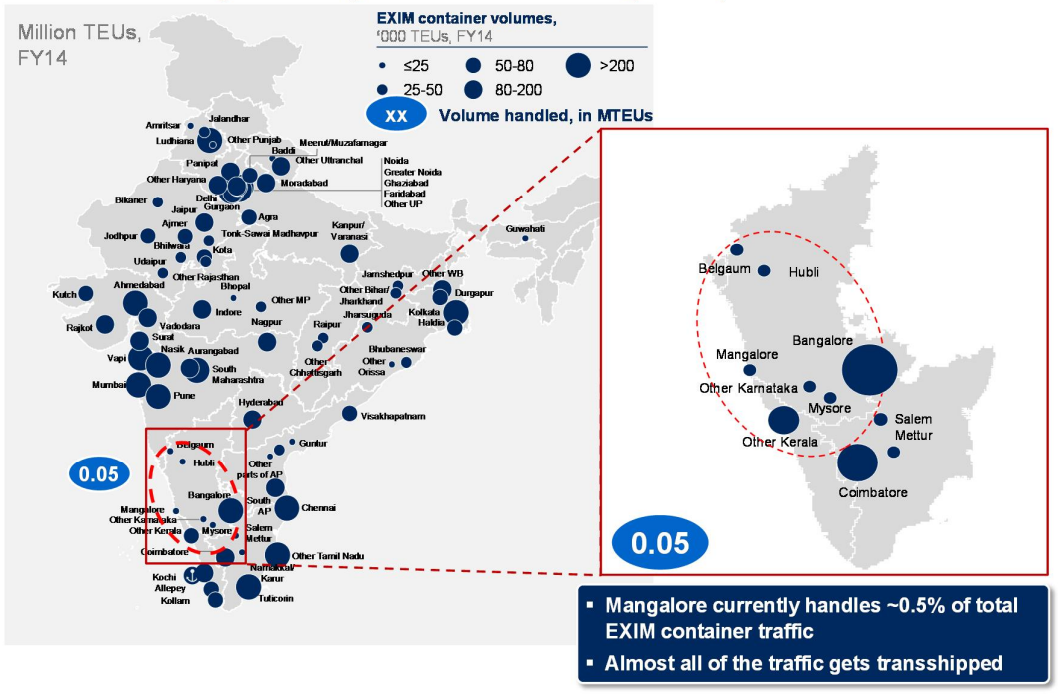
EXIM container volumes, '000 TEUs, FY14	JNPT	Mundra	Chennai	Pipavav	Tuticorin	Haldia	Cochin	Visakha-patnam	Mangalore
NCR+Punjab	936	1,264	0	329	0	0	0	0	0
Maharashtra	2,121	54	0	0	0	0	0	0	0
Tamil Nadu	0	0	1,240	0	484	0	0	0	0
Gujarat	552	262	0	169	0	0	0	0	0
Uttar Pradesh	228	274	0	107	0	0	0	0	0
West Bengal	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 6.2 Hinterland Analysis for New Mangalore Port

COMMODITY TRAFFIC | CONTAINER

EXIM container generating hinterland for Mangalore port



SOURCE: APMT; IPA statistics; Stakeholder interviews

Figure 6.3 Container Generating Hinterland for New Mangalore Port

6.2.4 Other Cargo

NMPT has 1.5 MTPA of KIOCL's captive cargo which includes 0.9 MTPA of iron ore fines imports and 0.5 MTPA of iron ore pellets exports. There is limited scope to expand here due to the mining ban and fall in the iron ore prices globally.

NMPT also handled ~0.7 MTPA of fertilizers in 2015. The volumes have fallen by ~30% since 2008, as it has moved to other ports like Krishnapatnam. There is potential to increase the volume by reducing the handling costs through mechanization.

The **Table 6.1** summaries the traffic potential for key commodities for New Mangalore port.

Table 6.1 Mangalore Port Traffic Projections

Units: MMTPA (except Containers)

Mangalore Port - Traffic Projections

xx Base Scenario xx Optimistic Scenario

Commodity	2014-15	2020	2025		2035		Remarks
Liquid Cargo							
POL	22.98	25.1	30.3	33.3	37.2	41.1	▪ MRPL refinery expansion and possibility of LNG terminal in optimistic case
Dry and Break Bulk Cargo							
Thermal Coal (Loading)	0.0	0.0	0.0	0.0	0.0	0.0	
Thermal Coal (Unloading)	2.73	11.2	12.9	14.3	21.4	25.5	▪ Udupi Power and import substitution
Coking Coal	5.43	1	1	1.2	1.2	1.4	▪ Diversion of traffic by JSW Dolvi is expected to reduce traffic at the port
Iron Ore	1.55	1.5	1.5	6.0	4.9	6.0	▪ Import of fines and export of pellets (KIOCL)
Fertilizers	0.75	0.9	1.1	1.1	1.7	1.8	
Containers and other Cargo							
Containers (MnTEU)	0.06	0.08	0.10	0.12	0.17	0.21	
Others	2.21	2.5	3.4	3.5	5.6	6.3	▪ Highly fragmented
Total (MMTPA)	**36.5**	**43.4**	**51.7**	**61.2**	**74.5**	**85.2**	

Conversion Factor Used for Containers Projections: 1 TEU = 14.6 Tons

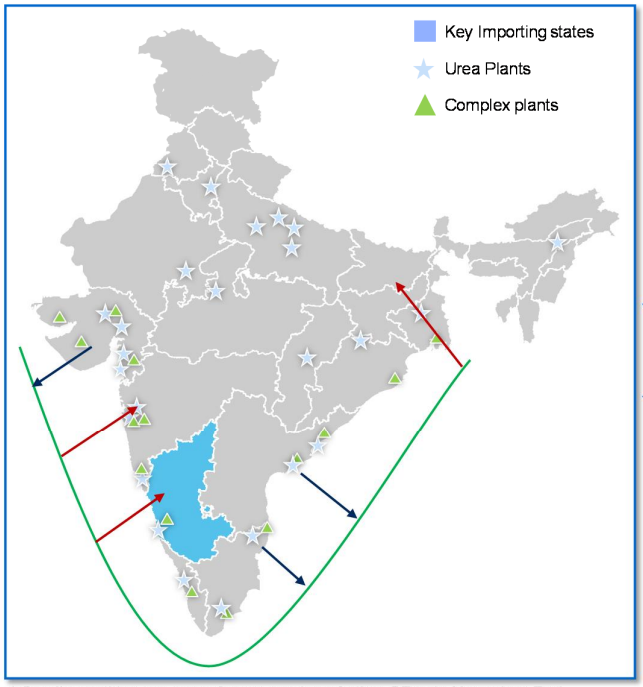
6.3 Coastal Shipping Potential

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

- **Fertilizers:** There is a potential to coastally ship ~1.5 MTPA of fertilizers to Mangalore port by 2025. This movement would primarily be from the source states of Tamil Nadu, Andhra Pradesh, Gujarat and Odisha.

COASTAL SHIPPING | FERTILISERS

~1.5 MTPA fertilizer can be shipped to Mangalore Port by 2025



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

Key ODs with coastal shipping potential to Mangalore Port

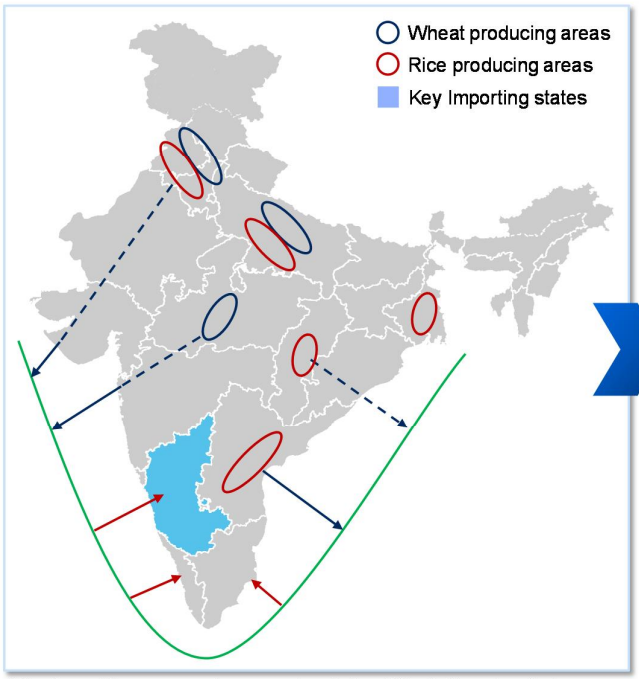
Route[1]	Volume, '000 TPA
Tamil Nadu to Karnataka	442
Andhra Pradesh to Karnataka	245
Gujarat to Karnataka	239
Odisha to Karnataka	218

Figure 6.4 Coastal Fertlizer Traffic Forecast

- **Food grains:** There is a potential to coastally ship ~6 MTPA of food grains to Mangalore port by 2025 from Punjab and Haryana via ports in Gujarat. Small movements can also happen from Uttar Pradesh and Chhattisgarh.

COASTAL SHIPPING | FOODGRAINS

~6 MTPA of food grains can be coastally shipped to Mangalore Port by 2025; Punjab and Haryana being key source states



Key ODs with coastal shipping potential to Mangalore Port

Route[1]	Volume, '000 TPA
Punjab to Karnataka	2,888
Haryana to Karnataka	1,294
UP to Karnataka	401
Chattisgarh to Karnataka	225

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

Figure 6.5 Coastal Food Grain Traffic Forecast

- **Cement:** ~2.5 MTPA of cement can be coastally shipped to Mangalore port from the proposed cement cluster in Andhra Pradesh by 2025 contingent on the development of central AP port.

COMMODITY TRAFFIC | CEMENT

Additional ~2.5 MTPA can be coastally shipped to Mangalore Port from the proposed cement cluster in AP by 2025

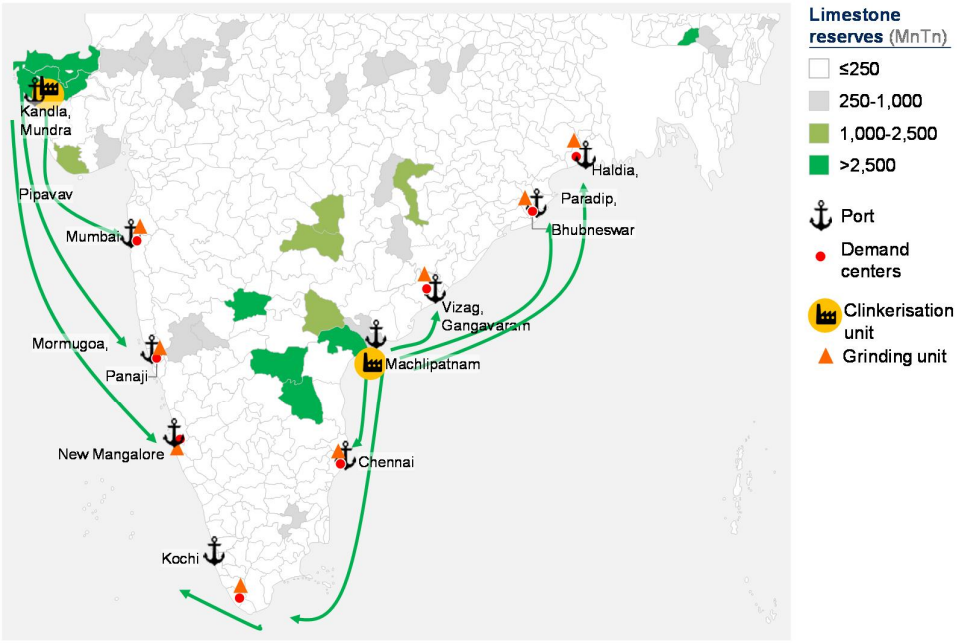


Figure 6.6 Coastal Cement Traffic Forecast

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

Table 6.2 Mangalore Port – New Opportunities Possible via Coastal Shipping

Units: MMTPA (except Containers)

Commodity	2020	2025	2035
Steel (Loading)	0.11	0.15	0.27
Steel (Unloading)	0.07	0.10	0.17
Cement (Loading)	0.03	0.04	0.06
Cement (Unloading)	0.00	2.50	2.50
Fertilizer (Loading)	0.02	0.03	0.04
Fertilizer (Unloading)	1.32	1.60	2.37
Food Grains (Loading)	-	-	-
Food Grains (Unloading)	4.85	5.90	8.73

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

7.0 CAPACITY AUGMENTATION PROPOSALS

7.1 General

The capacity of the existing berths has been worked out as presented in **Table 7.1**.

Table 7.1 Capacity of Existing Berths

Cargo Berths	Cargo Handled	I/E	Current Capacity (MTPA)
Liquid Bulk			**49.17**
• SPM	Crude	I	18.0
• Berth 13	LPG/ POL	I/E	23.37
• Berth 14	Crude Oil / POL	I/E	
• Berth 15	Crude Oil / POL	I/E	
• Berth 16	POL / Chemical / Edible Oil	I/E	
• Berth 17	Crude Oil / POL / LPG / Chemical	I/E	7.8
Break Bulk			**23.20**
• Berths 1-8	Breakbulk & Dry& Liquid Bulk (Edible Oil and FRM-Liquid at Berth no.4, 5, 6) – Multiple Cargo berths	I/E	16.60
• Berth 18	Iron ore Pellets (KIOCL) & Dry Bulk	I/E	6.60
Dry Bulk			**5.4**
• Berth 9	Coal (UPCL)	I/E	5.4
Total			**77.77**

At present the port is working at about 44% of its capacity i.e. 36.5 MTPA was handled in the year 2014-2015.

7.2 Requirement for Capacity Expansion

Even though prima facie it appears that the overall capacity is slightly more than the overall traffic, there is shortfall on facilities for handling specific cargo. While comparing the existing capacities for New Mangalore port with the traffic projections as shown in **Table 7.2**, it could be seen that in 2025 there would be a shortfall of capacity for dry bulk cargo.

Table 7.2 Requirement of Capacity Addition Over Master Plan Horizon (MTPA)

Commodity	Current Capacity (MTPA)	2020		2025		2035	
		Forecast Traffic (MTPA)	Capacity Augmentation over current (MTPA)	Forecast Traffic (MTPA)	Capacity Augmentation over current (MTPA)	Forecast Traffic (MTPA)	Capacity Augmentation over current (MTPA)
Liquid Cargo	49.17	25.1	0	30.3	0	37.2	0
LNG	0	0	0	0	0	0	0
Break Bulk/Dry bulk/other liquid bulk/ Containers	16.60	4.6	0	5.96	0	9.782	0
Iron Ore/other Dry Bulk	6.60	1.5	0	1.5	0	4.9	0
Coal (UPCL)	5.4	12.2	6.8	13.9	8.5	22.6	17.2
Total	**77.77**	**43.4**	**6.8**	**51.7**	**8.5**	**74.5**	**17.2**

It is therefore necessary that action be initiated immediately for the development of Coal handling facility so that the projected throughput for year 2020 could be handled at port. Augmentation of coal handling facilities would be needed in subsequent phases of development.

Similarly, with the proposed upcoming Kochi-Mangalore-Bangalore pipeline, there might be the possibility of importing LNG from Kochi taking away NMPT's share. Therefore, the possibility of setting up of terminal facilities for LNG handling has been explored.

7.3 Opportunities for Mechanisation

Following are the opportunities available at NMPT for mechanisation to improve the productivity at berths:

7.3.1 Mechanisation of Fertiliser Handling

There is a requirement for handling of fertilizers through mechanised/semi mechanised means and bagging facility at port. Currently, the port is handling 0.7 MTPA of fertiliser which is expected to increase to 1.7 MTPA by 2035. Apart from this, there is a possible opportunity for fertiliser handling through coastal shipping. It has been assessed that the coastal shipping is 1.3 MTPA in 2020 increasing to the tune of 2.4 MTPA by 2035.

7.3.2 Mechanisation of Food Grain Handling

Similarly, in view of the significant throughput of food grains import expected at the port through coastal movement, it is suggested to provide a fully mechanised bulk grain handling facility comprising of unloader, conveyor system, storage silos, bagging machine etc.

7.3.3 Dedicated Facility for Container Stacking with Effective Space Utilisation

At present the containers are stacked at various areas of port. As no specialised equipment are used and without any specific planning, the space is not being effectively utilised. It is therefore suggested to allocate a dedicated space for container stacking with suitable infrastructure.

8.0 PORT EXTERNAL CONNECTIVITY AND INFRASTRUCTURE

8.1 General

For the efficient performance of a port, the effective hinterland connectivity through the national highway and trunk railway routes are essential to ensure faster receipt and evacuation of cargo. Accordingly, the existing situation at New Mangalore Port and constraints and proposals to ensure seamless traffic movement are described in this section.

Containerized cargo at NMPT has been growing at a fast pace since 2008 and there is significant hinterland demand that currently goes to other East coast ports. The main container cargo generating centres to the port are Hassan – agro based products, Mysore. There are four key challenges that need to be addressed to attract additional container cargo apart from the movement of other cargo:

- Widening of Shiradi Ghat section
- Widening of NH 66 stretch between BC Road to Kundapura
- Widening of Stretch of NH-50 between Mangalore and Shimogha
- Widening of Hubli Ankola Road Stretch
- Widening of Road from Mani to Mysore (NH275) and thereon to Nanjangudu

8.2 External Road Network

8.2.1 Widening of Shiradi Ghat Stretch of NH 75

Hassan is one of the main container cargo generating hub for Mangalore port. Cargoes like agro based products, coffee, cashew are exported from this place which is also a home for many other small scale industries. NH 75 is one of the main connectivity, connecting Hassan and Bangalore to Mangalore. NH 75 passes through towns of Nelamangala, Kunigal, Channarayapatna, Hassan, Sakleshpura, Uppinaangadi and reaches Mangalore. It climbs the Western Ghats through the Shiradi range. Total length of this highway is 328 km. The NH 75 passing through Shiradi Ghat section is as shown in **Figure 8.1**.

Shiradi Ghat is most narrow and steep section. The stretch of 26 km passing through the Western Ghat is a major nightmare in this highway. The Shiradi Ghat section is the dreaded section in this highway. The condition of this national highway gets worse during monsoon (rainy) season especially in ghat section. The road most of the time of the year is filled with potholes and the problem of the pothole ridden stretch does not seem to be getting solved as large and heavy trucks pass through this stretch on their way to the seaport at Mangalore (**Figure 8.2**). Travellers avoid this route and take either Bangalore – Mysore –Kushalnagara - Mangalore or Charmadi route during rains from month of June to October, even if it takes longer time. The trucks and trailers carrying LPG and other petroleum products from MRPL to Bangalore have been frequent cause of accidents in this road.

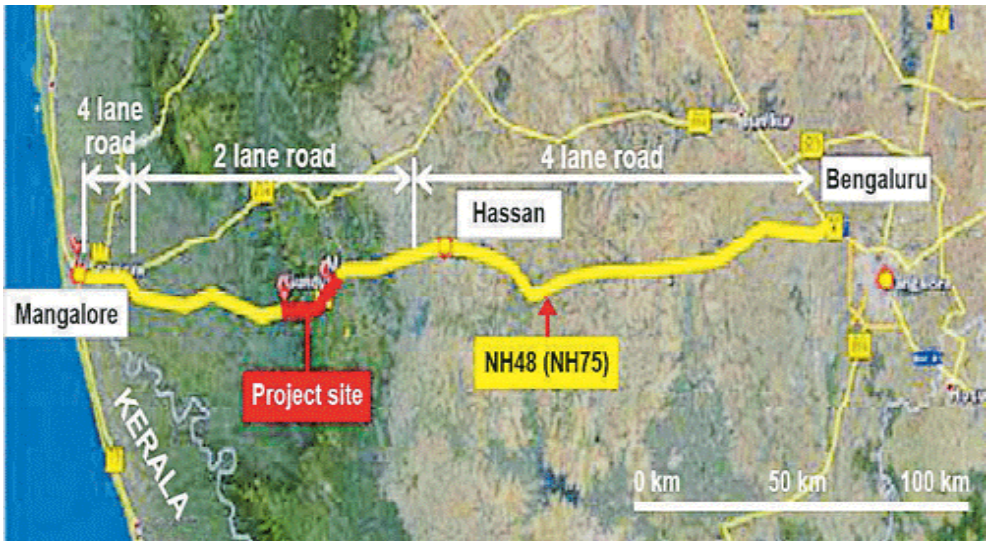


Figure 8.1 NH 75 passing thorugh Shiradi Ghat Section

Figure 8.2 Shiradi Ghat Stretch on NH 75

Currently, the section between Mangalore and Shiradi Ghat is a 2 lane road which needs to be widened for smooth traffic flow. In order to overcome these recurring hassles, the state PWD has taken up the task of developing the Shiradi bypass road as shown in **Figure 8.3**.

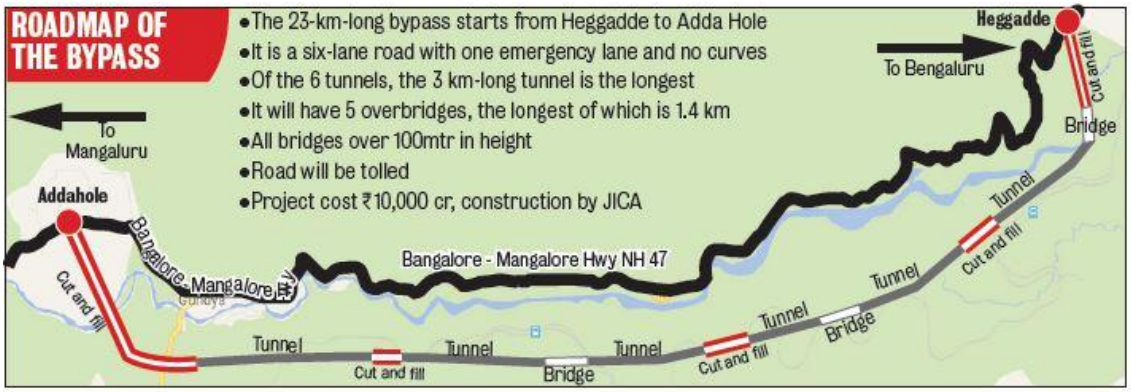


Figure 8.3 Proposed Shiradi Bypass Road

In the 23 km, this road will have six tunnels, five over-bridges and a six- lane road. The estimated cost of the project is Rs. 10,000 crore and the 23 km of by-pass road will be constructed between Heggadde village near Sakleshpura to Addahole near Gundiya.

NH 75 is getting widened and upgraded to the 60-meters wide, 4-lane highway. Mangalore - B.C Road (45 m wide) and Hassan – Nelamangala (60 m wide) section has been upgraded to 4-lane highway. Widening of the stretches from Mangalore to Gundiya into 6 lanes, from Gundiya to Sakleshpura into 4 lanes and Sakleshpur to Bengaluru into 6 lanes will increase the business of NMPT with the improvement of cargo flowing into the port.

8.2.2 Widening of Road from Mani to Mysore (NH275) and thereon to Nanjangudu

The Mangalore Mysore highway is currently a 2 lane State Highway 88. This highway starts from its junction with NH-75 near Bantwala connecting Puttur, Sulya, Madikeri, Priyapatna, Mysore, Srirangapattana, Mandya, Channapatnam, Ramanagaram and terminating at its junction with new NH No. 75 on Bengaluru. The route connects the port city with Mysore and Nanjangudu which are the main cargo generating centres to the port. In order to enhance the movement of traffic, the government has taken up the task of widening the current 2 lane road to 4 lanes. This road would then be NH275.

Figure 8.4 Connectivity from Mani to Mysore

Figure 8.5 Road Strech Connecting Bangalore to Mysore and Nanjangudu

The Karnataka Government's INR 3,000 cr. proposal to convert the Bangalore-Mysore road into a six-lane national highway has been approved. The 123 km six-lane highway stretch would now be part of NH275 and NHAI will be funding for the entire project.

From Nanjangudu goods like tyre, cloths, coffee, special coffee and automobile spare parts will flow towards NMPT if the connectivity between Mysore, Bengaluru with New Mangalore Port gets improved. This in turn increases the cargo of NMPT significantly.

8.2.3 Widening of NH 66 Stretch between BC Road to Kundapur

NH 66 is passing in front of the port, which connects B C (BANTWAL CROSS) road and Kundapur which is heavily congested. From the current situation the road is fully saturated and it needs to be widened from 4 lanes to 6 lanes, which will allow the free movement of traffic from the NMPT.

Figure 8.6 NH 66 – Stretch Between BC Road and Kundapur

8.2.4 Widening of Stretch of NH-50 between Mangalore and Shimoga

NH 50 connects Mangalore to Sholapur which has a total length of 691 km. It is a 4 lane road and some stretches are 2 lanes and some stretch is being upgraded to 4 lanes. Though the road is a national highway, it is narrow along many stretches, which causes frequent mishaps. In particular, the stretch between Chitradurga and Hospet is extremely bad and with heavy truck traffic.

The stretch of 50 km between Shimoga and Mangalore which is a 2 lane road causes heavy congestion of traffic passing through Moodabidri, Karkala, Sringeri, Koppa and Thirthahalli. It is proposed to widen the stretch into a four-lane, 60 m wide grade separated highway. The road would be widened to four lanes between Mangalore and Moodbidri and Karkala. As the forest department does not allow the widening of the roads going through the Western Ghats, it is expected that a tunnel would be required to be built, similar to the NH75 tunnel to the Shiradi Ghat. A tunnel would reduce travel time by 3 hours, reduce fuel usage, and increase the productivity of the industries around. It will also provide an alternative route for the trucks transporting materials to the seaport and air-cargo facility at Mangalore.

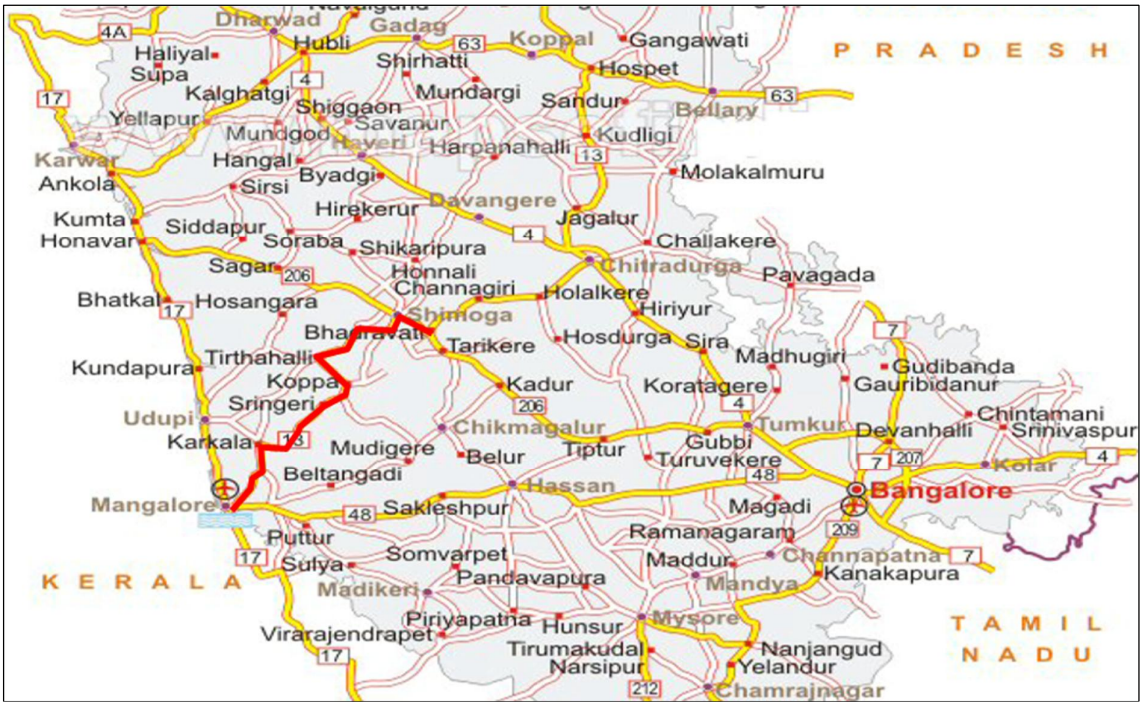


Figure 8.7 Stretch Between Mangalore and Shimoga

8.2.5 Widening of Hubli Ankola Road Stretch

NH 63 linking Ankola to Hubli is the lifeline for goods vehicles in the vast Hubli-Dharwad, Bellary and North Karnataka hinterland to Mangalore Port. NH 63 is currently a two lane highway. Its significance is borne by the fact that approximately 28,000 vehicles pass over it every day. Many of these are heavy vehicles overloaded with granite and other cargoes to the port. A highway on which more than 15,000 vehicles run daily, is qualified for four-laning and that NH 63, with 28,000 vehicles is still a two-lane highway. Traffic jams and the vehicles skidding frequently have become common. The journey between Hubli and Karwar or Hubli and Ankola has become laborious and time-consuming because buses and light vehicles should run slow.

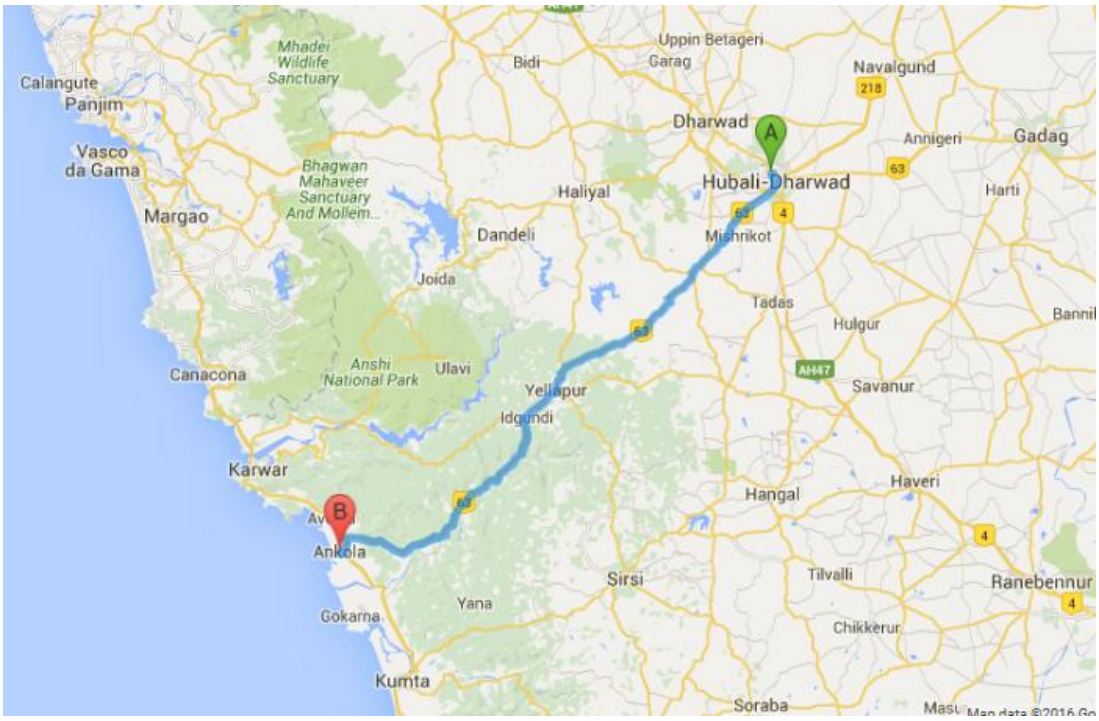


Figure 8.8 Road Stretch Connecting Hubli and Ankola

For efficient movement of cargoes to the port and from the port to the hinterland, it is proposed to widen NH 63 from Ankola to Hubli to 4 lanes from the existing 2 lanes. However, the prerequisite for the widening of this highway would be the Clearance from the Union ministry for Forests and Environment as NH-63 runs through a thick evergreen valley and forests of the Arabial Ghat (part of Western Ghats).

8.3 Rail Connectivity

The evacuation of cargo through New Mangalore port is predominantly by road. However, some portion of cargo is handled by rail as well. Currently, the port handles 6 rakes per day apart from 3 passenger trains daily along the Hassan Mangalore line, which has the capacity of 10 – 12 rakes per day. This route has still has the spare capacity to carry additional cargo rakes to cater the augmented port capacity.

Similarly, along the Mangalore-Udangudi-Goa-Mumbai line only 3 rakes/day of coal are plying along this route to Udangudi but it is likely to go up once additional coal traffic required for the power plants in hinterland materialises. However, it is assessed that the port has adequate rail evacuation capacity to meet the currently projected traffic to be handled by rail.

9.0 SCOPE FOR FUTURE CAPACITY AUGMENTATION

9.1 FSRU for LNG Terminal

9.1.1 General

The New Mangalore Port is in the close proximity of Middle East Countries and has been identified as one of the LNG import ports in India. A terminal can be constructed to handle LNG, which will enhance the port capacity.

The main requirement would be to locate a berthing facility which is away from the navigational areas and other berthing facilities by at suitable safety distance. Apart from that the transit storage tanks should also be at a suitable safety distance from the other port facilities. The safety distances are governed by the risk assessment studies but as per industry practice with a radius of 250 m from the transfer point no shipping/cargo handling activity should take pace.

9.1.2 LNG Potential

Mangalore is in the eco-sensitive area of the Western Ghats, the industries are keen to use clean energy, LNG, to meet the statutory requirement. At present MRPL, OMPL and MCF require around 1.0 MT of LNG per annum. MCF is also planning to expand its capacity, thereby there may be additional requirement of 0.5 MT, after 4 years. That apart, Ministry of Urban Development, Govt. of India has declared Mangalore as Smart City and there would be requirement of 0.5 MT of LNG for domestic consumption.

Considering the current throughput limited to 2 MTPA only, it is suggested that a facility with an FSRU could be built, so that the significant investment on the very expensive and fixed infrastructure such as liquefied storage tanks and regasification units is avoided.

9.1.3 Location to Setup LNG Facility at NMPT

At present the memorandum of understanding (MoU) has been signed between ONGC-MRPL and NMPT for setting up of an LNG facility at the port.

AECOM carried out the initial assessment of the most optimum location for this facility. As per the industry practice for initial planning the LNG jetty should be located such that the jetty head (or the transfer point) is at a distance of 250 m to 500 m from the areas of port activities. This was accordingly considered while arriving at the location of the jetty.

The various locations examined at shown in **Figure 9.1**.

Figure 9.1 Alternative Locations for Development of LNG Facility at NMPT

The summary details of the evaluation are as under:

- Alternative location 1 has an adequate space for locating the berthing facility as well as has adequate backup area for onshore infrastructure. The main issue however at this location seems to be that the safety distance of only about 250 m is available between the LNG berth and the other port facilities.

- Alternative location 2 in the lee of the north breakwater is exposed to the predominant south west monsoon waves and therefore may result in some downtime at berth. The ships would first need to enter the basin and then shall be brought back to the berth outside harbour. Further the backup area available is proposed to be utilised for berths 12 and 11, leaving no space for LNG facilities. Also on the rear side of north breakwater is the Panambur beach and development of such a facility to the tourist vicinity pose a severe safety concerns. Further at this location a safety distance of even 250 m is not available.

- Alternative location 3 is protected from SW monsoons but constraint like navigation as in alternative location 2. However, the backup area as available for alternative location 1 can be utilised for onshore facilities.

- Alternative 4 requires creation of a new harbour altogether for LNG terminal only. This would involve construction of 2200 m long breakwater and dredging in the channel and harbour basin at relatively higher capital cost. The backup area as available for alternative location 1 can be utilised for onshore facilities.

As could be seen from the evaluation above, alternative locations 1, 3 and 4 appear to be suitable for setting up of the LNG FSRU terminal. The indicative cost estimates for development of basic marine infrastructure for alternatives 1, 3 and 4 are presented in **Table 9.1** below:

Table 9.1 Cost Comparision of Marine Infrastructure

S. No.	Item	Capital Cost (INR in Crores)		
		Alternative 1	Alternative 3	Alternative 4
1.	Breakwater	-	-	278
2.	Berth and Approach Trestle	156	160	165
3.	Dredging	-	-	155
Total		**156**	**160**	**598**

It is observed from the above table Alternative 4 involving an outer harbour, would involve considerable investment as compared to alternative 1 and 3. It is to be further noted that the proposed investment of Rs. 598 crores is for the basic infrastructure of LNG terminal only. The total cost of the LNG terminal including top side handling facilities and other backup infrastructure would be in the range of Rs. 2,500 crores.

It is therefore essential that detailed site specific mooring, navigation simulation and safety studies are required to be carried out for Alternative 3, to establish whether the safety distances offered at these sites are acceptable or not. Only thereafter the detailed studies for alternative 4 should be taken up.

9.2 Utilisation of Berth 8 and Backup Area as Container Terminal

The port is growing aggressively towards handling the containers and accordingly looking for the options of developing a full-fledged container terminal. Currently, the port is carrying out the container storage operations in the stackyard near the entrance gate and at the area behind berth 4 (**Figure 9.2**). With these are the two different areas of operation, results in the handling inefficiencies and high operational costs.

Based on the traffic forecast, NMPT has the potential to attract more container cargoes as depicted in traffic forecast section. Accordingly, there is a need to provide a full-fledged container handling facilities.

Figure 9.2 Scattered Storage of Containers

With a view of providing the full-fledged container handling facility, it is proposed that berth 8 and its backup area be developed as a container terminal on PPP basis (**Figure 9.3**).

Figure 9.3 Container Handling Facility at Berth 8

6 bays of RTGs shall be provided perpendicular to the berth 8. The RTGs capable of stacking 5 high shall be provided. With this arrangement, it would be possible to provide about 1,350 ground slots. With a dwell time of 3 days, an average stacking height of 3.5 and 25% peaking factor, this container yard can cater to the annual container throughput of about 400,000 TEUs, which is well within the projected traffic. The advantage of locating the container yard at this location is that in the event of berth 8 being occupied the containers could be handled at berths 6 and 7 also.

9.3 Berths 10 and 11

Based on the traffic forecast, additional capacity would be needed for coal handling facilities. In this regard berths 10 and 11 are most suitable to be developed in stages with fully mechanised system for bulk cargo handling. Being the fully mechanised system, the storage area could be located away from the berths. The possible storage area for these berths could be located in the proposed additional stacking area as shown in **Figure 9.5**.

9.4 Additional Stacking Area for Bulk and Breakbulk Cargo

With the proposed container terminal and the ongoing development of berth 12, there would be requirement for storage area for cargo that would be handled at berth 10 and 11. The area availability for berth 8, 9 and 12 is as shown in **Figure 9.4**.

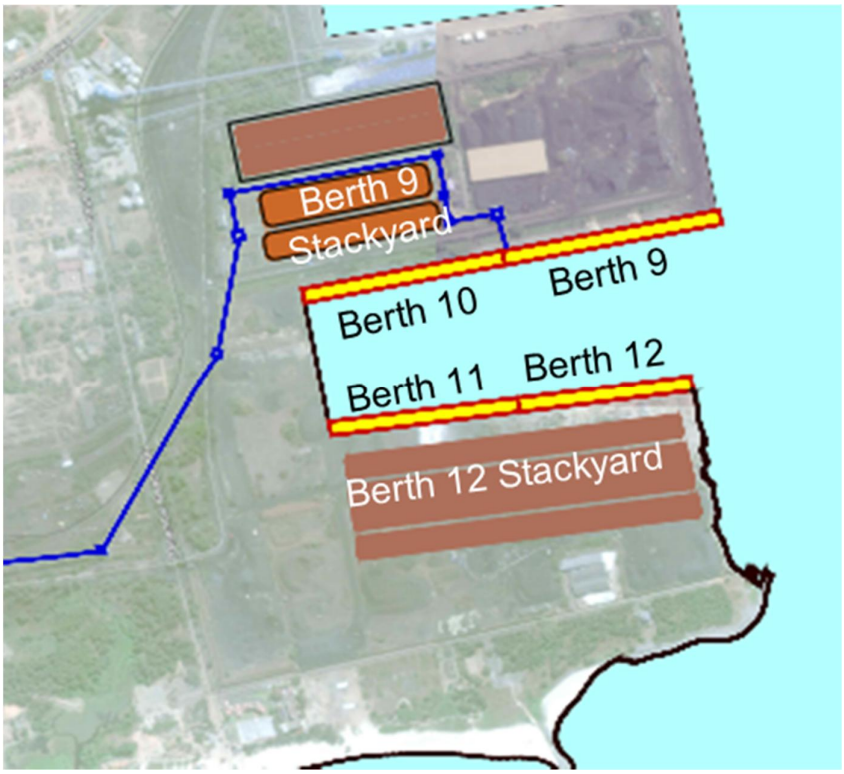


Figure 9.4 Storage Area for Berth 8, 9 and 12

It is proposed to annex the area of the port marshalling yard within the port custom boundary with a view to provide the additional storage area for bulk and breakbulk cargo. This arrangement would provide an overall area of 120 ha (i.e. 300 acres) of land, as shown in shown in **Figure 9.5**, for port operations and storage.

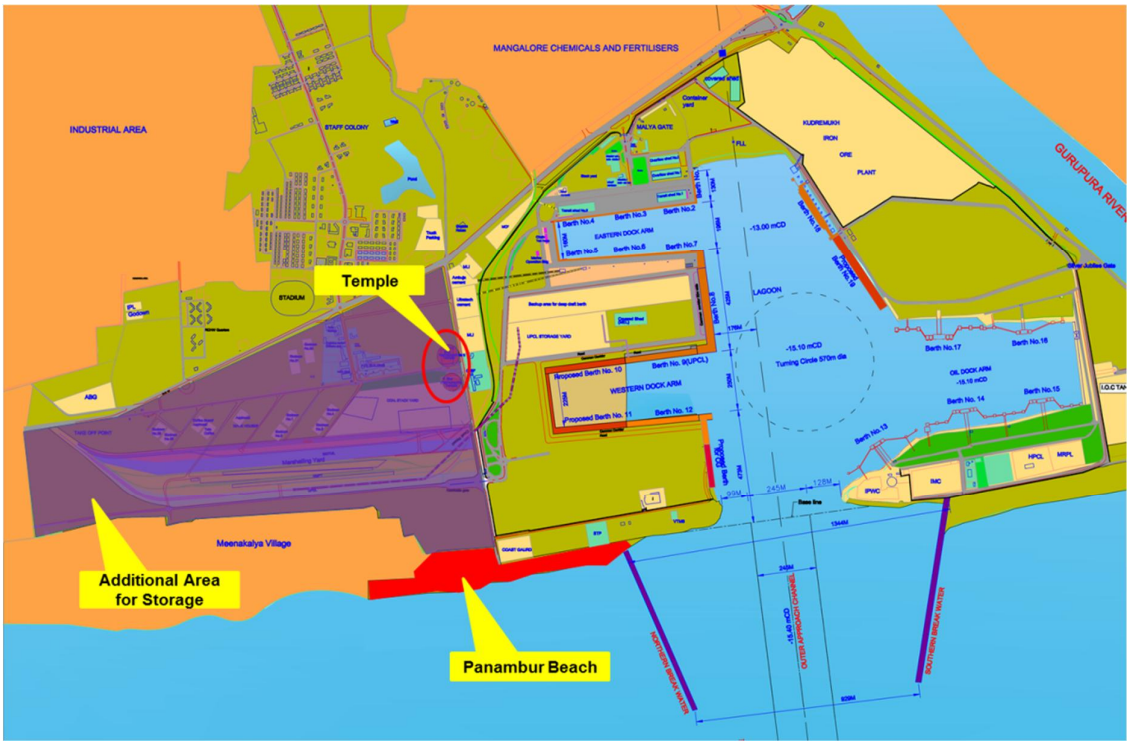


Figure 9.5 Possible Stacking Area for Bulk and Breakbulk Cargo

However it needs to be ensured that while doing so the free access to Panambur beach, which is one of the tourist spot, and access to two of the temples along this road, is not blocked. It is therefore suggested to provide an elevated corridor from the temple up to the beach. The current approach road to the temple may be retained.

9.5 Potential for Mechanisation

9.5.1 Mechanised Fertilizer Handling Facility

Currently, the port is handling the fertiliser at Berth 2 through conventional means by dumping the fertiliser on the berths and transporting to the respective storage sheds for neem coating and bagging facility. In order to provide a clean cargo handling, it is proposed to provide mobile hoppers at berth where the grab/ ship gear transfer the cargo from ship to hopper for truck loading (**Figure 9.6**).

Figure 9.6 Mobile Hopper for Truck Loading

The above arrangement is suitable till the traffic reaches a threshold level of about 1.5 MTPA utilising the potential offered by coastal shipping, beyond which it is suggested to fully mechanized berth 2 for fertilizer handling. This would comprise of Unloaders (mobile Harbour cranes) at berth, conveyor belt to feed fertilizer into covered storage facilities and thereafter to the mechanized bagging plant having bagging and stitching machines.

Figure 9.7 Mechanised Fertiliser Handling Facility

9.5.2 Mechanised Food Grain Handling Facility

In line with the government's vision of promoting coastal shipping as an alternative to rail movement of food grains, it is envisaged that a large mechanized food grain loading facilities will be installed in Kandla to export wheat, maize and oil cakes from a single integrated mechanized facility. It is noted that Mangalore port will be one of the important recipients of food grains in bulk from such facility more particularly wheat in bulk. If the significant traffic projections for food grain import materialises then there would be a rationale for setting up a mechanised grain unloading terminal in NMPT. The system envisaged includes a mobile tyre mounted grain unloader, and conveying them through a closed pipe conveyor on to storage silos. The evacuation of stored grains from silos will be through an automatic grain evacuator, an automatic bagging machine and conveying to bags into the Lorries directly and loading automatically without any manual handling. It is suggested to utilise berth 3 for installing the mechanised food grain facility.

Figure 9.8 Mechanised Food Grain Unloading Facility

9.6 Additional Deep Draft Berths at Port

9.6.1 General

NMPT has berth 8 as its only deep draft berth capable of handling vessels in the range of 80,000 – 100,000 DWT vessels. This berth handles majorly the dry bulk cargo. This berth handled a total of 4.9 MTPA of cargo in 2014-15 of which 88% of the cargo constituted to be coal. With the conversion of Berth 8 to full fledge container terminal, there is a requirement of development of deep draft berth at the port. In this regard, AECOM explored the following options to provide deep draft berth at NMPT.

9.6.2 Option1- Deepening of Eastern Arm

Eastern arm has 6 berths (berth 2 to 7) with the draft varying from -9.5 m CD to -10.5 m CD. The cargo complexion handled in this arm is as shown in **Table 9.2**.

Table 9.2 Cargo Complexion Handled in Eastern Arm

Cargo Handled	Berth 2	Berth 3	Berth 4	Berth 5	Berth 6	Berth 7
Liquid Bulk	-	-	1,82,305	3,10,397	1,66,428	-
Dry Bulk	3,69,723	2,33,722	7,500	3,35,630	1,81,035	4,18,129
Break Bulk	9,153	11,822	2,996	48	53,295	25,225
Containers	95,226	5,48,321	42,597	-	76,913	77,498
Total	**4,74,102**	**7,93,865**	**2,35,398**	**6,46,075**	**4,77,671**	**5,20,852**

The average occupancy of these berths is about 28%. The low berth occupancy is attributed to the following.

- Cargo complexion is fragmented and is handled in small parcel sizes.
- Cargoes are handled through ship gears and no equipment are deployed on berth

It may be noted from the above table that approximately 91% of container traffic is handled at berths in the eastern arm. With the proposed new container terminal, all the container cargo would shift to berth 8. Berth 5 & 6 which predominantly handles non-hazardous liquid (palm/ edible oil) cargo, cement and fertiliser for which necessary infrastructure like pipelines, conveyors are in place.

The eastern arm is approximately 600 m long with the tapered width varying from 195m to 160m. In order to cater deep draft vessels of panamax ships, it is required to provide the dock width of approximately 220 m to 250 m.

The berths in the eastern arm were constructed when the port was commissioned i.e. 1975. Most of these berths have attained their design life and need retrofits. Given the established infrastructure along berth 5-7, it is proposed to increase the width of the dock along berth 1-3.

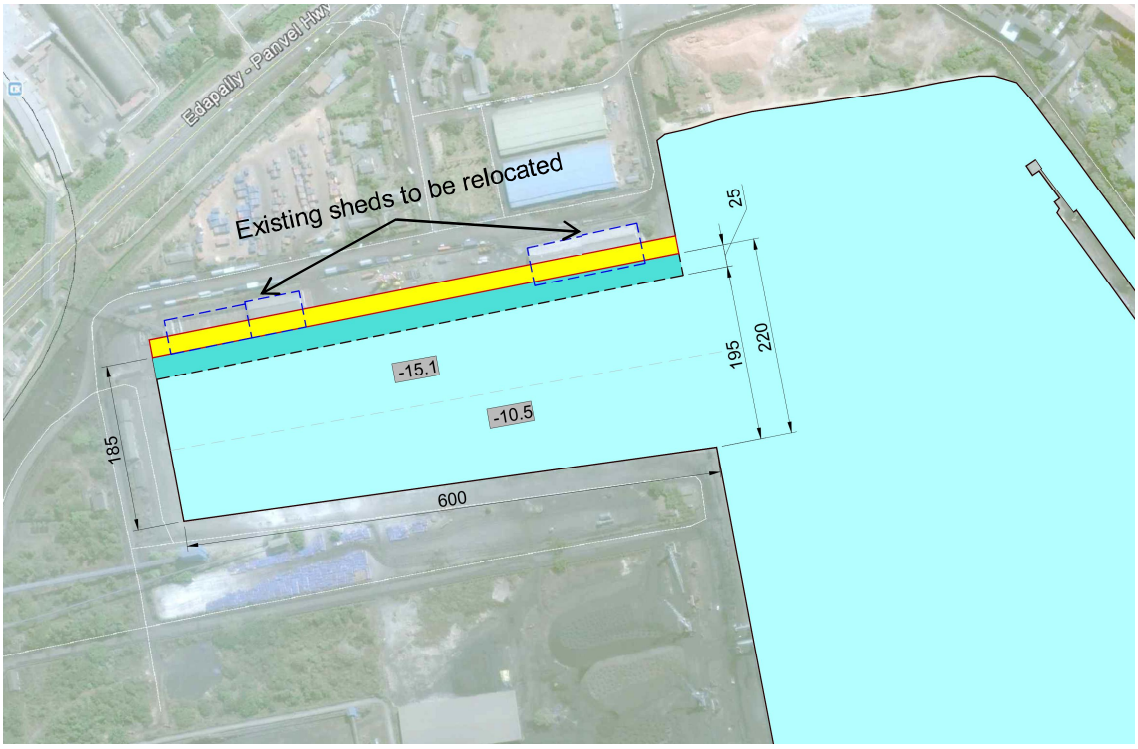


Figure 9.9 Option 1 Modified Arrangement of Eastern Arm

Following are the merits and demerits of this option.

- This option involves demolition of dilapidated berths 2-4 which need to be retrofitted.
- 2 deep draft berths could be developed to cater the bigger size vessels
- The existing storage and cruise shed need to be relocated;
- Constraint on storage area and circulation.

The overall cost estimate for this option is INR 1,200 crores.

9.6.3 Option 2: Providing Independent Deep Draft Berth beside Berth 18

A new deep draft berth is proposed beside the iron ore berth (Berth 18). The required open area and sheds for storage are proposed in the vacant area behind the berth.

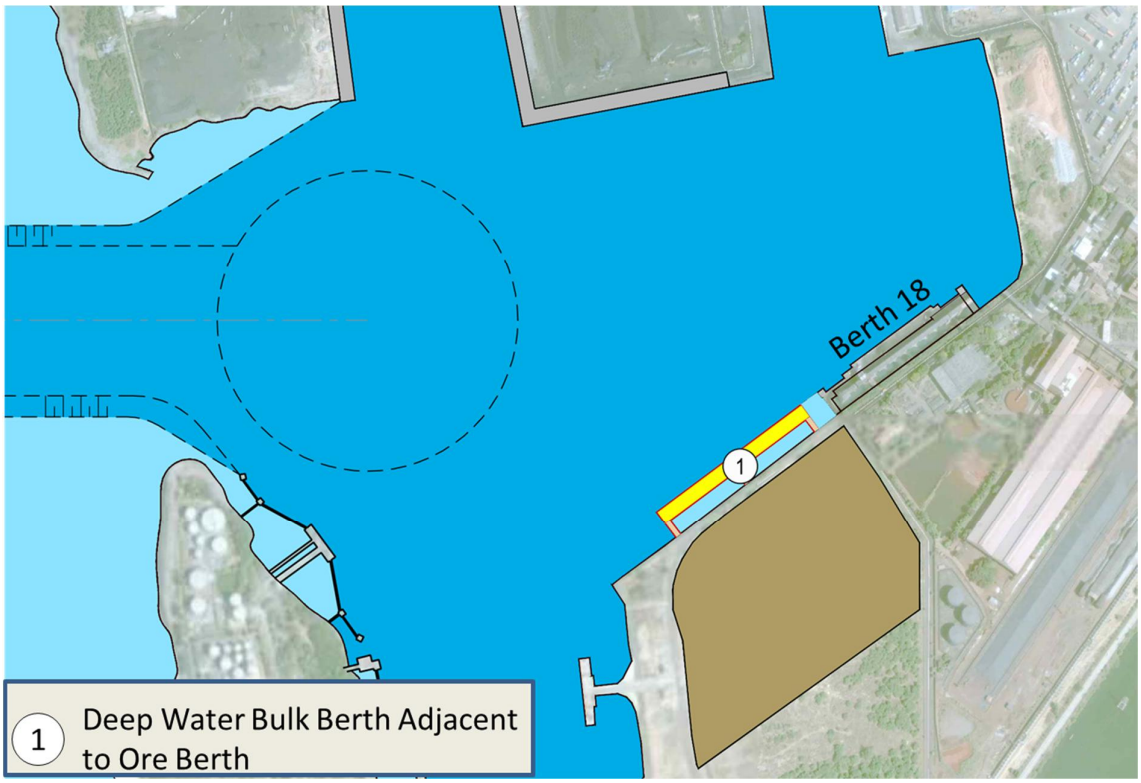


Figure 9.10 Proposed New Deep Draft Multipurpose Cargo Berth

This option has the following merits.

- Independent deep draft berth to the existing facility
- New storage area free from space/ area constraint

The overall cost estimate for this option is INR 120 crores.

9.6.4 Recommendation

Based on the above, it may be noted that retrofitting of berths could be taken up as and when required. To address the downtime during the implementation of retrofitting there is a requirement of deep draft berth. It is therefore prudent to develop a new independent deep draft berth as shown in **Figure 9.10**. While upgradation of the eastern arm berths is undertaken the cargo could be shifted to deep draft berth during the downtime period.

9.7 Concept of Satellite Port

It is evident that there are limitations in increasing the draft at port for handling of cape size ships. Further the available waterfront within the port limits is almost exhausted with little scope for expansion. Another issue at the current port location is the limited capacity for evacuation of cargo by rail, which limits its suitability for handling of cargo for deep hinterland.

Under such circumstances, the port should identify nearby minor ports under the State Port Directorate for adoption and development as a satellite port. NMPT can consider developing satellite port near Ankola. The port development at this place is however subject to approval of the rail link between Hubli and Ankola.

10.0 SHELF OF NEW PROJECTS AND PHASING

As part of the NMPT master plan, several projects have been identified which need to be taken up in phased manner to commensurate 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 as the port master plan is a dynamic document and could be reviewed periodically and revised based on the economic scenario and demand for port at that particular point of time.

The requirement and rationale of these projects are discussed in brief in the sections below.

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	Investment Required (INR in Crores)	Capacity Addition (MTPA)	Mode of Implementation
1.	Mechanization of Berth 12	469.46	6.73	PPP

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

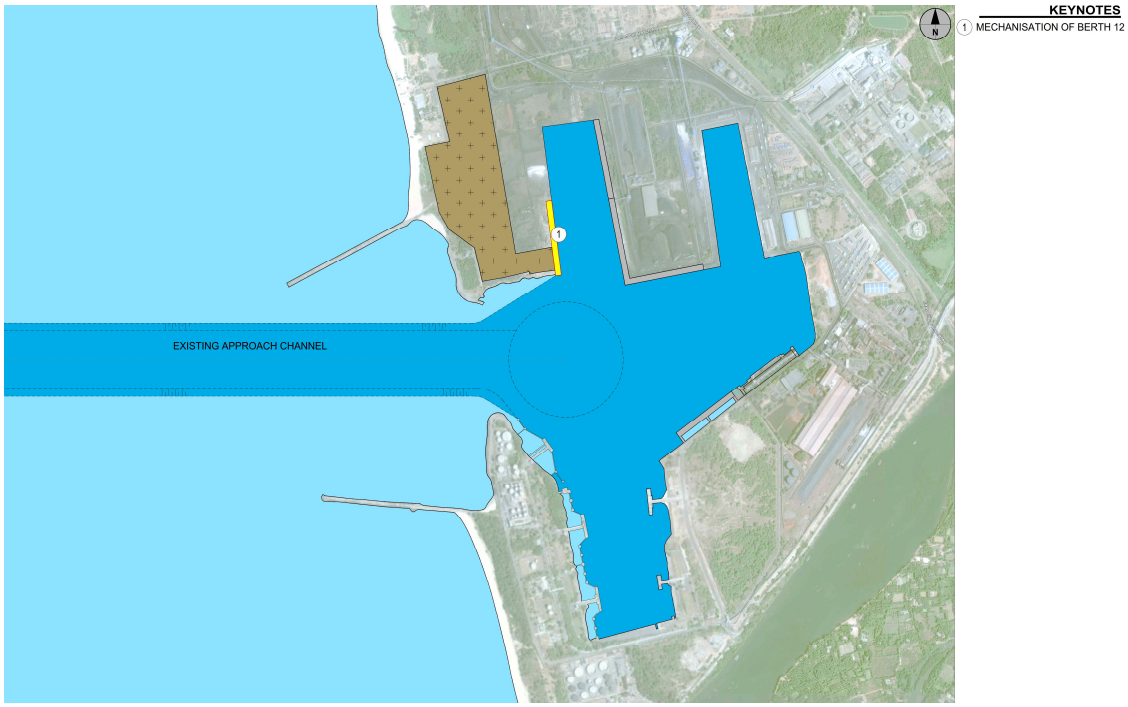


Figure 10.1 Port Layout along with Ongoing Developments

10.2 Projects to be Completed by Year 2020

The details of the projects which are envisaged to be completed by year 2020 are given below in **Table 10.2**.

Table 10.2 Projects to be Completed by Year 2020

S. No.	Project Name	Investment required (INR in Crores)	Capacity Addition (MTPA)	Mode of Implementation
1.	Development of 30 acres of stack yard and ancillary roads for parking of Ro-Ro cargoes and cars	25.00	-	Port's funds
2.	Utilisation of Berth 8 and Backup area as Container Terminal	277.19	4.0 Lakh TEU's	PPP
3.	Deep water break bulk berth adjacent to ore berth	150.00	5.0	Port's funds

The 2020 port layout plan with the above mentioned projects is as shown in **Figure 10.2**.

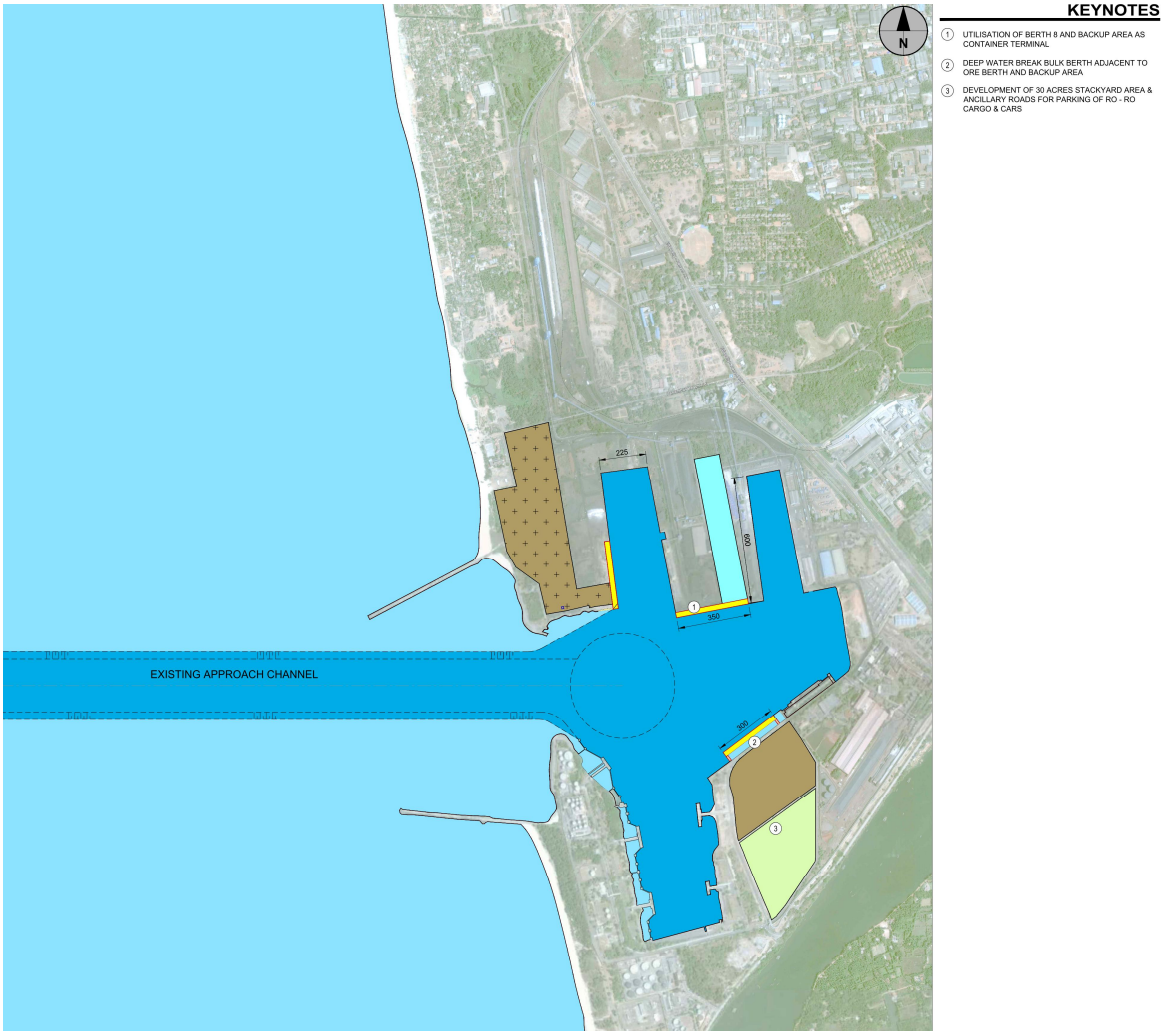


Figure 10.2 2020 Port Development Plan

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 below in **Table 10.3**.

Table 10.3 Projects to be Completed by Year 2025

S. No.	Project Name	Investment required (INR in Crores)	Capacity Addition (MTPA)	Mode of Implementation
1.	Deepening of Eastern dock	1,200	3.0	Port's funds
2.	FSRU for LNG handling	2,500	2.0	PPP
3.	Mechanised Fertilizer Handling Facility	155	3.0	PPP
4.	Mechanised Food Grain Handling Facility	120	0.5	PPP
5.	Development of Berth 10 for handling bulk cargo	500.	5.0	PPP
6.	Additional Storage area for bulk cargoes	50	-	Port's funds

The 2025 port layout plan with the above mentioned projects is as shown in **Figure 10.3**.

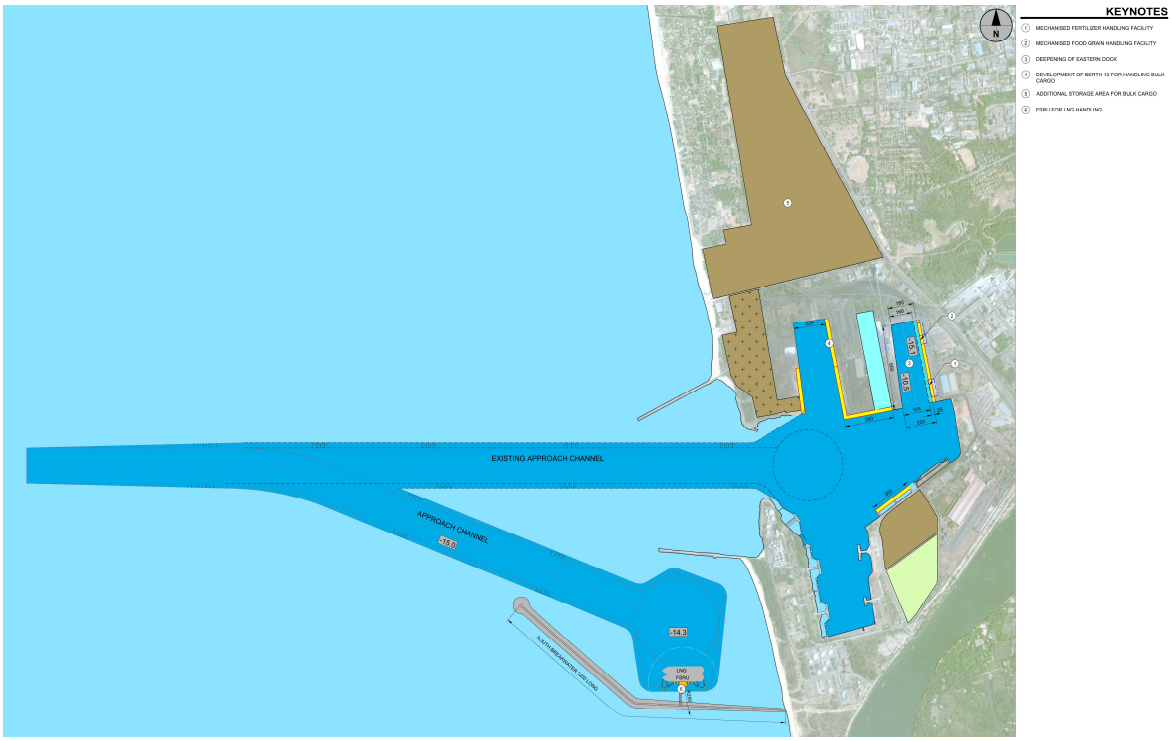


Figure 10.3 2025 Port Development Plan

10.4 Projects to be Completed by Year 2035

The details of the projects which are envisaged to be completed by year 2035 are given below in **Table 4.5**.

Table 10.4 Projects to be Completed by Year 2035

S. No.	Project Name	Investment required (INR in Crores)	Capacity Addition (MTPA)	Mode of Implementation
1.	Development of Berth 11 for handling bulk cargo	500	5.0	PPP

The 2035 port layout plan with the above mentioned projects is as shown in **Figure 10.4**. This layout depicts the overall port master master plan over 2035 horizon.

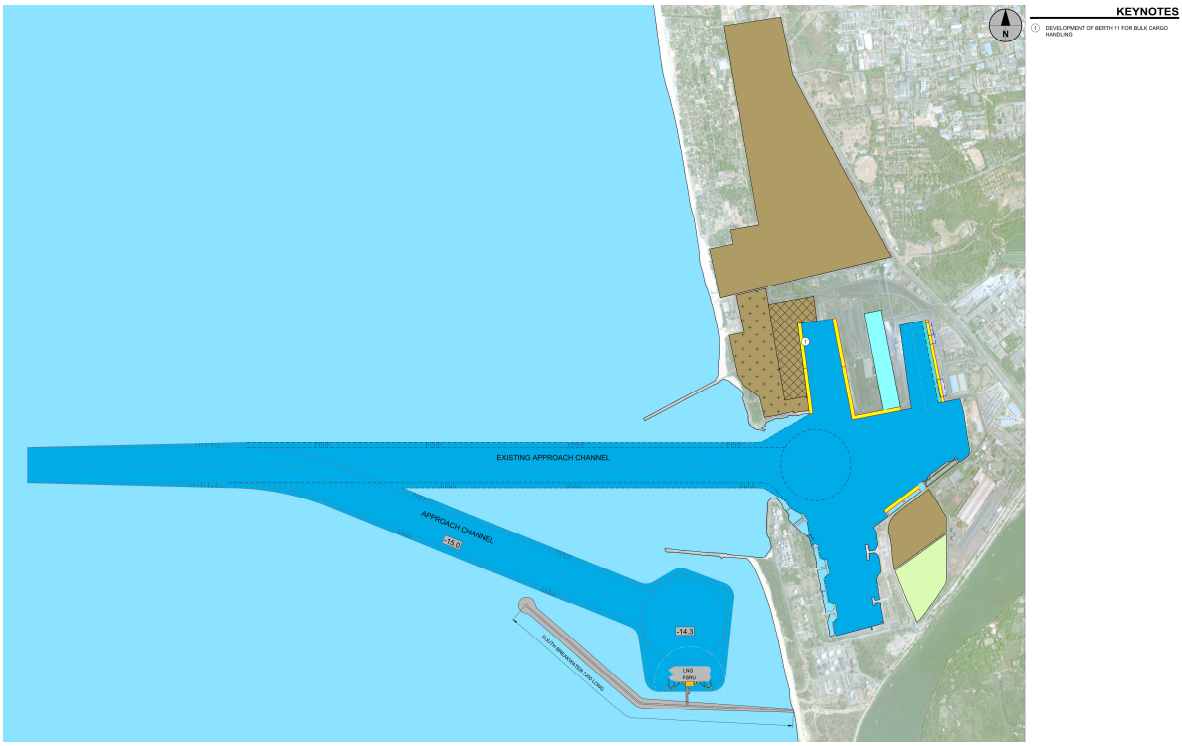


Figure 10.4 2035 Port Development Plan

Appendix 1 - **BCG Benchmarking Study for New Mangalore Port**

12 New Mangalore Port Deep-dive

12.1 Port overview

New Mangalore Port Trust (NMPT) is the only major port of the state of Karnataka, located on the west coast of southern India at Panambur, Mangalore. It has 15 berths that handle general cargo to coal, bulk, iron ore, crude and POL. It has 2 berths on concession to UPCL for coal, and KIOCL for coal and iron ore.

Figure 362: Berths at NMPT

Revenues have been growing at ~2% annually since 2012, with a healthy operating profit of Rs. 131 crores in 2014–2015. However, net profits have been declining since 2012 due to higher berthing and mooring costs, and lower cargo handling revenue.

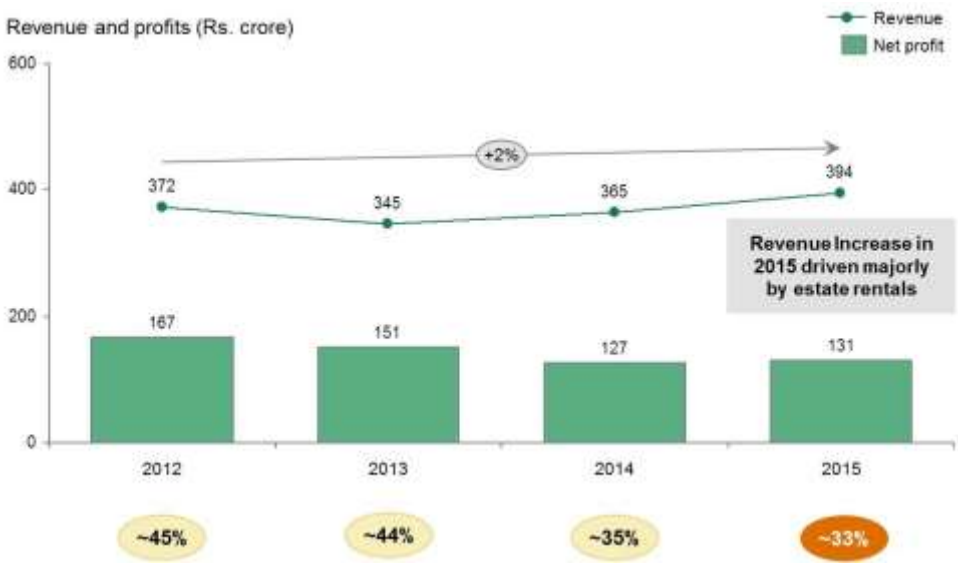


Figure 363: NMPT revenue and profits

A total traffic volume of ~37 Mn MT was handled in 2015. Cargo volumes have stabilized since 2006, with the loss in iron ore balanced by increase in POL and coal. However, cargo volumes decreased by ~2 Mn MT in 2014–2015 due to decrease in iron ore and POL. Iron ore exports decreased due to fall in prices in the international market, and POL exports decreased due to reduction in MRPL's refined products.

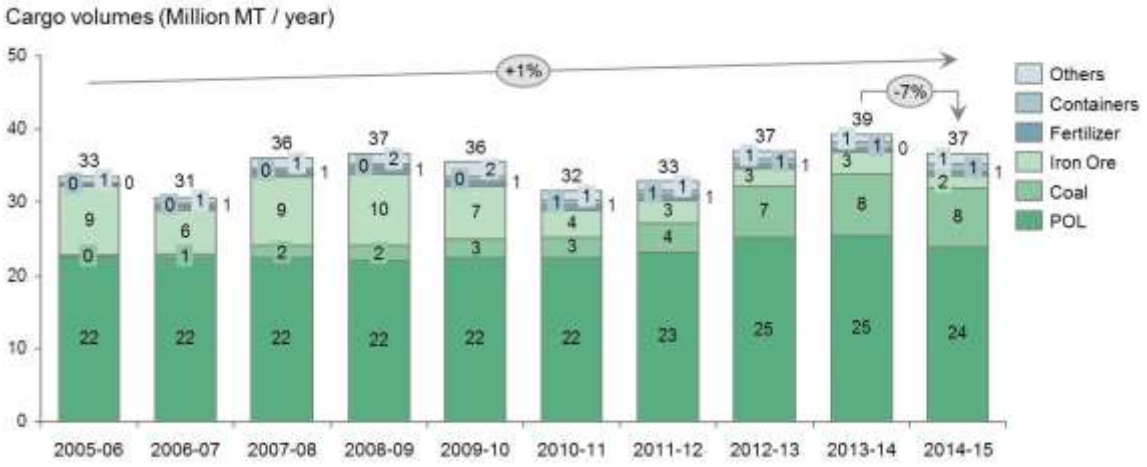


Figure 364: Cargo volumes at NMPT

NMPT has average berth occupancy of 36%. Berth occupancy on general cargo berths is low, and only berth 14 is highly utilized. Beth 14 handles mostly coal and fertilizer cargo and is equipped with 2 private MHCs. Berth occupancy on POL berths is moderate, and SPM is 35% occupied.

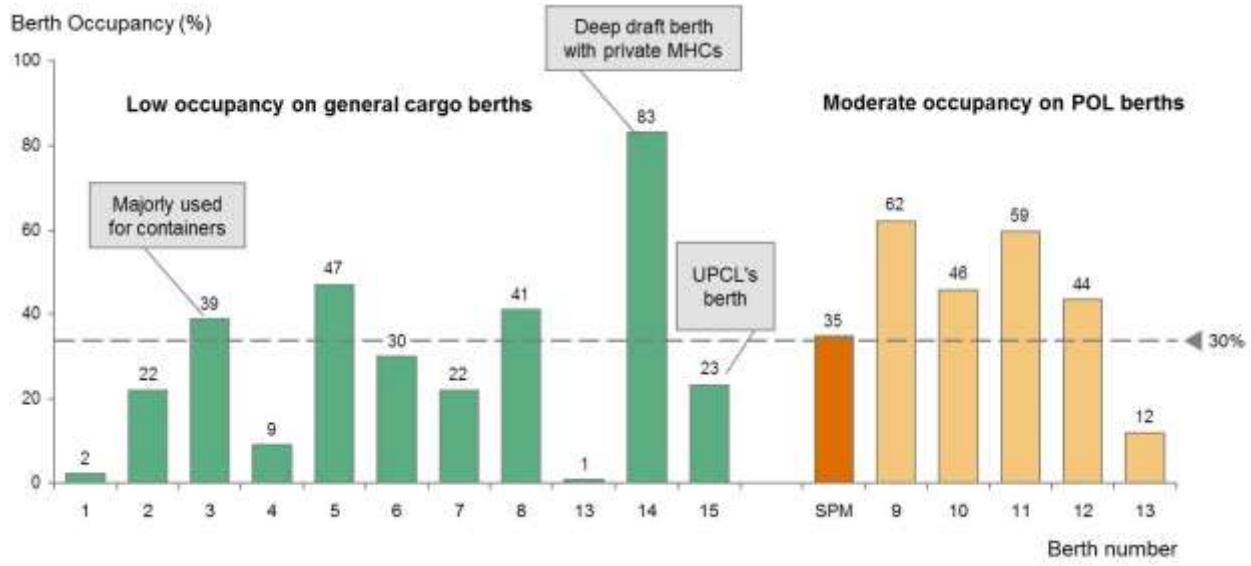


Figure 365: Berth occupancy at NMPT

12.2 Key findings and initiatives from deep-dive

12.2.1 Container

12.2.1.1 Initiative: NMPT 1.1 Attract container volumes from Mysore and adjoining areas

Initiative Overview

Containerized cargo at NMPT has been growing at a fast pace since 2008 and there is significant hinterland demand that currently goes to other east coast ports. There are three key challenges that need to be addressed to attract additional container cargo:

- Hinterland connectivity
- High freight and low frequency
- Sub-optimal container handling equipment

Hinterland connectivity is on the way to improvement with strengthening of Shiradi Ghat section and improvement in road connectivity to Mysore. This enables the port to attract container cargo from Mysore and adjoining areas.

Feeder costs at NMPT are currently very high due to monopoly on both routes to Mundra and Colombo, which neutralizes the inland haulage advantage for these areas. There is a need to attract additional players on existing and new routes to bring down feeder prices.

Key Findings

We have identified potential customer and demand centers in NMPT's hinterland that currently move cargo to Chennai. NMPT can potentially attract additional ~110,000 TEUs per year, increasing total cargo by 170%. There are certain key challenges to be addressed that have been discussed later.

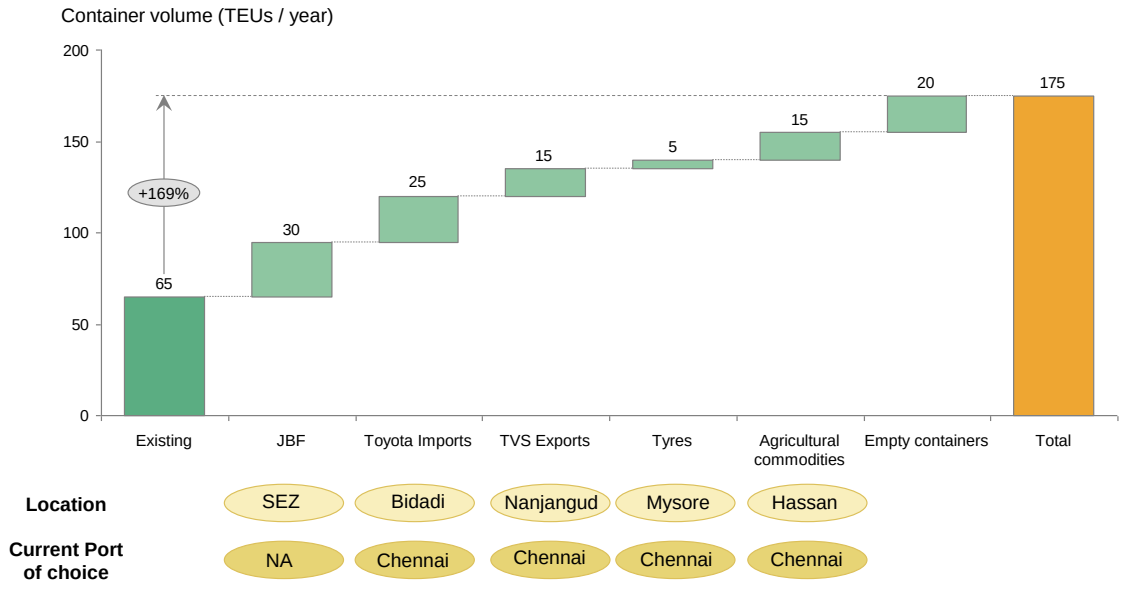


Figure 366: Potential to increase container cargo by 170%

Hinterland connectivity, high shipping costs and sub-optimal container handling infrastructure are the key issues restricting the flow to NMPT.

Hinterland Connectivity: Western Ghats limit connectivity to key customers.

Historically, hinterland connectivity from NMPT has been the major hindrance in attracting container cargo. Western Ghats have limited hinterland connectivity to customers in Mysore, Madikeri, Hassan, Shimoga and Bangalore. This cargo currently flows to Chennai via Bengaluru due to significantly better road infrastructure.

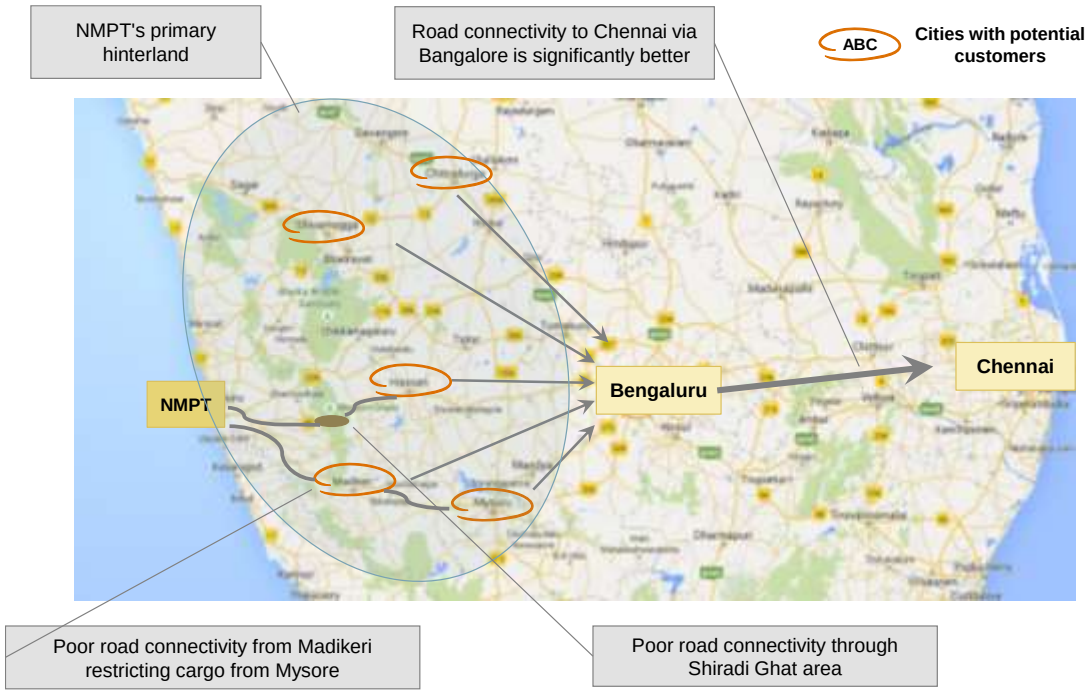


Figure 367: Western Ghats limiting road connectivity to NMPT

Certain infrastructure projects have begun and are underway to significantly improve connectivity to the hinterland across the Western Ghats. Some of them are:

- 4-lane highway to Mysore via Madikeri is under improvement, and is now capable of handling trailers for 40 feet containers
- Connectivity to Hassan has significantly improved by strengthening the Shiradi Ghat section
- 6 lanes of Bangalore-Mysore NH 275 have been approved in 2014
- Rail connectivity to Bellari and Hospet region to improve significantly after construction of missing link from Hubali and Ankola

Given the infrastructure projects that are underway, the port can now start attracting key customers from the connected areas to increase container volumes.

High sea freight and low feeder frequency

Container traffic has to be transshipped at Mundra or Colombo due to absence of mainline vessels to Europe, USA, Africa and the Middle East and, hence, containers are shipped to Colombo and Mundra via feeder vessels.

The feeder charges to both destinations are significantly higher than neighboring ports, which neutralizes the inland haulage advantage for customers in places closer to NMPT than Chennai (mainly regions around Mysore).

Feeder charges at NMPT are USD 300/TEU for Colombo, and USD 220/TEU to Mundra, which are approximately thrice the charges from Cochin, Chennai and Tuticorin.

There is a cost advantage of ~Rs. 17,000/TEU in transporting a container from Mysore to NMPT over Chennai, which is neutralized by the abnormally high feeder charges, resulting in cargo flow to Chennai.

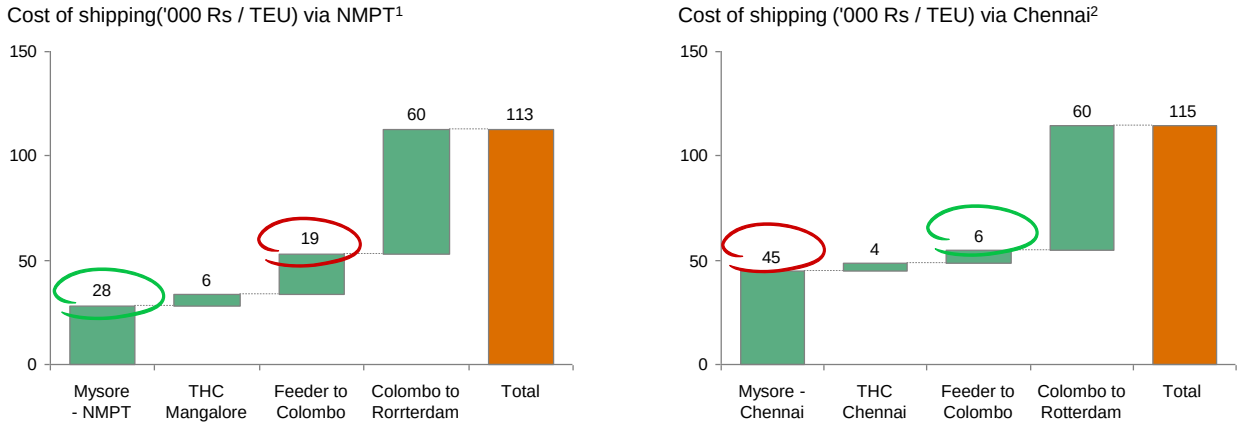


Figure 368: Comparison of shipping costs from Chennai and NMPT

Currently, there are two feeder operators operating at NMPT to Mundra and Colombo. Monopoly on both the routes is driving prices high, and there is potential to reduce the feeder cost after the entry of another player.

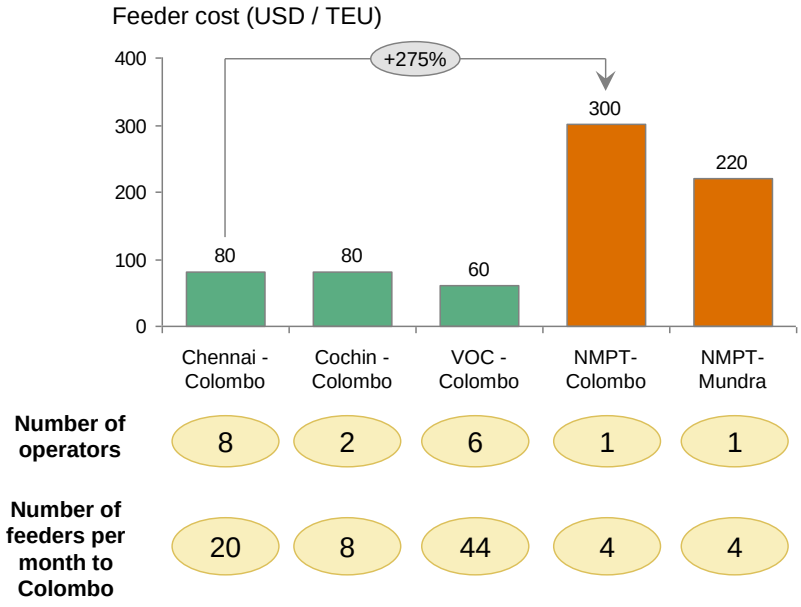


Figure 369: Comparison of feeder charges

Along with attracting additional cargo, the port should focus on attracting new players to operate feeder services. Competition and increased cargo will reduce prices to bring them in line with other ports.

Focus on acquiring JBF's coastal cargo of 30,000 TEUs per year

JBF India has setup a new plant in SEZ to manufacture PET for its plants in Middle East and Gurgaon. Capacity of the plant is 1.5 MT. JBF is expected to ship 50% of its cargo as break bulk to its plant in the middle East and another 50% to be transported to Sarigam, Gujarat.

JBF is evaluating trucking and coastal shipping as two alternatives for transportation to Gujarat. There is an expected cost saving of Rs. 10,000/TEU in adopting the coastal shipping route.

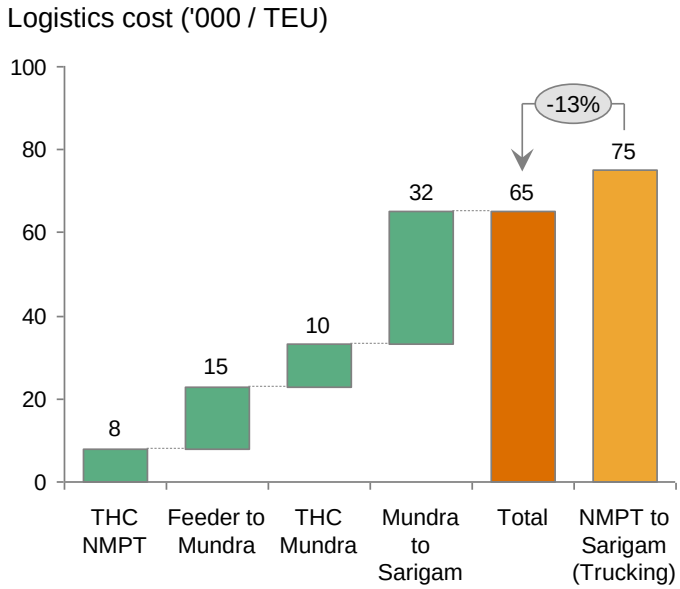


Figure 400: Logistics cost saving for JBF's coastal cargo

JBF will benefit if an additional feeder operates to Hazira port instead of Mundra. Inland haulage cost is much less from Hazira to Sarigam, as compared to Mundra.

Recommendations

The port should set up a business development team for attracting customers in Mysore and adjoining areas. BD team to consist of representatives from Traffic department, Finance department, Vessel agents, Feeder operators, CHAs, etc.

BD team should map the potential customers in adjoining areas and create a centralized database. BD team should conduct trade meets and focus on attracting key customers. Team should demonstrate the steps taken by the port to attract more cargo, and the inland haulage advantage at NMPT as compared to Chennai and other ports.

Besides, ports should engage with feeder operators to attract new players for starting operations at NMPT. Increased competition is expected to decrease feeder costs and increase frequency to key destinations of Mundra and Colombo.

Port to attract JBF's coastal cargo to Sargigam, and it should provide discounts or incentives to attract 30,000 TEUs per year. Potential incentives could be VRC discounts, warehouses on longer term contract or volume based wharfage discount. Besides, port should also facilitate the discussions between JBF and a feeder operator to explore the possibility of starting a feeder to Hazira.

Expected Impact

Aggressive marketing is expected to increase container volumes at NMPT by 110,000 TEUs per year by October 2016. Customers are expected to perceive NMPT as a port of choice and the cargo is expected to increase further to ~2 lakh TEUs by 2017.

12.2.1.2 Initiative: NMPT 1.2 Improve berth and yard productivity for container handling

Initiative Overview

Berth productivity for containers at NMPT is low due to absence of dedicated container berth and quay cranes. NMPT also has sub optimal yard space and yard infrastructure to support the berth.

Productivity can be increased from 17 moves per hour to 25 moves per hour by installing an MHC or a quay crane. Additionally, there is a requirement to allocate 20,000 Sqm of yard space and 3 additional reach stackers. NMPT also needs to implement yard planning by maintaining a centralized container location database to facilitate easy location of containers in the yard.

Key Findings

Berth productivity for containers at NMPT is significantly lower than other container handling ports. Most vessels rely on vessel gear as there are no quay cranes available. Vessels have to pay for use of MHCs and the reach of the current 64 MT cranes is limited. Hence, vessels only rely on vessel gear.

Installation of a quay crane or an MHC will increase productivity by 50%.

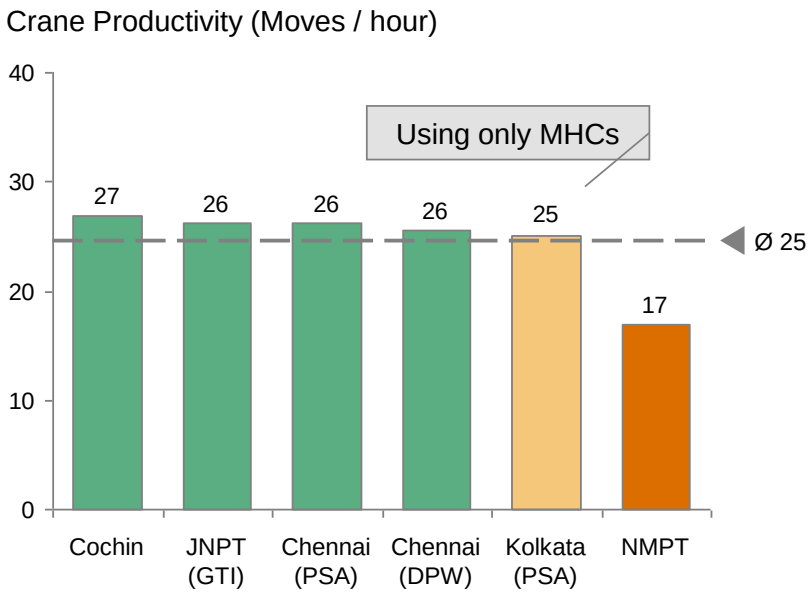


Figure 370: Berth Productivity for containers

However, there is a significant investment required in setting up an MHC and the private party that will set up the MHC needs to recover the investment from cargo volumes.

IRR calculations suggest that the crane operator will be able to recover a healthy IRR of 20% on an investment of Rs. 40 crores if container traffic reaches 1.5 Lakh TEUs per year.

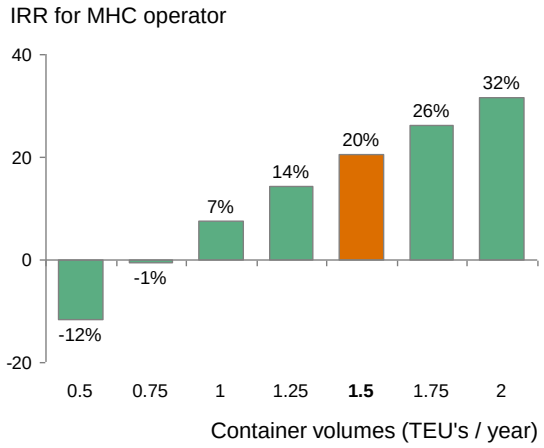


Figure 371: IRR for crane operator on an investment of Rs. 40 crores

Yard occupancy at NMPT is 95% and is significantly higher than the recommended utilization of 75%. On certain days, the occupancy is above 100%. This is evident from containers lying on the berth and on the roadside.

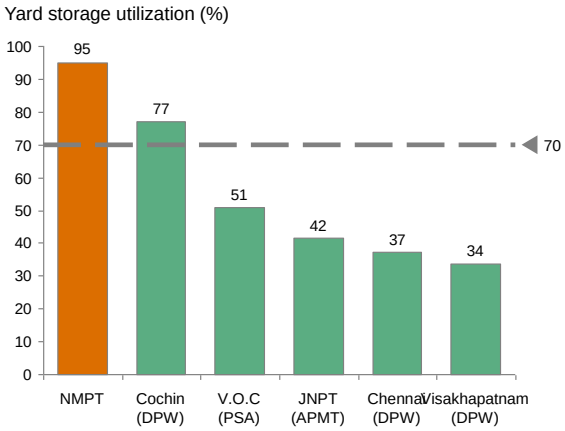


Figure 372: Yard utilization at NMPT

Figure 373: Container lying on the roadside

There is a need to allocate additional yard space of 20,000 Sqm to support the increased traffic volumes of 1.5 lakh TEUs per year.

Currently, the port owns 3 reach stackers that are operated by a private party. There is a requirement of 3 RTGC/reach stackers per crane operating at the berth.

- 1 RTGC to load the export container
- 1 RTGC to unload the import container
- 1 RTGC for yard management

At any given time, there are at least 2 vessel cranes operating on the berth and, hence, there is a requirement of 6 RTGCs / reach stackers. Since the port currently owns 3 reach stackers, it should invite a third party to invest and operate 3 additional reach stackers.

Currently, port does not maintain a centralized database to locate containers in the yard / wharf area. There are huge challenges in locating the containers as they are lying all over the wharf on berths, and on the roadside. Port needs to implement yard planning and management to handle containers efficiently.

There is a need to create and maintain a centralized database with location of all containers to identify the containers when required.

Recommendations

1. Install a mobile harbor crane for container handling on a PPP mode to increase productivity by 50%
2. Allocate additional yard space of 20,000 Sqm to handle additional volumes
3. Set up 3 additional reach stackers on PPP mode
4. Implement yard planning by creating and maintaining a centralized database

Expected Impact

Undertaking the above 4 key initiatives will ensure an increased service level of container handling at NMPT. Berth productivity will increase from 17 moves per hour to 25 moves per hour, and yard efficiency will ensure seamless feeding at the berth.

12.2.2 LNG

12.2.2.1 Initiative: NMPT 2.1 Set up an LNG terminal at NMPT

Initiative Overview

There is a significant captive demand of ~2 MMTPA of LNG per year in the vicinity of NMPT. There is an attractive opportunity to serve this demand by setting up an LNG terminal at NMPT.

The port had signed an MoU with ONGC to explore the feasibility of an LNG terminal—ONGC has not provided a conclusive answer to the port. The port has received expression of interest from other parties like GAIL.

The port should obtain a conclusive answer from ONGC with respect to milestones for setting up the terminal. In absence of interest from ONGC, the port should go for open bidding of water front to all players.

Key Findings

Several key industries in Mangalore have a potential LNG demand if a terminal comes up at NMPT. In total, there is a captive demand of approximately 2 Mn MT per year in the Mangalore city itself.

- MRPL + OMPL: ONGC's two entities have a combined demand of 0.6 Million MT per year.
- Mangalore Chemicals and Fertilizers operate on Naphtha and have upgraded their equipment to consume LNG. There is a demand of ~0.4 Mn MT per year in the existing plant. Additionally, they are planning to set up a new plant of 1 Mn MT of Urea that shall require an additional 0.5 MMTPA of LNG every year.
- Tannir Bhavi Power plant, which was recently shifted to Kakinada, will return back to Mangalore if an LNG terminal is set up. The demand from the power plant is expected to be close to 0.4 Mn MT per year.
- Smart City: Mangalore has been declared as a Smart City, which will increase the power requirement of the city—it is expected that an additional demand of 0.4 MMTPA will be created.

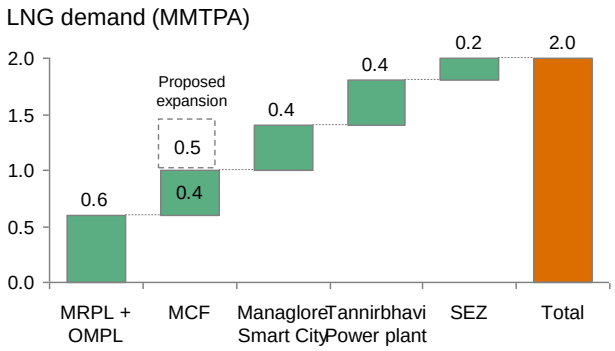


Figure 374: Captive LNG demand at Mangalore

All these industries are in the immediate vicinity of the port and, hence, there is no issue of land allocation for pipelines. Given the proximity to the port, these customers can be served at a very low cost as the cost of LNG rises with distance of pipelines.

Figure 375: Location of captive customers

NMPT signed a memorandum of understanding with a consortium of ONGC, BPCL and Mistui to explore the feasibility of setting up the terminal in 2013. ONGC has not provided a conclusive answer yet.

The port has received expression of interest from other players like GAIL and other private players due to the attractive proposition of captive demand.

Recommendations

NMPT should demand a conclusive answer form ONGC with the proposed timeline, milestones and a financial commitment for setting up the terminal. In absence of interest from ONGC, the port should go for the open auction of water front for setting up the LNG terminal.

Expected Impact

We expect that setting up a ~2-2.5 Mn MT LNG terminal at NMPT will result in additional revenues of ~Rs. 25 crores per year to the port.

12.2.3 Fertilizer

12.2.3.1 Initiative: NMPT 3.1 Set up a mechanized facility for fertilizer handling

Initiative Overview

NMPT has lost fertilizer cargo to private ports like Krishnapatnam due to limited storage and warehousing capacity inside the port. Fertilizer has to be shifted to warehouses outside the port where they are bagged manually, which drives up the cost of handling.

Mechanizing the fertilizer handling will avoid double handling and reduce total handling costs by ~ 40%, making NMPT attractive for fertilizer imports. Port should set up a mechanized berth on a PPP basis. Shore offloaders to discharge fertilizer on a conveyor that will transport it to silos from where it will be fed into a hopper for the mechanized bagging plant.

Key Findings

Fertilizer volumes at NMPT have decreased by 30% since 2008-09. Market share of NMPT in Indian fertilizer imports has decreased from 17% in 2006 to 4 % in 2015. While the market share of Krishnapatnam has risen sharply from 0% in 2007 to 105% in 2014.

Interviews from fertilizer handling stevedores suggest that lack of storage space inside the port is the key reason for fertilizer moving to other ports. Currently, the fertilizer has to be transported from berth to a transit shed as Mangalore has frequent rains and the fertilizer cannot be left on the berth. From transit sheds, fertilizer is moved to private godowns outside the port (~5-6 Kms) where they are bagged manually by labor. Total cost of handling fertilizer from discharge to rake loading is ~Rs. 710/MT. There are two inefficiencies in the process driving the cost high:

- Double handling due to lack of storage and bagging facilities inside the port
- Labor involvement in manual bagging and stitching

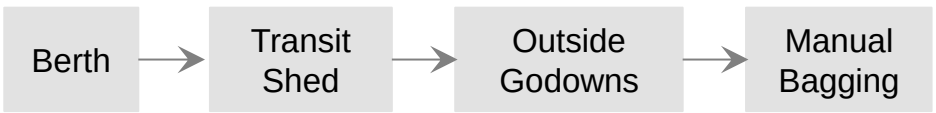


Figure 376: Current fertilizer handling process

Mechanization can reduce the cost by 40% to ~430 per MT by setting up storage and discharge facilities inside the port. Setting up silos will eliminate the need to transport the fertilizer to outside godowns, and installation of conveyors will further reduce cost by eliminating labor involvement.

Additionally, mechanized bagging will bypass labor involvement and reduce costs of handling, standardization and stitching.

Recommendations

NMPT should setup a mechanized berth for fertilizer handling on a PP basis to reduce handling costs and attracting more cargo. New berth should have the following handling process:

- Mechanized discharge from shore offloader to a conveyor belt
- Conveyor belt to feed fertilizer into Silo storage facilities located inside the port
- Silo storage to feed directly into hoppers of mechanized bagging plant

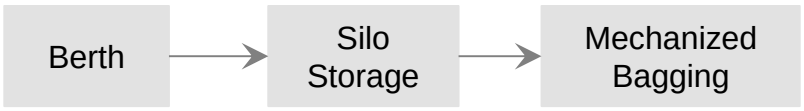


Figure 377: Proposed fertilizer handling process

Expected Impact

We expect that after mechanization, the handling costs of fertilizers will go down from Rs. 710/MT to Rs. 430/MT. The ~40% cost saving will be an incentive for fertilizer importers, and cargo volumes will grow to ~1 MT per year from the current 0.65 Mn MT.

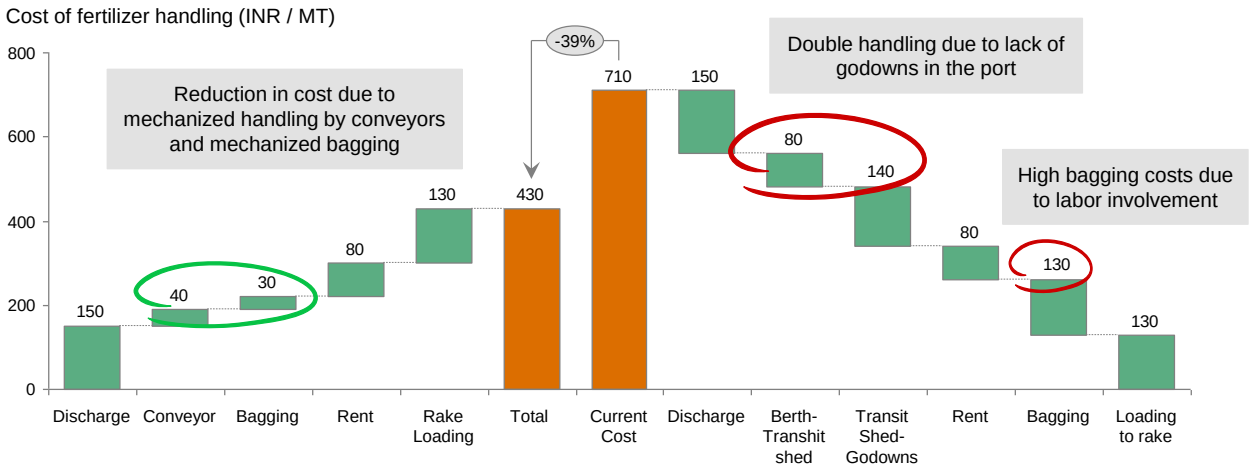


Figure 378: Reduction in logistics cost by proposed mechanization

12.2.4 Cost

12.2.4.1 Initiative: NMPT 4.1 Reduce overtime cost in marine equipment through 3-shift deployment

Initiative Overview

Overtime costs for marine equipment in NMPT is high due to the two shift deployment. Each employee has to work for 12 hours in a day as opposed to 8 hours in other ports and, hence, has to be paid 4 hours of overtime per day.

Migration to 3 shifts will require additional manpower for manning the new shifts, which can be minimized by reduction of equipment deployment during night shifts. Based on discussions with the Marine department, it is feasible to handle operations in the night with 1 tug and 1 pilot launch.

	Tugs (10 people per group)	**Pilot Launches** (6 people per group)	**Mooring Boats** (3 people per group)
Shift 1	**2 Tugs / 20 People**	**2 launches / 12 People**	**2 Boats / 6 People**
Shift 2	**2 Tugs / 20 People**	**2 launches / 12 People**	**2 Boats / 6 People**
Shift 3	**1 Tugs / 10 People**	**1 launch / 6 People**	**1 Boat / 3 People**
Extras for weekly off	**10 People**	**6 People**	**NA**
	60 People	**36 People**	**15 People**
	1 additional group required • Spare SPM tug to be utilized for exigencies	**2 additional groups required**	**Decrease in staffing fro 4 to 3** • Workload reduced to half because of outsourcing

Figure 379: Proposed equipment deployment

Migrating to a 3-shift deployment will significantly reduce over time cost of Rs. 5 crores. The port has sufficient staff to migrate to a 3-shift deployment, but lacks certain category of employees. Outsourcing mooring activities will release the required manpower to enable the migration.

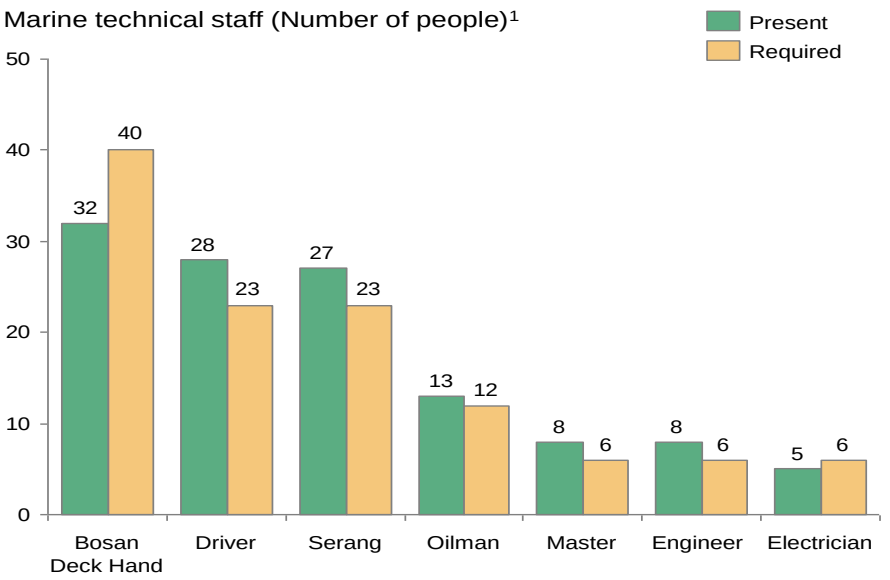


Figure 380: Manpower requirement for 3-shift deployment

Outsourcing the mooring section will release manpower for catering to shortfall of manpower for 3-shift deployment. Outsourcing will release 12 Deck Hands, 12 Fitters and 2 Foremen. Fitters deployed in the water supply division will reduce overtime costs, and Deck Hands on tugs and pilot launches will further reduce overtime.

Recommendations

The port should outsource mooring activities and migrate to a 3-shift deployment for tugs, pilot launches mooring boats. The migration is to be done in a phased manner after discussion with the trade unions. NMPT should first outsource mooring activities.

Expected Impact

Migrating to 3-shift deployment for tugs, pilot launches and mooring boats will eliminate overtime for marine equipment. Hence, outsourcing mooring activities and migrating to a 3-shift deployment will result in overtime cost savings of ~Rs. 4.3 crores.

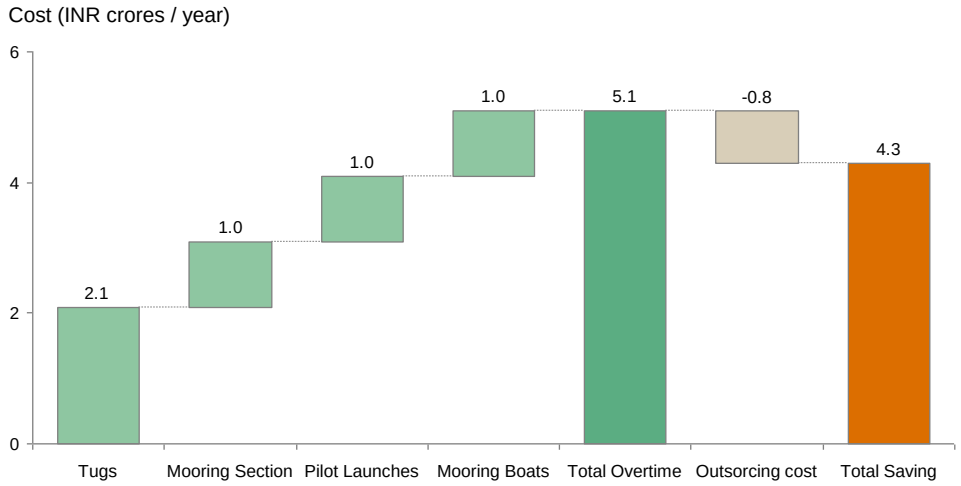


Figure 381: Reduction in overtime costs