TECNO ECONOMIC FEASIBLITY REPORT

EAST KARANJA PORT

Phase I- Expansion of the Existing Port

Proposed by

M/s Karanja Terminal Logistics Pvt Ltd

Karanja Terminal

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1. INTRODUCTION

1.1. Background

Karanja Terminal & Logistics Pvt Ltd is developing a world class Multipurpose Terminal and ship repair yard at Karanja creek of Raigad District in Maharashtra which is the "gateway" to the financial heart of India. The company is led by its Chairman Mr. Madan Lal Meena (IAS Retd.) and mentored by Mr. Nikhil Gandhi who has a successful track record of delivering one-of-a-kind, path breaking mega projects over his 30 years career.

Maharashtra Maritime Board has leased the project site to Karanja Terminal & Logistics Pvt Ltd for a period of 50 years on Build Operate Transfer (BOOT) basis.

1.2. Strategic location of Project.

Karanja is strategically located with a naturally protected ambience, which supports its capability to make more offerings as a service provider. Being geographically situated at the mouth of Karanja creek, it has natural protection from all sides, ensuring consistent all-weather working condition throughout the year unlike the eight-month cycle usually followed (due to monsoon hazards), making it an all-weather terminal.

Following are the nearest infrastructure facilities and connectivity.

Sr no.	Destination	Distance from site
1	Nearest Airport	International Airport (62km) Proposed International Airport (18km)
2	Nearest Railway station	Bokadvira/Uran Railway station (3 km)
3	Nearest Highway	NH4B (7km)
4	Nearest Port	JNPT, Mumbai (7 nm)

Table 1.1: Project location and site connectivity

Figure 1.1: Karanja Port on google map w.r.t. Mumbai and Raigad region.

Figure 1.2: Location of existing and proposed site on Google map

1.3. Need of the project

JNPT and Mumbai ports handle close to 50% of the country's port traffic. JNPT is in the Nava Sheva area and situated just north of Karanja. The port is well connected to neighbouring Mumbai and to the hinterland of Maharashtra, Madhya Pradesh, Gujarat, Karnataka and most of North India. Both JNPT and Mumbai are expected to grow substantially together with significant increase in coastal trade from adjoining minor/feeder ports.

Following are few highlights on need for the project:

- Immense congestion of JNPT Road networks for which Karanja could provide waterside evacuation.
- Phasing out of MbPT has envisaged need for the Ports in the vicinity, which can be met by Karanja with good rail and road connectivity for more efficient discharge of cargo to the warehouses, in Navi Mumbai which are closer and well connected and nearer to Karanja.
- Implementation of projects under SAGARMALA scheme for Coastal movement to reduce land movement and karanja can take credit as the first port in the country to fulfil this objective and for oncoming more such barge ports along the coast.

Karanja Terminal & Logistics Pvt. Ltd has obtained EC & CRZ clearance from MoEFCC vide letter dated 21.08.2013, for developing a multipurpose terminal in 80 hectares area of Karanja creek. The company has started development of Port after obtaining the EC & CRZ clearance, however, there is a patch of mangroves in the location grown over the time which requires replantation of mangroves to 80 hectares cleared by MoEFCC for the project. The company is developing current project on 60hectares, there is a patch of mangroves in the location grown overtime which requires replantation before we area able to develop the balance 20 hectares.

Today due to the upcoming infrastructure projects like MTHL, Coastal road, expansion of JSW Dolvi port etc., the demand for area requirement has increased which was not envisaged at the time of obtaining clearance. The government departments like Navy, Coast Guard and Ministry of Fisheries has also shown interest in the project due to the strategic location of the project. This has led to necessity of project expansion by additional 80 hectares. This additional 80 hectares cannot be continuous to the present project area as, there is a culvert made by CIDCO towards East and no place to expand at West side of the port, hence the proposed expansion of additional 80 hectares area is on East side of existing project at approx. 400m.

1.4. Existing development

Karanja Terminal & Logistics Pvt Ltd has obtained required clearance including Environment and CRZ Clearance from Ministry of Environment, Forest & Climate Change (MoEFCC) to develop Multipurpose Terminal vide letter dated 21.08.2013. The project falls in intertidal zone and does not involve acquisition of land from any private or public entity. The existing facility is developed for 10 number of berths with 1000m total length with port related facilities required for operation.

1.5. The Proposed Project

Karanja Terminal & Logistics Pvt Ltd has proposed additional 80 hectares area on East side of Existing Project called as East Karanja Port. The master plan for the proposed project is provided in Chapter 4. This proposal is for development of phase I of the Karanja Port. Apart from the Easr Karanja Port, proposal is also for developing land approximately 20 hectares behind the existing project and a survey no. 419 or bund road.

2. ENVIRONMENTAL ASPECTS

2.1. Project Location:

The project site is located at latitude 18° 51' 22" N and longitude 72° 57' 56" E in Chanje village, Navi Mumbai on the Western Bank of Karanja Creek.

Sr. No.	Study location	Direction	Distance from site
01	Proposed project Site	At Site	
02	Navapada	East	2.24 Km
03	Koproli	West	5.42 Km
04	Dongri	North	4.3 Km
05	Revas	South	8.4 Km
06	Chanje Village	North-west	1.84 Km
07	Bhendkhal	North-east	3.37 Km
08	Navkhar	South-west	6.71 Km

TABLE 2.1 : ENVIRONMENTAL STUDY AREA

The various parameters studied during environmental survey at above locations are indicated in the following Table 2.2

Sr. No.	Parameters	
1.	Air	Particulate matter, SO_X, NO_X, CO
2.	Water	pH, COD, BOD, DO, etc.
3.	Noise	Noise levels
4.	Socio-economy	Socio-economy status, population, literacy etc.
5.	Land	Soil, Landuse pattern etc.

TABLE 2.2: ENVIRONMENTAL SETTINGS

Fig: 2.1. location of study area.

2.2 Topography and geology

2.2.1 Topography

The topography of the Dronagiri area includes a hilly region towards the west of the node. Owing to its peculiar topography rainfall in this region is rather heavy. In order to ensure proper drainage of the area, CIDCO, in the past has constructed holding ponds in this area to allow water to accumulate during high tide. There is one such holding pond near the project site and during low tide, water from this holding pond flows back into the creek. The project site is the inter-tidal zone of Karanja Creek which is south west of existing Bund Road (Link Road). The project site starts after leaving survey no. 418 & 419 from the Bund road.

2.2.2 Geology

Raigad District, formerly known as Kolaba District is situated in the western part of Konkan belt of Maharashtra State along the west coast of India. It lies between 17^0 52' and 19^0 08' North latitude and 72^0 51' and 73^0 40' East

longitude. The district stretches 160 km from North to South while it ranges 24-48 km from East to West. It forms part of the Konkan coastal low lands and is flanked by Thane District on north, Ratnagiri District on south, Pune and Satara Districts on east and bounded by Arabian Sea on west. The coastline is 250 km long. Raigad District can be divided into three characteristic zones based on topographic features viz. coastal zone, central zone and hilly zone. Though the District forms part of Konkan plains, the topographic set-up is very uneven and rugged. The coastline is characterized by alternative bluffs and curved bays having narrow hinterlands. The central region of District has many plateaus and hills rising from valleys. The eastern part is rugged and merging with the Sahyadris existing in North-South direction. The eastern horizon is marked by Sahyadri hills with good forest cover. The District spreads 48 km in the western direction with a steep slope descending from 869 m at Raigad to 3 m above MSL at Shrivardhan. Physiographically, the district can be divided into three main groups. The portion covering North-south alignment of Sahyadri ranges with several traverses, system of subsidiary hills with varying heights covering more than 45% of the total area of the District. The portion between coastal region and Sahyadri hill ranges, moderately undulating terrain with low lying area covering about 35% of the total area of the District. The extreme western portion in vicinity of Arabian Sea covering about 20% of the total area of the District. The project site on its north has a holding pond and CIDCO's residential land. Karanja village is located to its southern side.

2.2.3. Climate

The climate of the region is tropical maritime with high relative humidity throughout the year. The general climatic regime is equitable since seasonal fluctuations of temperature are not significantly large. The moderating effects of the nearby sea and the high amount of relative humidity in the atmosphere have restricted the variability.

2.2.4. Temperature

The mean of the highest air temperature recorded in Mumbai is 35^0 C in the months of March, April and May while the mean lowest is 16^0 C recorded in the month of January. Mean daily maximum and minimum temperatures are 31^0 C and 24^0 C respectively.

2.2.5. Wind

The following analysis of the wind data is based on the data extracted from the ship collected visual data of the region. The data consisted of ship observed wind speed and direction for a period of 65 years from 1921 to 1985 from the India Meteorological Department (IMD) and are analysed for the grid, Latitude 190 – 220 N and Latitude 700 – 73 E0, which centres offshore of the area of interest. The predominant direction was observed to be west and the wind speed is less than 20 knots (10 m/s) for 94% of time. From the cumulative percentage of occurrence of wind speed and directions, it was observed that during the fair-weather season viz. October to May, the wind speed was less than 12 knots for about 91% of the time. However, during the monsoon (June to September), the wind speed was less than 16 knots for only 62% of the time. During the peak monsoon period (July and August), wind speed of 12 to 27 knots occurred for about 29% of the time. Wind speed of 27 knots was seldom exceeded. However, a maximum wind speed of 44 knots (22.7 m/s.) is also reported.

2.2.6. Relative Humidity

The average relative humidity varies from lowest in the month of December to the highest of 85% during July. The humidity is relatively higher in the morning hours than in the evening hours. The daily humidity values do not show any significant or sudden changes. The relatively high humidity has a considerable impact on the atmosphere in reducing its variability. The relative humidity remains between 44% to 76% throughout the year.

2.2.7 Rainfall

The monsoon generally sets in around the second week of June and continues till late September. July and August are the wettest months all over the region. Maximum rainfall is recorded mostly in the month of July. During winter and the post monsoon season skies are generally clear. In pre-monsoon season light clouds are observed in the evenings with clear mornings. During the monsoon both morning and the evening skies are overcast. The study area falls in the High Rainfall Zone of Konkan. It receives rain during June to September i.e. monsoon period. Small amount of rainfall is also received during non-monsoon period.

2.2.8 Cyclones

The normal frequency of cyclonic storms in the Arabian Sea is one or two in a year, but sometimes more with severe intensity. These storms occur in the months of May/June and October/ November and the paths they follow are

entirely different for these two periods. Although wind intensities during the fine weather period are normally much less than that during the monsoon, occasionally a sudden high wind comes from the north-east. The NE winds are locally known as “Elephants”.

2.2.9 Seismic Conditions

A part of the peninsular India has experienced earthquakes, but relatively few, occurring at much larger time intervals with considerably lesser intensity. As per the latest publication of Seismic zone map IS 1893 (Part I):2002, the Karanja Creek lies within Seismic zone III with close boundary to zone IV. The past Seismic history indicates that zone III had witnessed earthquakes of magnitude 5-6 on the Richter scale.

2.3. Marine Environment

2.3.1.Waves

(a) South Deep Sea Waves

The National Institute of Oceanography (NIO) has compiled and published wave data for the entire coastline of India in the form of a ‘Wave Atlas’. The monthly wave rose diagrams for the region between the Latitudes 15° to 25° N and Longitudes 70° to 75° E indicate that the predominant wave directions are from South West to North West. During this period, waves of 4-5m high occur normally; however, waves up to 8m in height with a period of 14 seconds have also been reported. October and November are the transition months during which the predominant wave direction changes from North to Northeast. Also during December and January, the waves occur from North to Northeast and from February to May waves predominantly come from the NW Quadrant.

(b) Waves within the Creek

However, as the waves enter the shallow waters of the Dharamtar Creek, they tend to get refracted resulting in reduction of their wave energy. By the time waves reach the site at Karanja shores, the heights are expected to be reduced substantially, thus making the waters in Karanja Creek relatively calm and without much disturbance.

2.3.2. Tides

The tidal variations in Mumbai waters are mainly semi-diurnal but with an appreciable diurnal element which produces unequal tides on most days and causes wide variations in extreme levels such that the lowest HW is actually lower than the highest LW. The Admiralty Tide Tables are available for Mumbai and these indicate that the spring and neap tidal ranges are of the order of 4.8m and 1.5m respectively. Water levels at the site may be marginally different to Mumbai but this difference is considered not to be significant. The various tide levels with respect to Chart Datum for Mumbai applicable at Karanja Creek are shown below:

Tide Level

High Water Level (June 1924) (HHWL Highest)	+5.38 m
Mean High Water Springs (MHWS)	+4.42 m
Mean High Water Neap (MHWN)	+3.30 m
Lowest High Water	+2.80 m
Mean Sea Level (MSL)	+2.50 m
Mean Low Water Neap (MLWN)	+1.85 m
Mean Low Water Springs (MLWS)	+0.76 m
Chart Datum (CD)	0.00 m

2.3.3 Currents

The currents in Mumbai harbour are entirely due to tidal ebb and flow but in the SW monsoon period during heavy rainfall, the run-off from the rivers is sufficient to alter the flow pattern appreciably. The normal maximum currents inside Mumbai harbour are about 2 to 3 knots although 4 knots can sometimes occur on the ebb during wet weather. Admiralty Chart 2621 indicates currents between 2 - 3 knots in SW - NE to SSW – NNE direction at the confluence of Dharamtar and Thane creeks. Recorded current data are not available for Karanja Creek but the current strengths in Karanja creek are expected to be in the order of 1.5 - 3 knots.

3. TRAFFIC POTENTIAL

3.1. International & Domestic Trade

3.1.1. World Trade

India is presently known as one of the most important players in the global economic landscape. Its trade policies, government reforms and inherent economic strengths have attributed to its standing as one of the most sought after destinations for foreign investments in the world. Also, technological and infrastructural developments being carried out throughout the country augur well for the trade and economic sector in the years to come.

With the Government of India striking is important deals with the governments of Japan, Australia and China, the external sector is increasing its contribution to the economic development of the country and growth in the global markets

Total exports from India (merchandise and services) have increased 8.73 per cent year-on-year in 2018-19 (up to February 2019) to US$ 483.92 billion, while total imports have increased by 9.42 per cent year-on-year to US$ 577.31 billion, according to data from the Ministry of Commerce & Industry. By 2018-19 end exports are expected to reach US$ 540 billion.

3.1.2. India's Trade

Though ports have been in use since ancient times, the emergence of ports as gateways of international trade became important after the coming of the European traders and colonisation of the country by the British. This led to the variation in the size and quality of ports. There are some ports which have very vast area of influence and some have limited area of influence. At present, India has 12 major ports and 185 minor or intermediate ports. In case of the major ports, central government decides the policy and plays regulatory functions. The minor ports are there whose policy and functions are regulated by state governments. The major ports handle larger share of the total traffic. The 12 major ports handled about 71 per cent of the country's oceanic traffic in 2008-09.

The capacity of Indian ports increased from 20 million tonnes of cargo handling in 1951 to more than 586 million tonnes in 2008-09. It is expected that by 2025, the ports will be required to handle a cargo of 2500 MTPA while the current port capacity in India is 1500 MTPA.

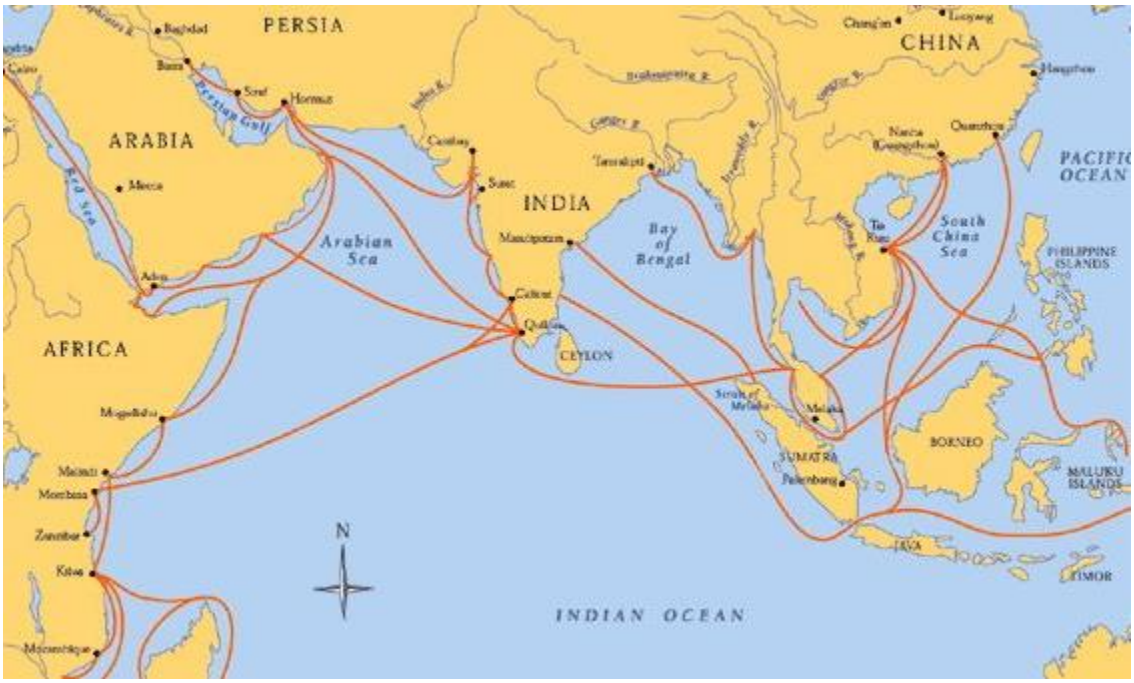


Fig: 3.1. Sea trade routes of India

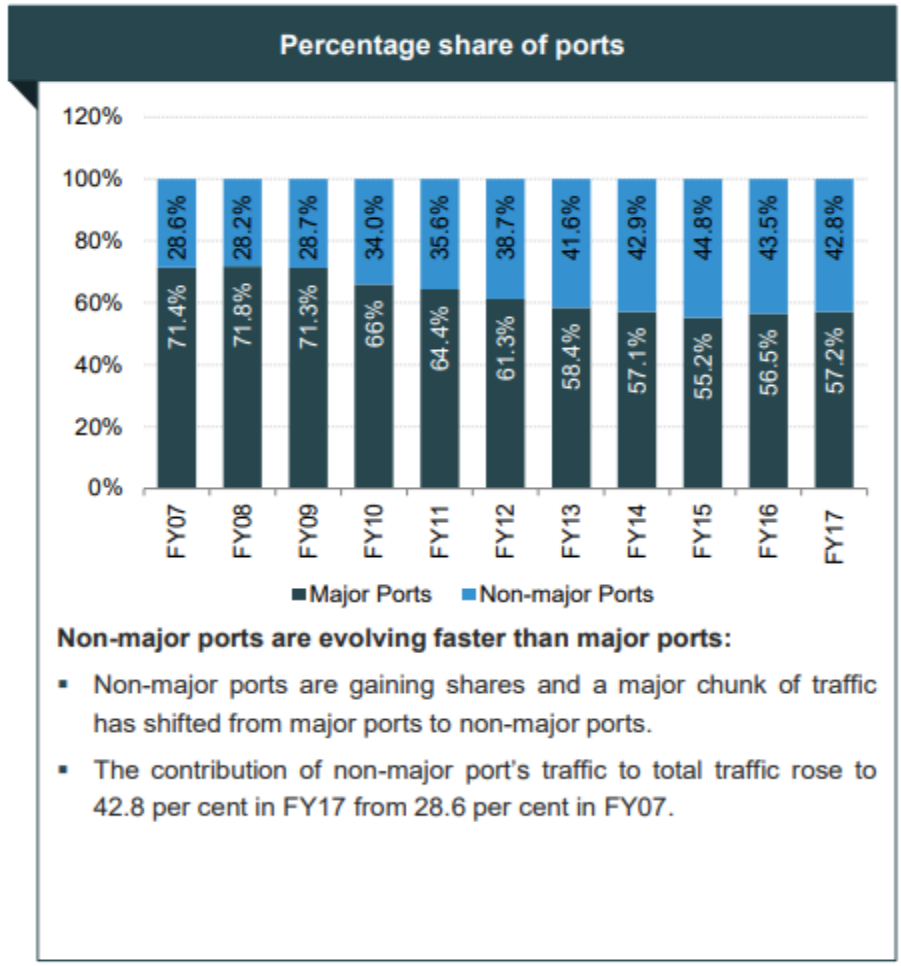
3.1.3. Indian Economy Overview

3.2. Cargo Traffic

3.2.1. Cargo Traffic at Indian Ports

India has 12 major ports and about 200 non-major ports. Under the National Perspective Plan for Sagarmala, six new mega ports will be developed in the country. In FY19 traffic has increased 2.90 per cent year-on-year to 699.05 million tonnes. Cargo traffic at non-major ports was estimated at 281.0 million tonnes FY19P*.

Since ports handle almost 95 per cent of trade volumes in India, the rising trade has contributed significantly to the country's cargo traffic. Capacity at major Indian ports reached 1,477 million tonnes by FY19P. Capacity at non-major ports is expected to reach 968 MMT in 2019 from 750 MMT in 2016.



The graphical representation shows non major ports has huge potential to grow.

3.2.2. Cargo Traffic at Maharashtra

The Maharashtra State is situated on the West coast of India between the state of Gujarat in the North and Goa in the South. It has a coastline of 720 km., 10 per cent of India's coastline. But the development of minor ports has become a need of the day. The minor ports in Maharashtra handled cargo traffic of 20 MTPA; So, Government of Maharashtra is prepared a plan for development of these ports. The minor port comes under the jurisdiction of the state governments and Maritime Boards have been established in the respective states in which Maharashtra is one of

the important among ocean states. The major ports are run by Central Governments under the Major Port Trust Act 1963.

The coast of Maharashtra is generally rocky and rugged. Some places near the coast consist of elevated plateau intersected by numerous creeks and navigable rivers situated between steep and lofty hills. The Western Ghats with general elevation of 600 to 900 mt and few peaks as higher than these is a typical feature of Maharashtra coast. Many of the state ports are in the river estuaries or creeks like Devgad, Vijaydurg, Jaigad, Ratnagiri, Bhagwati Bunder, Dabhol, Murud-Janjira and Revadanda. Estuaries of rivers, some navigable have muddy banks with mangroves but near the coastline these are fringed with sandy beaches. The important rivers include Manmad, Kundalika, Amba, Vaghthane (Vijaydurg Creek), Shastri (Jaigad Creek), Vashishti (Dabhol Creek),Savitri (Bankot Creek), Ulhas, Vaitarna and Damanganga. The MMB has identified 35 creeks and rivers as having a potential for the construction of new minor ports. A number of captive port facilities constructed in the creeks and bays are typical features along the coast of Maharashtra. A natural availability of shelter in these locations has not been fully utilized. These facilities are usually operated for limited period in non-monsoon seasons because of constraints of coastal shipping or anchoring the vessels for lighter age operations. According to MMB, the facilities have been developed in Dharamtar creek, Rajpuri creek and Pawas bay.

The composition of the organized industrial sector in Maharashtra as observed from the Annual Survey of Industries data has undergone a considerable change in the last four decades. The consumer goods industries were predominant, and the net value added by these industries was then about 52 per cent of the total value added by all the industries together in 1960. The relative importance of consumer goods industries has gradually declined with shift towards the capital goods industries. The emerging investment pattern shows that the state is offering a wide diversified menu of industrial location specializing in different core industries as shown in the below table.

Table no. 3.1. Locations of the Industries.

Industry	**Districts**
Automobile Industry	Pune, Aurangabad
Petrochemicals, Plastic & rubber industry	Ratnagiri, Pune
Metals and metal products industry	Raigad, Ratnagiri

Chemicals industry	Raigad thane
Textile Industry	Nagpur, Raigad
Coal & mineral	Chandrapur
Oil-gas	Ratnagiri, Mumbai

The development of industries results in import of raw material/export of finished cargo.

Commodity	Details
Containers	1. Despite plans for capacity expansion on sea-side, evacuation remains an issue at JNPT 2. Container traffic from JNPT can shift to Karanja with mid-stream lighterage of containers or sent through water mode by loading containers unloaded from mother vessel on the shore and subsequent movement through barges to Karanja for faster evacuation to feeder movement from JNPT-KTPL
Iron and Steel	1. Iron and steel traffic was approx. 5.4 mn tonnes at Mumbai port in FY16 accounting for 9% of total cargo handled at the port, whereas it amounted to approx. 2 mn tonnes (primarily captive) accounting for approx. 7% of total traffic at the non-major ports in FY16 2. Karanja is in close proximity to major steel producing units in Maharashtra and can shift significant volume from MbPT considering the evacution issues
Project cargo	1. Project cargo is imported at Mumbai and Dharamtar ports 2. Mumbai port has major evacuation issues for project cargo movement 3. Karanja can provide faster evacuation to project cargo vis-a-vis Mumbai port
Cement	1. Cement moves from cement plants in Gujarat to Mumbai by sea or road to cater the rising demand of Mumbai region 2. Karanja can offer a captive jetty to major cement players in the region lowering the total logistics cost of moving cement via road

Ro Ro	1. Vehicle exports at Mumbai port have increased by a CAGR of 25% in FY14 - FY16 2. Pune -Nashik belt is one of the major automobile manufacturing clusters in India 3. Karanja can facilitate faster movement of vehicles to Mumbai port for exports

Table 3.2. Commodity-wise traffic shift from JNPT and MbPT to Karanja

4. PROJECT DETAILS

4.1. Details of Existing Project

Karanja Terminal & Logistics Pvt Ltd is developing a Multipurpose Terminal with 10 berths along 1000m waterfront out of which 5 berths are ready and four has Consent to Operate.

Karanja Terminal & Logistics Pvt Ltd is developing a Multipurpose Terminal & Ship repair yard at Karanja creek and has obtained necessary permissions from concerned authority including following:

Sr.	Letter no.	Dated	Details
1	BO/RO(HQ)/CE/CAC-552	03.08.2012	Consent to Establish for Multipurpose Terminal Facility of 1000m waterfront consisting of Containers, Iron & Steel in coil & bundles, plates & fabricated sections with average capacity for barge unloading of 3000 to 4000 tonnes/day and boat/yacht parking facility.
2	F. No. 11-59/2010 – IA.III	21.08.2013	Environmental and CRZ Clearance for the proposed Multipurpose Terminal and Ship Repair Facility at Village Change Dist. Raigad, Maharashtra by M/s. Karanja Terminals & Logistics private Limited.
3	Format 1.0/BO/CAC-Cell/UAN No. 32035/ CAC-1903000484	07.03.2019	Consent to operate to port activity for Multipurpose Terminal Facility of 400m waterfront consisting of Containers, Iron and steel in coil and bundles, plates and fabricates sections with average capacity for barge

			unloading of 3000 to 4000 tones/day and boat/yatch parking facility. (Except handling of coal)
4	Format 1.0/BO/CAC-Cell/UAN No. 58500/CAC-1903000676	13.03.2019	Revalidation of Consent to Establish for Multipurpose Terminal facility of remaining 600 meters waterfront (Remaining operational Area of 50 Hectors of the port) consisting of containers, iron & steel in coil & Bundles, plates and fabricated sections
4	CRZ – 2011/CR – 249/TC-3	11.09.2012	Environmental and CRZ Clearance for the proposed Multipurpose Terminal and Ship Repair Facility at Village Change Dist. Raigad, Maharashtra by M/s. Karanja Terminals & Logistics private Limited

4.1.2. Facility

The current project has permission to develop 10 berths along 1000m waterfront in Karanja creek near Chanje Village of Raigad district of Maharashtra.

While seeking clearance the company has mentioned that, they will be handling bulk, breakbulk and container cargoes.

4.1.3. Road Connectivity

The present project has very good road connectivity and connects to State highway and 8 lane NH4B.

The project has good road connectivity to the present projects like JNPT, ONGC etc and to the proposed projects like, Mumbai Trans Harbour Link, Coastal Road, Navi Mumbai International Airport.

4.2. Proposed Expansion of Karanja Port

4.2.2. Area and Location

The current application is made for expansion of the approved project. This includes following areas.

i. 80 hectares area adjacent to the current project (East Port).

ii. 20 hectares area behind the West Port for mangroves removal.

4.2.2.1. Details of East Karanja Port: Area utilization for the port activity and handling capacity is given below for both the East & part of West Karanja Port.

East Karanja Port (Proposed 80 hectares area)

Area Utilization	**2022**	**2024**	**2026**	2028	2030
Storage Space for various cargoes (in ha)	**8**	**16**	**20.3**	27	27
Internal Roads & Circulation Space in Storage areas @ 50% (in ha)	**4**	**8**	**12**	16	16
Logistics (in ha)	**7.89**	**15.78**	**19.67**	26.56	26.6
Rail Corridor (in ha)			**7.7**	10	10
Port Building including general parking (in ha)	**0.01**	**0.02**	**0.03**	0.04	0.04
Berthing length (in mtr)	**500**	**1000**	**1500**	2000	2500
Green belt, landscaping (in ha)	**0.1**	**0.2**	**0.3**	0.4	0.4
Total area (in ha)	**20**	**40**	**60**	80	80
Dredging	**-6**	**-6**	**-6**	-10	-12
Vessel size with Capacity (Dwt)	**4000**	**4000**	**35000**	35000	55000
Throughput (million MTPA)	**5**	**10**	**15**	40	77

Note: The Phase I is marked in Bold

Table: 4.1. Development of proposed 80 hectares area in phases.

West Karanja Port (20 hectares area to west Karanja Port)

Area Utilization year wise	**2022**	**2024**	**2026**	2028	2030
Storage Space for various cargoes (in ha)	**8**	**8**	**8**	8	8
Internal Roads & circulation Space in Storage areas @ 50% (in ha)	**4**	**4**	**4**	4	4
Logistics (in ha)	**7.89**	**7.89**	**7.89**	7.89	7.89
Port Building including general parking (in ha)	**0.004**	**0.004**	**0.004**	0.004	0.004
Berthing length (in mtr)	**-**	**-**	**-**	300	300
Green belt, landscaping (in ha)	**0.04**	**0.04**	**0.04**	0.04	0.04
Total area (in ha)	**20**	**20**	**20**	20	20
Dredging	**-**	**-**	**-**	-6	-12
Vessel size with Capacity (Dwt)	**4000**	**4000**	**4000**	4000	4000
Throughput (million MTPA)	**3**	**3**	**3**	3	3

Table: 4.1. Development of 20 hectares area in phases.

For the West Port the dredging is proposed from -6m to -12m draft in the Master Plan. Initially only the land area will be used for Port related activities.

The reclamation work cannot be done in phases, it must be one time construction. As the area has good demand for storage of cargoes, the additional area reclaimed will be utilised for storage till the time the master plan is implemented.

The piles for berths length for phase I is planned to be constructed considering -12 draft. The phase I is expected to be completed by year 2026. The throughput of phase I when fully operational is expected to be 15million MTPA.

4.2.2.2. Land-use of 80 hectares area in East Port.

Karanja has planned 854m cargo berth, 835m POL & cargo berth and 794m Bulk & break bulk berth along stretch of waterfront in Master Plan. In the phase I of East Karanja Port only 1000m quay length is proposed.

This will include berths for handling cargoes like general dry cargo, container cargoes, break bulk cargoes, bulk cargoes, refer cargoes, Ro_ Ro , liquid/liquified gas berths.

Yacht marina, Ship repair/building yard are also part of this project.

Fig: 4.1. Layout showing proposed 80 hectares site u/r

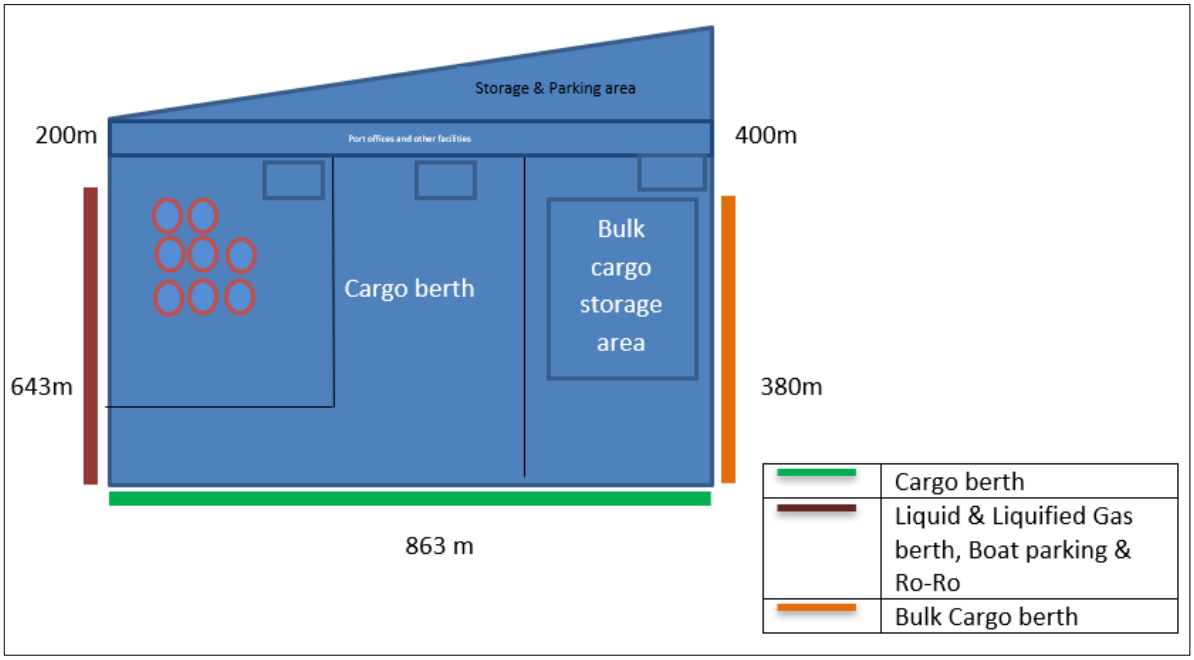


Fig: 4.2. Land-use map for 80-hectare area.

4.2.2.3. Area behind current reclaimed area.

The area behind the current reclaimed area measuring approx. 20 hectares is yet to be developed. This area will be used as backup area to store cargoes and port utilities including 390m boat parking area, port offices, Marine Hub, Storage Area, Parking area and a road with 268m x 144m along with internal roads and RO-RO jetty etc.

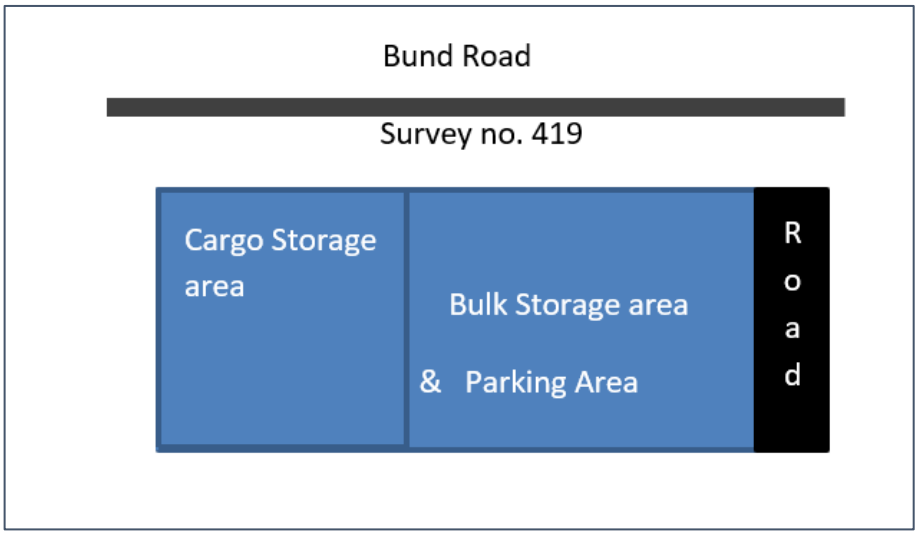


Fig: 4.3. Land-use map for 20 hectares area.

4.2.3. Cargo's in Existing and Proposed project

The existing project has Environmental and CRZ Clearance dated 21.08.2012, as per which bulk, break bulk and container cargoes can be handled. However, no specific list of cargoes is mentioned in the EC.

Therefore, for the existing and proposed project, following list of cargoes/goods are proposed to be handled.

Cement/ Coal / Iron ore / limestone / Mines & Minerals & other dry bulk/Fertilizers and raw materials for manufacture of fertilizer / food grains / sugar / clinker / cement / Project cargo / timber & wood / machines/ Iron steel products / Break Bulk etc./Container, Ro – Ro & Automobiles and any other non-hazardous cargo including livestock. All Class A, B, C petroleum products, Including Petrochemical products, Hazardous, Toxic and Non Hazardous chemicals/Liquids and other Liquid cargos Tentative list of hazardous liquid cargo but not limited to are as follows: Ethylene, Propylene (Propene), Butadiene, Pentane, Ethyl Mercaptan Motor Spirit, Propylene Oxide, Hexane, Naphtha, Acetone, Methyl Chloride / Chloro Methane, Cyclohexane, Benzene, Ethyl Acetate, Acrylonitrile Acetonitrile, Methyl Methacrylate, Methacrylonitrile, Methanol (Methyl Alcohol),Isopropyl Alcohol, Ethyl Alcohol (Ethanol), Ethylene di chloride, Methyl Isobutyl Ketone, Ethyl Benzene, N-Butyl Acetate, Isobutyl Alcohol (Iso Butanol), N-Butyl Alcohol (NButanol), Epichlorohydrine, Styrene, O-Xylene, High Speed Diesel, Cumene, Crude

Oil, Aviation Fuel, Kerosene, Acetic Acid, Acetic Anhydride, Non-edible/Mentha Oil Low Sulphur Heavy Stock/ Furnace oil, Carbon Black Feedstock (CBFS), Aniline, Methyl Ethyl Ketone Peroxide, Ethyl Hexanol-2, Vinyl Chloride, Phenol, Naphthalene, Ethylene Glycol, Mono Ethylene Glycol, Toluene 2.4 -di isocyanate, Diphenyl Methane Di-Isocynate, Edible oil/Palm Oil, Paraffin, Bitumen, Sulphur, Lube oil, Asphalt, Coal, CNG, NG, Ammonia (NH3), Diammonium Phosphate, Muriate of Potash (MOP), Soda Ash (Sodium Carbonate), Urea, Limestone, Caustic Soda, Sulphuric acid, Phosphoric acid, Piperine/ Piperdine, Chloroform, Hydrochloric Acid (HCL), Ethylene diamine (EDA), CMDI etc.

LNG, LPG, CNG, NG, Propane, Butane, and All Class A, B, C petroleum products, excluded petroleum products Including Petrochemical products, Hazardous, Toxic and Non-Hazardous chemicals/Liquids and other Liquid cargos.

Explosives in case of Indian Navy for Defence and Coast Guard.

4.2.4. Dredging

For the proposed project capital and maintenance dredging is required for the area allocated by Maharashtra Maritime board as Channel.

The dredging upto -12m is planned in Master Plan however, unless the IPCL & GAIL pipeline is rerouted the barge for -12m depths cannot be thought of, initially dredging upto -6m for handling cargoes is planned which can be extended to -12m in phases. Approximately 43 lakh cm3 of dredging will be required for the proposed project in phase I.

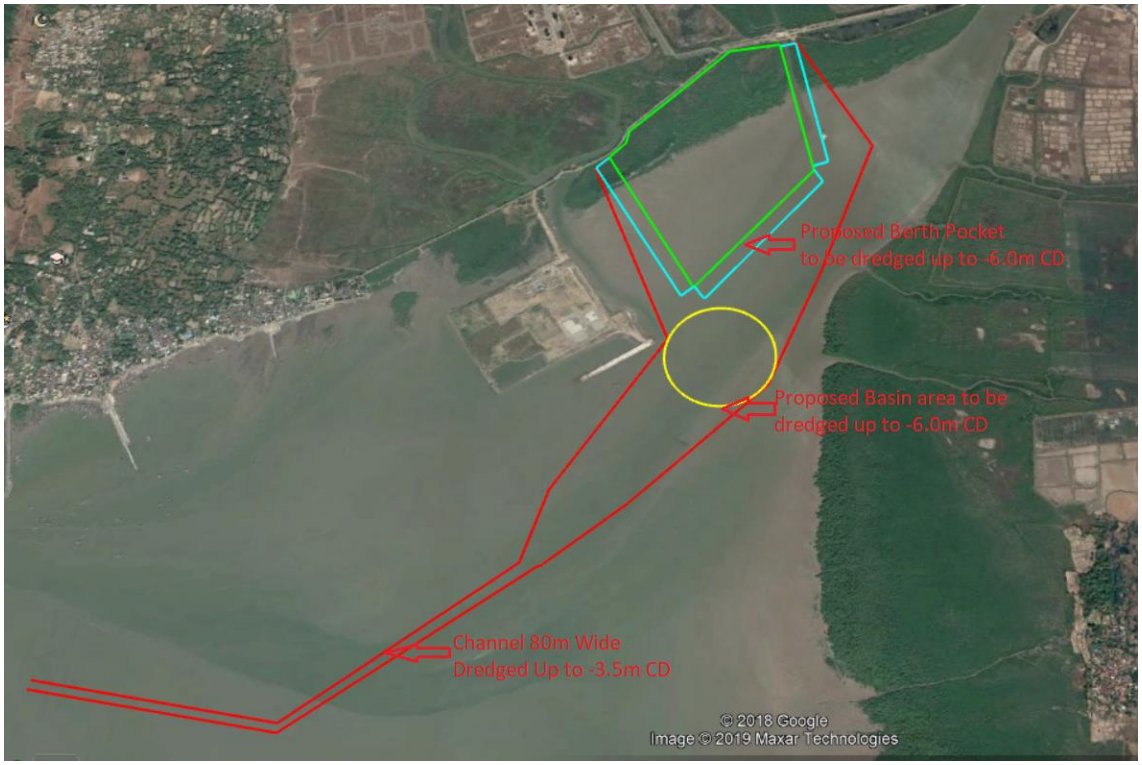


Fig: 4.4. Existing and proposed dredging channel

4.3. Proposed Cargo Terminals

4.3.2. Container Terminal

Container ships are cargo ships that carry all their load in truck-size intermodal containers, in a technique called containerization. They are a common means of commercial intermodal freight transport and now carry most seagoing non-bulk cargo. Container can accommodate anything from foodstuffs to electrical equipment's to automobiles.
Container ship capacity is measured in twenty-foot equivalent units (TEU). Typical loads are a mix of 20-foot and 40-foot (2-TEU) ISO- standard containers.

Fig: 4.5. Barge Carrying Container Cargo

4.3.3. Bulk Terminal

A bulk carrier, bulk freighter, or bulker is a merchant ship specially designed to transport unpackaged bulk cargo, such as grains, coal, ore, and cement in its cargo holds. Ship designed to carry dry (such as cement, grains, ores) or liquid (such as methanol, oils, petroleum) bulk cargo.

Fig: 4.6. Bulk Terminal

4.3.4. Steel, heavy lift/Project cargo & Automobile Terminal

Steel Coil / Steel rods are usually transported in open barges while water transportation, special fork lifts are used for internal transportation and loading/unloading.

Fig: 4.7. Transportation of steel coil

Heavy lift/Project cargo vessels are specialised in the transport of extremely heavy or bulky objects such as other ships and large industrial components. The common project cargos are wind turbine blades and towers, quay cranes and industrial machinery.

Fig: 4.8. Unloading of Project Cargo

4.3.5. Break bulk/ General Dry cargo terminal

Dry cargo ships are known for multipurpose. Transporting different goods, general cargo, bulk, containers and can even bring a small tank. Normally carry cranes in the middle for loading and unloading vessels.

Fig: 4.9. Transportation of livestock

4.3.6. Ship repair yard

Every ship after construction requires periodic maintenance to maintain its fitness to trade. This keeps the ship repair industry afloat with lots of opportunities. A ship is built using various types of materials, equipment and machinery integrated by different trades of engineering. Any defect of its components or the engineering results in ship-repair.

Lack of adequate government support to the ship repair industry. Even ships owned by the government agencies choose foreign countries to carry out repairs instead of supporting Indian shipyards even if the ships regularly call Indian ports due to the reasons that Indian shipyards are not competitive. Indian shipyards would certainly have a price disadvantage of up to 25 per cent due to the government taxation only

In adequate quantity of shipbuilding grade steel plates produced within India. The cost of such Indian steel plates is very high compared to the ones produced in China

Various navigational and communication equipment used on board ships complying with required standards are not produced in India. India has to

depend on foreign countries for these items leading to higher costs and makes such repairs in India un-viable

The case is no different as far as the other major marine equipment are concerned

Attrition of trained human resources to Middle East countries for higher wages affects the productivity in Indian shipyards

Downturn in the global economy and over supply of vessels put ship owner to spend bare minimum for repair and maintenance. This is largely affecting shipyard's income and possibility for growth

Fig: 4.10. Ship repair yard

Rise in number of industries especially in Gujarat and Maharashtra is expected to attract more vessels to Indian coast

As a part of the Indian Navy expanding their fleet, more vessels are expected to be constructed which will boost Indian shipyards

The industry expects a massive policy initiative from the government for developing ancillaries to ship building and ship repair industry so that it could trigger a high growth in the Indian industrial sector.

4.3.7. Yacht Parking

During monsoon the sea is rough, and yacht are completely stopped from operation and thus a parking space is required for yacht. During monsoon the multipurpose terminal can utilize its space for parking yacht.

Fig: 4.11. Yacht Parking

4.3.8. POL

Petroleum, oils and lubricants permissible to handle in CRZ area are expected to be handled in the proposed project.

4.3.9. Tug Berths

Tug is a type of vessel that manoeuvres other vessels by pushing or pulling them either by direct contact or by means of a tow line. The main function of the towboat is to push the barge. Tugs are also used to tow barges from port to port. Tug berths are required for designated parking.

Fig: 4.12. Tug berths

4.3.10. Ro Ro berth:

Ro Ro berth is proposed to be developed for transportation of vehicles and humans directly from one Ro Ro berth to other. This will save time and fuel.

Fig: 4.13. Ro-Ro berth

5. MULTIPURPOSE TERMINAL & CARGO HANDLING

5.1. General

It is proposed that following activities are carried out in Port:

a. 20 hectares area between bund road and existing project

i. Cargo Storage area

ii. Marine Hub

iii. Trailer Parking Area

iv. Internal Roads & other Port related facility

v. Office structure for each activity

b. 80 hectares area on east side of existing project

i. Bulk Terminal

ii. Cargo Terminal

iii. POL Terminal

iv. Storage area for all terminal

v. Port related structures like office, illumination high mast, water supply, desalination plant, etc..

5.2. Containers/ Cargoes

5.2.1. Berth Requirement

Vessels are anticipated to be barges around 5600dwt carrying 200 to 250 TEU.

- Following berths are proposed in 80hectare East Port area:

i. 860m POL terminal on west side

ii. 850m Cargo terminal

iii. 440m Bulk Cargo terminal on East side

- For 20-hectare area a stretch of approx. 300m is considered for boat / yatch parking in monsoon and other berthing in non-monsoon period.

5.3. Storage Requirement

The yard has been planned for Rubber tyred gantried (RTG's) operation. The capacity required has been assessed based on the following assumptions:

- All containers are stored under RTG's. Often empty containers are stored block stacked using empty container handlers.
- Containers are stacked 4 high, and RTG's are 6+1 wide.
- At peak capacity the stacks are 70% full.

The norms adopted for calculating the storage areas in port for various commodities are as follows:

Sr no.	Commodity	Criteria for providing Storage Area		Stacking Assumption
		Days at Port or	% of Annual Throughput	
1.	Containers	5.5		3.5 TEUs/ground slot
2.	Break bulk	30		3m high
3.	Chemicals		8%	18m dia & 16m high tanks
4.	POL		10%	30m dia & 16m high tanks
5.	Coal		5%	8m high
6.	Cement	10		30m dia & 33m high silos
7.	Ro-Ro	7		16sqm/car

Table: 5.1. Norms for calculation storage area

Sr. no	Commodities	Storage area (hec)	Remarks
1	Container/liquid	48	Open storage
2	Bulk	8	Open and closed storage depending on material

3	Liquid	1.2	Storage in tank forms
4	Ro-Ro	0.8	Open storage

Table 5.2. Storage area assumed for the proposed project in Master Plan

Though only part of the berths will be ready in Phase I from the Master Plan, the reclamation work for the area will be complete in one go. Therefore, the area will be utilized for storage till the time the other phases of the project area ready.

The storage requirements have been assessed on the following assumptions:

- A dwell time of 20 days
- A peaking factor of 1.25 to allow for seasonal variations;
- Average density of stack of 3 tonnes/sqm
- 50% area used for actual storage with the balance for access and circulations.

5.4. Yard equipment requirements

It is envisaged that tractor trailers will move the cargo between the quay and the storage areas.

The Equipment's/machine like Quay gantry crane, Bulk handling crane, Rail mounted Ganty Crane, Rubber Tyred Gantry Crane, Reach Stackers and or Top lift Truck, Tractor Trailers, Tugs will be required depending on cargoes to be handled.

Fork-lift trucks would be used to load/ unload the cargo to/from the trailers and to/from the road going truck. These would have a capacity of around 20 tonnes and where appropriate be fitted with special attachments to suit the cargo.

5.5. Gate Operations

The gate movements have been assessed based on the following assumptions:

- Trucks carry one container when loaded;
- 50% of trucks visiting the port are full both ways;

- Design peak number of trucks per day=average daily number of trucks x 1.4
- Gate open 24 hours a day
- Peak hourly traffic= average hourly traffic x 2

Allowing 2 mins per truck at the gate, 3 gates are required each way for 20 hectares area and same for 80 hectares.

5.6. Liquid bulk terminals

Most of the liquid bulk trade is in crude oil and petroleum products. Other product groups like chemicals or vegetable liquids form a smaller part of the world trade in liquid bulk;
Liquid bulk commodity types are:

- Crude oil
- Oil products
- Chemicals
- Liquefied gas
- Vegetable oils
- Bio-fuels

Vessels

Liquid bulk vessels are divided in different types, depending on the transported commodity. Crude oil is typically transported in large tankers; Very Large Crude Carriers (VLCC) or Ultra Large Crude Carriers (ULCC), of 200,000 DWT and greater. Refined oil products, chemicals and vegetable oils are transported in product tankers up to 100,000 DWT.

Liquid bulk terminal elements

Liquid bulk terminals consist of the following elements.

- Jetty
- Pipelines
- Storage tanks

Liquid bulk terminals are often linked to local industry, long term storage is therefore not needed. However also stockholding terminals (that function as a long term storage), gateway terminals (that import and export cargo), or transhipment terminals for liquid bulk exist. These different

types of liquid bulk terminals largely dictate the required capacity of the terminals.

Jetty

At marine liquid bulk terminals jetties are often of the island berth type. These consist of an approach bridge (trestle) from the shore to the loading platform with access roadway and pipeway. The loading platform houses a loading arm, pipelines, service building, firefighting equipment, spillage tank and possibly a jetty crane (depends if resupplying of the vessel is accommodated). Furthermore, separate mooring and breasting dolphins are used, since vessel access is only required at the centre of the vessel. The dolphins are connected to the loading platform by catwalks.

Pipelines

At import terminals the liquid cargo is pumped with ship pumps through the unloading arm into pipelines positioned on the pier. The unloading capacity is therefore determined by the ships pumps and not by the terminal equipment. The pipelines go to the storage tanks on the terminal. When pipelines will be used for different commodities or when the liquid is likely to solidify during transport; equipment is needed for cleaning the pipes. This equipment is normally located at the (un)loading platform and near the storage tanks. For some materials heating (e.g. some vegetable oils) or cooling (e.g. LNG or ammonia gas) has to be applied in order to keep the material in a liquid form. This affects the pipeline design; for example insulation and expansion loops have to be applied. Pipelines are usually combined in large pipeways that run through the terminal area. Liquid bulk terminals 71 Cooled or pressurised liquids require a vapour-return-system that transports vapour, that forms when boiling occurs while loading the ship, back to the shore.

Storage tanks

The storage of liquid bulk happens in large cylindrical steel tanks. The (floating) roofs of the tanks prevent contamination from weather and prevent the evaporation of the liquid into the atmosphere. Crude oil and oil product tanks usually have a capacity between 500 and 20,000 cubic metres, however larger tanks exist. Vegetable oil tanks are generally smaller since shiploads are smaller, the tank capacity is normally about 1,000 tonnes or less.

Two options for storage exist; switch tanks or dedicated tanks. Switch tanks allow for different types of cargo to be stored, this requires however

cleaning and degradation costs but has large impact on the size of the terminal. Dedicated tanks store one type of cargo only. On liquid bulk terminals bunds are used to capture spills. These bunds can be concrete, or earth walls surrounding a single tank or tank group and must be designed so that at least a full tank load can be captured within these walls.

LNG

Gasses that are liquefied by cooling require tanks with insulation and a refrigeration plant. LNG is stored in cryogenic tanks that have to be manufactured from special alloys on account of the very low temperature (and consequently brittleness of steel). These tanks also consist of a double wall as a safety measure.

An LNG terminal requires additional components in order to convert the liquefied gas to a natural gas. As an indication these components are depicted in. They are however not a part of this research as explained in the introduction and because of the goal to maintain the general nature of this research.

Flammable products are categorised as listed in below table

Flammable liquid classes

Class 1	0^0C < flashpoint < 21 0 C Boiling point > 35 0 C
Class 2	21^0 C < flashpoint < 550 C
Class 3	55^oC ,< flashpoint < 100 0 C

For minimum distances between objects and tanks for the storage of flammable products of classes 1, 2 or 3.

Minimum distances between objects and tanks with flammable products

Tank type	Object	Minimum distance
Tanks with fixed roofs, including tanks with internal floating roofs.	Between groups of small tanks	15 meters
	Between a group of small tanks and a tank outside the group	Smallest distance of: 1. Half of largest diameter of the tanks.

		2. Diameter of the smallest tank. 3. 15m. but not smaller than 10 m or larger than 15 m.
	Between tanks that are not part of a group of small tanks.	15 meters
	Between a tank and a filling point or building.	15 meters
Tanks with floating roofs	Between two tanks with floating roofs.	10m if tank diameter < 45 m. 15m if tank diameter > 45 m. For crude oil: 30% of tank diameter but larger than 10m. Tank with largest diameter determines distance.
	Between tank with floating roof and tank with fixed roof.	Smallest distance of: 1. Half of largest diameter of the tanks. 2. Diameter of the smallest tank 3. 15m. But not smaller than 10 m or larger than 15 m.
	Between a tank and a filling point or building.	10 meters
	Between a tank and terminal border.	15 meters

Note 1: Small tanks are defined as tanks with a diameter < 10 m and a height < 14 m. A group of small tanks may be considered a single tank with respect to spacing or bunding. A small tank group can have a combined capacity of maximum 8000 m3.

Note 2: For tanks with diameter larger than 18 m. it may be necessary to enlarge the distances

6. PORT RELATED ACTIVITIES

6.1. Road Connectivity to State & National highway

Karanja Port is having a very good network of Roads including Main Road, Sub roads and internal interconnecting road.

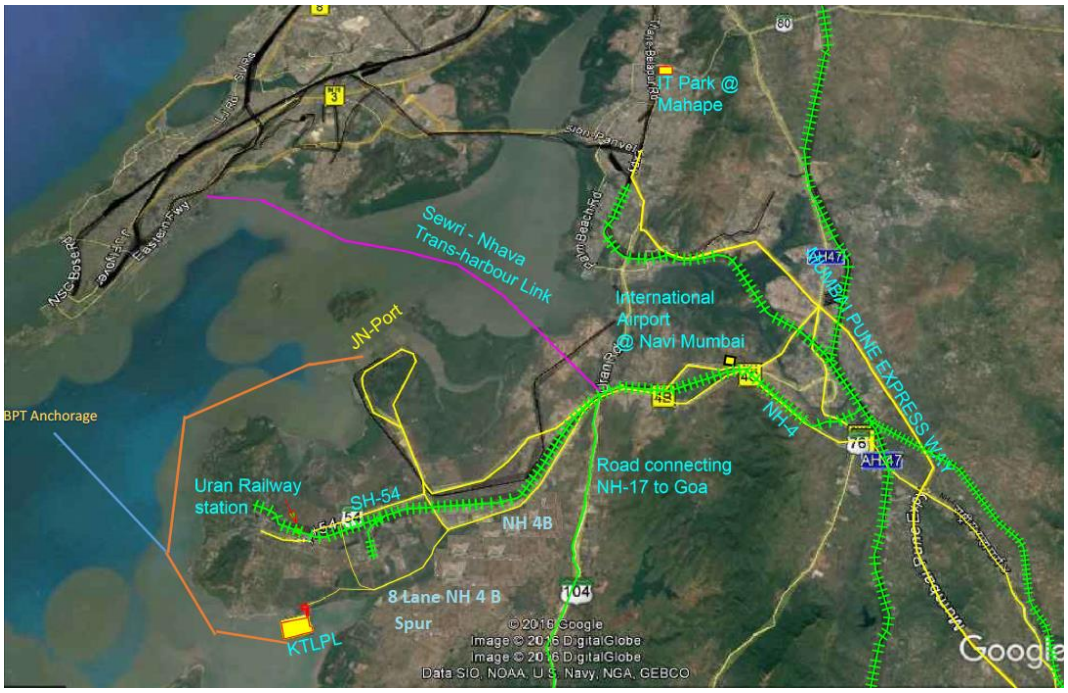


Fig 5.1. Rail & Road link to Karanja Port

6.2. Internal Road Connectivity

At present the main reclamation area is connected to the bund road by temporary bund road, which was proposed on piles while seeking the EC & CRZ clearance. However, as the proposed expansion includes the cutting and replantation of mangroves behind the reclamation area, Karanja Port has proposed to revise the road on piles to reclaimed road.

In order to ensure smooth flow of traffic anywhere within the Karanja Port has been constructed good internal road connectivity in the current Port.

Similarly, for the proposed expansion of port 4 and 6 lane internal roads are proposed.

6.3. Power supply and distribution

At present DG sets are used as source of power, however, laying of power cable is in process. The same cable after approvals from the concerned authority will be extended to the proposed project site.

6.4. Lightings

Lighting is currently provided using high mast lighting columns with lowering crowns, 30m high or similar. An average lighting level of 20 Lux at ground level will be provided, ignoring any shadow effects from the cargo.

The cargo handling equipment will have its own lighting, which will ensure adequate lighting levels for operations.

6.5. Water Supply

Potable water is required for the staff and labour working in the Port and on the ships/yachts/tugs etc.. At present the water is supplied through tankers and the connection of water supply is in process. The present phase requires $30m^3$ of water per day considering 500 people working on the commercial port and visitors.

6.6. Fire Fighting System

At present the installation of Fire Fighting System is planned in phases for current project. At present sea water is used for firefighting system.

A freshwater tank with the capacity equivalent to 1 hour's firefighting. This will be supplied from treated water from STP.

6.7. Port Backup area

The Port operation area is area adjacent to the berth used for transportation, storage and other port related activity.

6.8. Surface Water Drain

The terminal surface will be set out as continuous drainage channels provided at the valleys. The drainage channels will feed

into pipes laid to fall, which will discharge into the sea via outfalls through the revetment.

Where there is considered a significant risk of oil spills, bypass interceptors will be provided. This will include workshop and maintenance areas and parking areas.

6.9. Waste Management Unit

At present the STP with MBR technology of 40CMD capacity is installed at site. Initially the same STP will be utilized up to its full capacity. Further other STP will be installed as and when needed. Designated area for collection, segregation and disposal of solid waste is proposed.

6.10. Structures in Port area

Following buildings are proposed for managing the port operation:

i. Administrative building for offices of key personnel engaged in managerial and departmental activities related to port operations & management and their support staff. This building provides space for port users, bank and canteen.
ii. Administrative buildings are required to be provided for the container terminal and the bulk terminal in view of their locations.
iii. Port operations building to provide space for the operating staff in all the shifts. It would have engineering department, terminal operations department, marine operations department and a marine control room.
iv. Separate operational buildings are required to be provided for different terminals within the port.
v. Maintenance workshops comprising of a workshop plus storeroom, and an annex building to provide space for offices of the workshop foremen, mechanics, electricians, technicians and the storekeepers and rooms for off duty operational personnel and maintenance labour.
vi. Substation buildings to house the transformers and other electrical equipment shall be provided as per the load requirements in the different parts of the port area.
vii. Fire station building to house firefighting equipment, fire tenders, etc.

viii. Amenity building providing changing rooms, washing facilities and lavatories for the labour.
ix. Gate house to support the gate and security staff, and deal with any trucks that have been rejected at the gate.
x. Workshop for maintaining the equipment
xi. Office for customs
xii. Designated area for Waste Management & Maintenance
xiii. Dispensary building to be located near the operational areas and provide minimum facilities required for the first aid.
xiv. Toilet blocks for visitors.
xv. Other miscellaneous utility sheds as per requirements of a Port.
xvi. CCTV and illumination.

6.11. ISPS Fencing

Port boundary will be fenced as per ISPS standards.

6.12. Onsite Emergency Plan

Assessing the adequacy of available resources to take care of emergencies as identified in the risk analysis study. Providing recommendations on the infrastructure, communication system and other facilities such as first aid, security, firefighting etc. in view of effective handling of the emergencies identified. Specifying the roles and relationship amongst personnel from the facility and outside agencies for effective handling of the emergencies. Identification of assembly points and escapes routes for evacuation. Preparation of an Onsite Emergency Response Plan Document is envisaged. The stages of On-site Emergency Plan include:

6.12.1. Outline Emergency Response Team.
- Designated person in charge.
- Key responsibility of each individual.
- Telephone numbers for Key people.

6.12.2. Risk Evaluation on preliminary hazards

- Type, Quantity and Storage method of Hazardous materials used at site along with MSDS.
- Location of possible Hazards (Process, Storage-yard, Transfer, Piping, etc.)
- Type of Accidents.
- Special handling requirements, firefighting procedures as per MSDS.
- Safety measures to be taken and installed if any.

Details regarding:

- Location of Key-personals.
- Emergency Control room, if provided.
- Emergency Telephone numbers.
- First-aid Kit and Fire Extinguisher locations.
- Warning alarm, safety and security.
- Precautions during design and Engineering.
- Continuous surveillance.
- Details of Hospital and Fire-brigade facility.
- Procedures for notifying family members of injured employees.
- Procedure for reporting emergencies.

Awareness amongst workers for:

- Knowledge of chemicals used (property, toxicity, handling methods, etc)
- Use of fire-fighting equipment and first-aid.
- Mock-drill for Hazards and Disasters.
- Use of personal protective equipment.
- Procedure for reporting emergency.
- Knowledge of alarm systems.
- Manuals for each Operating system.

Control Plans:

- Emergency Control plans.
- Safe time to resume work after an emergency.
- Control measures for any spillage, leakage, explosion, etc.

6.13. Occupational Health and Safety

Specific occupational health and safety issues relevant to proposed project primarily include the following:

Physical hazards
Chemical hazards
Confined Spaces
Exposure to Organic Inorganic Dust
Exposure to Noise

The main sources of physical hazards at ports are associated with cargo handling and use of associated machinery and vehicles. However, this shall be taken care of by applying all the terminal related norms and Standards. The workers and vehicles passageway shall be kept separate. Avoiding entry of workers as far as possible in the area of ship loading and unloading activity and areas where grab is operational.

The Chemical Hazards are related to inhalation of fumes during fuelling refuelling or other emissions from the Cargo. This can be eliminated by providing adequate personal protective Equipment to the workers working in such areas of exposure.

The workers working in Confined spaces shall follow the General EHS Guidelines for working in Confined Spaces. They will also be provided with relevant personal protective equipment.

Noise pollution can cause due to one of the various activities at the Terminal or parking facility. However, proper mitigative measures are out-lined for control of Noise at the Facility. Onsite Medical facility will be provided in case of any hazard or casualty during the Operational Phase. Fire safety measures shall be incorporated and implemented. Periodic health check-up of all the workers shall be carried out.

6.14. Disaster Management Plan

a) Objectives

The emergency DMP for onsite and offsite location will be inter-related. The overall objectives are

To identify type of major disasters which may occur
To localize the emergency and if possible, eliminate
To minimize the effect of accidents

Elimination of hazard will require equipment like fire-fighting equipment's, water sprays, emergency shutoff valves and purposeful construction. Minimizing the effect will be prompt action by operating and emergency staff, rescue, first aid, evacuation, rehabilitation and giving information promptly to people living / working nearby.

b) Types of Possible Emergencies:

Fire on berth / approach trestle / storage / buildings

Spillage while bunkering by vessel
Spillage due to collision in channel
Natural calamities like cyclone / rough weather / earthquake/ Tsunami War situation/ Air strike.

c) Functions of Disaster Management

Controlling spread of accidental effects with minimum damage to men, material, machine and structures.

To inform relevant agencies and request for help.
To rescue victims and provide succour.
To protect other and safely evacuate.
To inform nearby inhabitations.
To identify the affected persons and inform their relatives.
To provide authentic information to news media and other.
To preserve relevant records and equipment needed as evidence in any subsequent inquiry.
To rehabilitate the affected areas and a lot specific assignment to available manpower.

d) Classification of Accident

Level I	--	Operator Level
Level II	--	Local / Community Level
Level III	--	Regional level
Level IV	--	International level

e) Critical Targets

Disaster Management Plan is prepared after identifying the objects likely to be affected in the event of emergency. The target of fire includes personnel if emergency occurs at service platform during discharging of vessel and tank farm on shore.

f) Control Room (CR)

A control room will be established at a location away from likely spots of accidents and shall be easily accessible. Better location will be near the room from where all unloading operation are conducted and controlled.

7. COST ESTIMATE

7.12. General

The cost estimate has been prepared considering cost of current project. Sum, quantities and rates for the individual elements of the construction and items of equipment have been established from the drawing and with the experience of existing projects which is of similar nature. All such costs are subject to market forces prevailing at the time which cannot be accurately predicted. The estimates are therefore likely to be subject to considerable variation, either increase or decrease.

7.13. Project Cost

The indicative capital cost estimate has been prepared under the following three subheads:

- Infrastructure Development
- Superstructure Development
- Equipment and Machinery

The basis for cost estimate is as follows:

- Cost estimate of civil work have been prepared considering the present rates of related items carried out for the existing project. The cost is likely to be change if there is any unavoidable delay in project construction.
- Dredging work and costing for the existing channel has been referred for the proposed project.
- The construction of piling work has been considered assuming -12m draft in master plan.
- The cost of machinery has been considered; however, it might change if the same has been brought on lease.
- Provision for contingencies, CSR, CER, preconstruction studies has been considered.
- Activities like laying of water pipeline, electricity cables and firefighting systems is also assumed wile estimation.
- Land lease rental cost has not been considered.

- Any changes in plan may slightly affect the cost estimate.

Sr	Particulars	Total (in Cr)
1	Civil Works	1471
2	Dredging	172
3	Equipment	490
4	Other cost including financing cost & interest during construction (IT system etc)	216.4
5	CSR / CER	42.7
6	Contingency	213.4
7	PMC	106.8
8	Pre-construction studies	53.4
	Total Cost of the Project for Phase I is	2767.9

Table: 7.1. Cost of Proposed Development in Phase I.