Initial Environmental and Social Examination Report

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India: Nhava Sheva Container Terminal Financing Project

Prepared by Nhava Sheva Freeport Terminal Private Limited for the Asian Development Bank.

[a] This IEE is a draft, and a number of areas continue to be worked on. It is being shared to ensure that it is available during circulation of the RRP and linked documents. The information disclosure requirements of OM F1 will be met by board approval.

Initial Environment and Social Examination of Jawaharlal Nehru Port Container Terminal

Draft Report

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Acronyms

Acronyms	Description
ADB	Asian Development Bank
ARF	Applicable Reference Framework
BMCT	Bharat Mumbai Container Terminal
BMTPC	Building Materials and Technology Promotion Council
BPCL	Bharat Petroleum Corporation Limited
CA	Concession Agreement
CFS	Container Freight Station
CIDCO	City and Industrial Development Corporation of Maharashtra
CISF	Central Industrial Security Force
CPCB	Central Pollution Control Board
CRZ	Coastal Regulation Zone
CTO	Consent to Operate
CWPRS	The Central Water and Power Research Station
CWTDF	Common Waste Treatment and Disposal Facility
DFC	Dedicated Freight Corridor
E&S	Environment and Social
EBRD	European Bank for Reconstruction and Development
EC	Environmental Clearance
EDI	Electronic Data Interchange
EHS	Environmental and Health & Safety
EHS&S	Environmental, Health & Safety and Social
ESAF	E&S Advisory Firm
ESMP	Environmental and Social Management Plan

Acronyms	Description
FY	Financial Year
GAD	Gender and Development
GBVH	Gender based violence and sexual harassment
GRM	Grievance Redressal Mechanism
GTI	Gateway Terminals India
HWA	Hazardous Waste Authorization
IBA	Important Bird Area
ICD	Inland Container Depot
IESE	Initial Environmental and Social Examination
IFC	International Finance Corporation
ILO	International Labour Organization
IMDG	International Maritime Dangerous Goods
INPT	Jawaharlal Nehru Port Trust
IOCL	Indian Oil Corporation Limited
IP	Indigenous People
IR	Involuntary Resettlement
IT	Information Technology
ITT	Inter-terminal Transfer
JNPA	Jawaharlal Nehru Port Authority
JNPCT	Jawaharlal Nehru Port Container Terminal (JNPCT)
MARPOL	The International Convention for the Prevention of Pollution from Ships
MCZMA	Maharashtra Coastal Zone Management Authority
MoEFCC	Ministry of Environment, Forest and Climate Change
MoR	Ministry of Railway
MoS	Ministry of Shipping
MPCB	Maharashtra Pollution Control Board
MWML	Mumbai Waste Management Limited
NAD	Naval Armament Depot
NGT	National Green Tribunal
NH	National Highway
NSFTPL	Nhava Sheva Freeport Terminal Private Limited
NSICT	Nhava Sheva International Container Terminal
PAP	Project Affected Person
PESO	Petroleum and Explosive Safety Organization
PPP	Public Private Partnership
PSP	Public and Semi-public
R&R	Resettlement & Rehabilitation

Acronyms	Description
RfP	Request for Proposal
RMGC	Rail Mounted Gantry Crane
RMQC	Rail Mounted Quay Crane
RTGC	Rubber Tyre Gantry Crane
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SEZ	Special Economic Zone
SH	State Highway
SPCB	State Pollution Control Board
SPV	Special Purpose Vehicle
SR	Safeguard Requirement
TEU	Twenty-foot Equivalent Unit
UNESCO	United Nations Educational, Scientific and Cultural Organization
UOMIT	Upgradation, Operation, Maintenance and Transfer

EXECUTIVE SUMMARY

Introduction

Jawaharlal Nehru Port Authority (JNPA) is under process of re-development of Jawaharlal Nehru Port Container Terminal (JNPCT) through Public Private Partnership (PPP) on Upgradation, Operation, Maintenance and Transfer (UOMT) basis ("the Project") to increase JNPCT's maximum capacity to 1.8 million TEUs annually. The work has been awarded for 30-year Built-operate and transfer (BOT) concession to Nhava Sheva Freeport Terminal Private Limited ("NSFTPL"). In this context, NSFTPL has engaged an E&S Advisory Firm (hereinafter referred to as "ESAF") to undertake Initial Environmental and Social Examination (IESE) of the proposed upgradation works at JNPCT against the objectives, principles and requirements of ADB's Safeguard Policy Statement and other applicable environmental and social requirements as per Applicable Reference Framework ("ARF"). This IESE report identify and assess any potentially significant adverse environmental and social impacts associated with the proposed Project's expansion and operation, and determines the measures needed to prevent, minimize, mitigate and compensate adverse impacts.

Project Description

The Jawaharlal Nehru Port Authority (JNPA) at Navi Mumbai (formerly known as the Jawaharlal Nehru Port Trust) is handling 55% of the container cargo across all major ports in India. Commissioned on 26th May 1989, the port is located on land admeasuring 3402-hectare. JNPT name was changed to Jawaharlal Nehru Port Authority (JNPA) by Central Government on 3rd November 2021 under Major Port Authorities 2021.

JNPA port has five container terminals, one liquid terminal and one shallow water berth. The total capacity of these terminals is 7.7 million twenty-foot equivalent units (TEUs). Out of the five container terminals, one of the terminals is operated by JNPA (i.e., JNPCT), whereas the other four container terminals are operated by private players through BOT concession. JNPCT is currently being operated by JNPA, however, the terminal experienced a decline in the container traffic over the last few years and also experienced a decrease in overall share in JNPA traffic. The reason for decline in container traffic at JNPCT was attributed to the following facts:

- JNPCT is a government operated terminal with less competitive advantage when compared to other privately operated terminals within JNPA
- Private terminals at JNPA have modern infrastructure with higher operational efficiency
- JNPCT has negligible international presence when compared to other privately operated terminals.

Therefore, due to the above reasons, JNPA had decided to develop JNPCT terminal through Public Private Partnership (PPP) on upgradation, operation, maintenance and transfer (UOMT) basis.

Nhava Sheva Freeport Terminal Private Limited (NSFTPL) is a special purpose vehicle (SPV) established as a consortium between JM Baxi Ports and Logistics Limited and CMA Terminals (100% subsidiary of CMA CGM Group). The SPV was formed for the operation of JNPCT Terminal. NSFTPL plans to undertake expansion as well operation of the JNPCT terminal. As reported JNPA will hand hold NSFTPL for around 15 days before handing over all the operations to NSFTPL. Post-handover of the operations, JNPA will monitor operational performance of terminal.

The following are the development activities that the Port has planned to implement at JNPCT through the concessionaire i.e., NSFTPL:

- Berth upgradation activity to increase capacity to 1.8 million TEUs1
- Width of the berth will increase from 45.5 m to 60.5 m towards land side
- Relocation of Quay Substation and Fire Pump House
- Overall refurbishment of fenders and bollards, existing buildings, yards, if required IT infrastructure upgradation and installation of terminal operating system.

The expansion has been proposed to be undertaken in 2 phases as per concession agreement.

Applicability of Project to ADB Safeguard

The applicability of ADB safeguards to the Project has been provided below:

[1] The project will upgrade the JNPCT capacity to 1.8 million TEUs which will upgrade the total port capacity to 8.0 million TEUs.

Sr. No.	ADB Safeguard	Applicability/ Compliance
1.	Safeguard Requirements 1: Environment	Applicable The Environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts. An Initial Environmental & Social Examination (IESE) for the proposed project has been undertaken to identify and assess any potentially adverse environmental and social impacts associated with the proposed Project, assess compliance with applicable laws and the applicable reference framework, determine the measures needed to prevent or minimize and mitigate the adverse impacts, and identify potential environmental and social opportunities, including those that would improve the environmental and social sustainability of the Project. The proposed project is likely to have environmental impacts during construction and operation phase including air emissions due to operation of D.G. sets, machinery & equipment and vehicular movement; wastewater and waste (hazardous and non-hazardous) generation; contamination due to leakage and accidental spill of hazardous material; and occupational health & safety issues due to handling of dangerous goods.
2.	Safeguard Requirements 2: Involuntary Resettlement	Not Appliable As the project does not require additional land acquisition and there is no potential adverse social impact related to involuntary resettlement due to the proposed project. Further, proposed project shall be developed on existing land of JNPT which will be given to NSFPTL for 30 years concession period, as well as there are no close by communities and only authorized perrons can enter the terminal/port therefore proposed project does not have potential negative impacts and such adverse social impacts on Involuntary Resettlement related due to project is not anticipated. For more details refer to section 2.4
3.	Safeguard Requirements 3: Indigenous Peoples	Not Applicable As the project does not require additional land acquisition and there is no potential adverse social impact on Ips due to the proposed project. Further, proposed project shall be developed on existing land of JNPT which will be given to NSFPTL for 30 years concession period, as well as there are no close by communities and only authorized perrons can enter the terminal/port therefore proposed project does not have potential negative impacts and such adverse social impacts on IPs/IR related due to project is not anticipated. Additionally, during the construction and operation phase of the Project, the project will not have direct interaction or project's induced impact towards the local community. However, there will be limited impacted related to the community health and safety (refer to section 7.6.1.7 and 7.6.2.7)

Project Baseline Conditions

To understand the physical, biological, and socio-economic sensitivities and baseline conditions of the project area, a baseline study was undertaken to:

- Describe the environmental characteristics of the Project site and surrounding areas to identify key resources and receptors that will be affected by the Project during the scoping process.
- Determine if any nearby communities or structures will be affected by the Project establishment; and
- Understand the significance of the different habitats within the study area and its importance for sustaining species of conservation importance, in terms of providing habitat contiguity to the surrounding region and dependency of surrounding communities

Environmental Baseline

- Land Use: As per the satellite imagery and site visit observations, majority of the study area is surrounded by sea water (64.3%) followed by mangroves (~14%).
- Topography: As observed during site visit and as per satellite imagery, the elevation of the proposed project (JNPCT) was observed with to be ranging between -18m to 10 m above mean sea level.
- Geology and Soil: According to CGWB study for Raigarh District (where the proposed project fall), there are three physiographic divisions within the district i.e. (i) Coastal zone in west covers about 20% percent of the district (ii) Central zone covers about 1/3 rd. of the district, consisting of fertile land in low lying area (iii) Hilly zone in the eastern part highly uneven in altitude and covered with forest. This hill range is characterized by ruggedness and uneven topography, with crestline of

peaks and saddles forming the eastern horizon. Ulhas, Panvel and Patalganga are the three main rivers in northern part. The typical soil characteristics at the JN Port are silty clay or marine clay overlaying basalt rock.

- Oceanographic Temperature: Based on the marine water quality assessment for the month of August 2022, the temperature of marine water was recorded to be between 28.14^0 C -31.16^0 C. Furthermore, as per the annual environmental monitoring report for FY 2021-22 for JNPA, the annual mean temperature of marine water ranged between 25.10^0 C and 32.80^0 C.
- Current: The current strength ranges from 1.5 to 3 knots. Current speeds and directions within the bay and associated tributaries are largely due to tidal movements and show little variations from non-monsoon to monsoon. The maximum current speed in the outer Bay exceeds 1m/s. The maximum current speed decrease in the inner Nhava creek and are typically around 0.8 m/s, decreasing during neap tide. According to Central Water and Power Research Station (CWPRS) report dated February 2000, CWPRS studied current direction at JNP harbour. The general flow direction was recorded to be around 360 degrees North during flood and 180 degree North during ebb.
- Tides: The dominant tide in the Harbour side over Mumbai is the semi-diurnal tide with a period of 12 hours and 40 minutes.
- Waves: According to the Mumbai Port Authority, the predominant waves are the swell waves generated by deep sea storms. These mainly arise just before and during the South West monsoon. The statistical analysis indicates that most wave periods fall between 6 seconds and 10 seconds.
- Climate and Temperature: According to CGWB study for Raigarh district, 2013, the climate of the district is typical of west coast and characterized with plentiful and regular seasonal rainfall, oppressive weather in summer and high humidity throughout the year. The mean minimum temperature is 17.7°C and mean maximum temperature is 31.8°C.
- Rainfall: The total annual rainfall in the study area as per IMD (1981-2010) is about 2184.1 mm with a mean wind speed of 5.8 Kmph.
- Wind: As per IMD (1981-2010) data presented above, the maximum wind speed of 9 kmph was observed during the month of July and minimum wind speed of 4.2 kmph was observed during the month of November and December.
- Environmental Monitoring: The overall status of environmental monitoring conducted by IIT Madras at JNPA Port has been summarized below.
    - Ambient Air Quality: Ambient Air Quality of JNPA was well within the prescribed standards of CPCB except PM values at some locations. It is concluded from the air quality results that the airshed for PM 10 and PM2.5 is degraded at the project area.
    - Ambient Noise Quality: The noise levels at JNPCT and within 500 m of JNPCT i.e., (N2, N5, N6 and N10) were observed to be within CPCB as well as IFC/ WB EHS guidelines' permissible limit.
    - Marine Water and Sediment Quality: The results obtained for marine water and sediment quality parameters show no adverse effect of port activities on marine water quality.

Socio-Economic Baseline

- **Demographic Profile:** The study area comprises of 2,178 households supporting a population of 9,541 individuals. The average size of the households is 4.38.
- **Gender Bifurcation: Sex Ratio:** The study area exhibits higher child sex ratio (992) as compared to the tehsils (Uran – 974 and Panvel – 919), district (935) and the state (894) figures of child sex ratio. However, the highest adult sex ratio is in the Raigarh district (959), followed by Maharashtra state (929), Uran tehsil (934), study area (911), and lastly by Panvel tehsil (919).
- **Social Stratification:** Per the census survey the entire population in the study area falls in the rural category. However, as observed during the site visit the rural area has shifted to the peri-urban category at present. Further, per the census data there is only 7.49 percent is ST and SC consist of 2.01 per cent, respectively, of the total population. However, the village Hanuman Koliwada village have almost half (~51 per cent) of the total population been ST population.
- **Occupational Profile:** The Study Area is categorized by about 36 percent working population, where majority of the working population comes under "Main Workers", i.e., being employed for more than 6 months in a year. The Project Villages have 89.4% Main workers of the total working population. The proportion of non-working population, comprising of children, the older folks as well as unemployed youth, in the Project Villages is 66.87%.
- **Income profile:** As reported by the local community at the Mora Koliwada, the local community have an income profile in between a range of INR 50,000/month to INR 1,00,000/month for a household. However, there are some households whose income is equal to more than INR 5,00,000 per month.
- **Physical Infrastructure:** *Water Supply and Sanitation* - As per the Census data of 2011, majority of the villages form the Panvel and Uran tehsil get their water from treated tap water sources (82.3% and 88% of households respectively). The remaining of the households get their water from nearby covered and uncovered wells, handpump, tube well, borewell, or natural sources of water such as lake, pond, etc. The similar arrangement has been observed in the study area.; and *Education Infrastructure* - According to Census of India, Primary Schools provide education from class 1^{st} to 5^{th}, Middle

Schools cater to children studying from classes 6th to 8th, Secondary School provides education to students of classes 9th and 10th and similarly, senior secondary school teaches children studying in classes 11th and 12th.

Ecological Baseline

- **Study area:** For ecological assessment, the study area was considered as 5 km for the primary observation and consultations. At the same time, the secondary data available in the form of previous reports / studies within the range of 10-20 km were also considered. Thus, the baseline data presented in the current reports covers a buffer of at least 10 km (in general); and 20 km for marine fauna.
- **Habitats:** The area covered by different habitats in the study area has been listed in ***Table 4-16***. Among the natural habitats, sea and mangroves are the dominating ones by their cover area. A small portion of Panje wetland is also present about 4.5 km from the terminal in south direction, while the mangroves are majorly present towards the east.
- **Phytoplanktons:** Phytoplanktons are free-floating, microscopic autotrophs and contribute as a primary producer in the aquatic system. Their diversity, growth and multiplication depend on solar illuminations, temperature, silicates, trace elements etc. As they are open and sensitive to the surrounding environment (i.e. water), they are used as an indicator of water quality. The diversity of phytoplankton is variable and varies from one season to another. The variation of phytoplanktonic diversity and productivity is responsible for the diversity and growth of zooplanktons and finally the larger aquatic fauna. Based on previous site-specific reports a list of 41 phytoplankton from the study area is presented in the ***Table 4-17***.
- **Zooplanktons:** Zooplanktons are small floating but sometime weakly swimming organisms, that drift with water currents. They are dependent on phytoplankton for their food and nutrition. Based on previous site-specific reports a list of 39 zooplanktons from the study area is presented in the ***Table 4-18***.
- **Benthos:** Benthos are the organisms living in the benthic zone of an aquatic ecosystem i.e. on the bottom or associated with substrata. Based on previous site-specific reports a list of 31 benthos from the study area is presented in the ***Table 4-19.***
- **Fish and other aquatic fauna:** As per the literature review, local consultation with fishermen, and field survey, 28 fishes, 01 Mollusca and 01 Mammal (total 30) species were recorded (reported / observed) from the study area. Out of these, two species were categorized under Endangered category of the IUCN Red List (Online Version 2022-1) - Indian Humpback Dolphin (*Sousa plumbea*) & Fourfinger Threadfin (*Eleutheronema tetradactylum*); and one species [Indian Humpback Dolphin (*Sousa plumbea*)] was listed under the Schedule I category as per the Wildlife (Protection) Act, 1972. A list of all the recorded species along with their IUCN status and schedule category from the study area is presented in ***Table 4-20***.
- **Flora:** The floral diversity present within the project boundary and 5 km buffer areas was assessed during the site survey. A total of fifty-five (55) floral species belonging to twenty-seven (27) families were observed from the 5 km radius of the project area. Fabaceae was the most dominating family in the area with 12 species. None of the species identified in the region is threatened and/or restricted range species. A list of encountered as well as reported floral species with their families and life forms has been given in ***Table 4-21***.
- **Herpetofauna:** As per the literature review, local consultation, and field survey, thirteen (13) herpetofauna (reptiles + amphibians) species were recorded (reported / observed) from the study area. Out of these, one species - Khaire's Black Shieldtail (*Melanophidium khairei*) was categorized under any Endangered category of the IUCN Red List (Online Version 2022-1); and one species [Bengal Monitor Lizard (*Varanus bengalensis*)] was listed under the Schedule I category as per the Wild Life (Protection) Act, 1972. A list of all the recorded species along with their IUCN status and schedule category from the study area is presented in ***Table 4-22***.
- **Mammals:** As per the literature review, local consultation and field survey, nine (09) terrestrial mammals were recorded (reported / observed) from the study area. Out of these, one species - Bonnet Macaque (*Macaca radiata*) was categorized under any Vulnerable category of the IUCN Red List (Online Version 2022-1); while no species was listed under the Schedule I category as per the Wild Life (Protection) Act, 1972. A list of all the recorded species along with their IUCN status and schedule category from the study area is presented in ***Table 4-23***.
- **Mangroves:** Mangroves are a group of plants from different life forms (mostly trees and shrubs) that grows in the coastal intertidal zone. Mangrove forests are essential for the coasts because they reduce erosion from storm surges, currents, waves, and tides. Now a days with the increasing threat of climate change with rising sea levels, the mangroves become vital for shoreline communities. The mangroves have a complex underwater root system, which attracts several marine organisms for their food and shelter. Due to the increasing anthropogenic activities the global mangrove cover is continuously depleting, thus, it is important to conserve these natural coastguards. In the study area, a good mangrove cover is present (see ***Figure 4-10***), which is dominated with several true mangrove species such as, *Acanthus ilicifolius* L., *Aegiceras corniculatum* (L.)

Blanco, *Avicennia marina* (Forssk.) Vierh., *Avicennia officinalis* L., *Ceriops tagal* (Perr.) C.B. Robinson, *Lumnitzera racemosa* Willd., *Sonneratia apetala* Buch.-Ham., and *Sonneratia caseolaris* (L.) Engl. Some common associated species are, *Caesalpinia bonduc* (L.) Roxb., *Clerodendrum inerme* L., *Cressa cretica* L., *Derris scandens* (Roxb.) Benth., *Derris trifoliata* Lour., *Fimbristylis ferruginea* (L.) Vahl, *Ipomoea imperati* (Vahl) Griseb., *Ipomoea pes-caprae* (L.) R.Br., *Salvadora persica* L., *Sesuvium portulacastrum* (L.) L., and *Suaeda maritima* (L.) Dumort. A compiled list of mangrove species along with their life forms and IUCN status from the study area is presented in ***Table 4-24***.

- **Avifauna:** As per the literature review, local consultation and field survey, 272 avifaunal species were recorded from the region, which include four species Endemic to Western Ghats [Crimson-backed Sunbird (*Leptocoma minima*), Malabar Lark (*Galerida malabarica*), Malabar Starling (*Sturnia blythii*), Sahyadri Sunbird (*Aethopyga vigorsii*)]; two Endangered (as per IUCN Red Lis) [Indian Skimmer (*Rynchops albicollis*), Steppe Eagle (*Aquila nipalensis*)]; and five Vulnerable (as per IUCN Red Lis) [Bristled Grassbird (*Schoenicola striatus*), Common Pochard (*Aythya ferina*), Greater Spotted Eagle (*Clanga clanga*), Indian Spotted Eagle (*Clanga hastata*), River Tern (*Sterna aurantia*)]. Twenty-one (21) Schedule I species - Black Eagle, Black Kite, Black-winged Kite, Bonelli's Eagle, Booted Eagle, Brahminy Kite, Eurasian Buzzard, Eurasian Sparrowhawk, Eurasian Spoonbill, Greater Spotted Eagle, Indian Grey Hornbill, Indian Peafowl, Laggar Falcon, Montagu's Harrier, Oriental Honey-buzzard, Osprey, Pallid Harrier, Shikra, Short-toed Snake-Eagle, Steppe Eagle, Western Marsh-Harrier were also recorded from the region as per the Wild Life (Protection) Act, 1972. The area also supports 118 Migratory, and 22 Raptor species ***Table 4-25***. The maximum counts of some of the species observed during the avifaunal survey in the same region by Bombay Natural History Society (BNHS) have also been provided in the ***Table 4-25***.
- **Protected and Key Biodiversity Area(s):** There is no protected area (PA) within the buffer of 5 km. While, in the buffer of 10 km, two protected areas as well as Important Bird and Biodiversity Areas (IBA) are present, i. Thane Creek Flamingo Sanctuary (recognized Ramsar Site and notified marine protected area), and ii. Karnala Bird Sanctuary.
- Species with Conservation Significance: As per the available secondary information, atleast eight (08) species with conservation significance have been identified (***Table 4-26***). Limited secondary information regarding the foraging/feeding and breeding area of any species of conservation significance within the study area was reported. Most of the migratory birds' activities were reported from the Thane Creek Flamingo Sanctuary (present ~12.5 km from the terminal).

  Eight individuals of Fourfinger Threadfin (*Eleutheronema tetradactylum*) were reported from the Sewri and Mahul area in 2008; two more observations were reported near the Thane creek area in this year (2022). Only one observation of Khaire's Black Shieldtail (*Melanophidium khairei*) was reported from the Vikhroli area towards the Thane creek. The consultation with the fishermen indicates the movement of the Indian Humpback Dolphin (*Sousa plumbea*) in the 5 km buffer of the study area for foraging/feeding, secondary data also supports the same. No threatened marine species was observed by National Institute of Oceanography (NIO) during its marine ecology survey. Indian Skimmer (*Rynchops albicollis*) was reported Thane Creek Flamingo Sanctuary [19.1410937, 72.9609883], and only one observation near Panje wetland in 2018; 30 - 278 Black-tailed Godwit (*Limosa limosa*) were also reported from the same location; 15 - 1500 Greater Flamingo (*Phoenicopterus roseus*) & 1 - 432 Lesser Flamingo (*Phoeniconaias minor*) were also reported from the Panje wetland in 2018, but no roosting site was confirmed within the study area; while the Steppe Eagle (*Aquila nipalensis*) was reported away from the study area. As it is an operational port terminal, it is unlikely to have any significant foraging/feeding and breeding areas of species of conservation significance; at the same time no significant direct impact has been anticipated on the surrounding habitats. NIO also identified Indian Skimmer as uncommon with meager population; Black-tailed Godwit as common with average population; Greater Flamingo as common with average population; and Lesser Flamingo as common with medium population in its survey. It is unlikely to have a chance of critical habitat within the study area because, there is no significant nesting (breeding) site of the conservation significance species in the study area.

Key Identified Impacts during Construction Phase

Ambient Air Quality

Since the airshed for PM 10 and PM 2.5 is already degraded as per ambient air monitoring report, it is anticipated that there will be impact on the existing air quality increasing the PM levels due to increase in number of vehicles deployed at the construction site and increase in traffic due to transportation of construction material at site. VOC emission will be in small quantity during construction phase, but it may have impact on the air quality due to its toxicity. However, impacts will be confined to 500 m of the construction area. Since there are no settlements located within 500 m of the proposed project, impact on community is negligible, however, there will be workers working at other terminals located adjacent to the port who are anticipated to be impacted.

Proposed Measures

- Excavated soil and waste at the construction site should be carefully handled and soil heaps should be appropriately covered to minimize dust generation
- Batching plant should be set up away from marine water or drainage lines. Periodic sprinkling should be done in the batching plant area to suppress dust emissions
- Speed of vehicles on site will be limited to 10-15km/h which will help in minimizing fugitive dust emissions due to vehicular movement.
- Unloading from cement delivery trucks would be done on pallets which would be covered with tarpaulin sheets during non-working periods
- Vehicles entering site should be Pollution Under Control (PUC) certified

<u>Noise and Vibration</u>

Impact

The primary sources of noise during the construction phase will be use of construction vehicles and various construction equipment. The sources of noise in the construction phase also include civil work, operation of construction machineries, D.G. sets and movement of vehicles at project site. Construction activities may increase noise levels in the project area which will last for limited period of time i.e. 15-18 months (while some of the high noise activities may be limited to lesser duration).

Proposed Measures

- Select equipment with lower sound power levels
- Use noise barriers at the construction area and muffling devices for combustion engines
- Ambient noise quality monitoring should be conducted onsite quarterly.
- Provide acoustic enclosures for equipment causing radiating noise.
- Periodic inspection of machineries and vehicles should be done and appropriate lubrication and tightening of moving parts should be done in case of increased noise levels during operation

<u>Soil and Sediment Environment</u>

Impact

Wastes generated during construction phase, if not handled adequately, may lead to land and soil contamination. Any leaks or spills of oil and lubricants from heavy equipment during drilling activities at site or at workshop area and/or improper discharge of wastewater at site may lead to long term negative impact on land and soil quality. Furthermore, there are other terminals located adjacent to the project in north, south and east directions, in case of surface run off due to excavation activities for development of new structures at the project site, it is anticipated that the runoff may flow directly into the sea increasing turbidity or may potentially flow into other terminals causing water logging. Physical desegregation of soil may occur during excavation work resulting in mixing of different soil layers. Spillage from various construction vehicles and equipment if not handled properly, may result in chemical desegregation and contamination of soil.

The proposed structures will have limited footprint in water, which will remain inside the limits of existing piles and therefore will not lead to sediment deposition. Presence of any permanent structures that protrudes into water and influence the flow or current, leads to settling of sediments in newer areas, which is not expected in this case.

Proposed Measures

- Silt traps should be constructed to control onsite surface runoff
- Install sediment traps to control sediments and particulates from reaching marine water
- Storm water at the construction site should have oil water separator or stormwater be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea. Storm water drains to have oil - water separator and it is to be ensured that contaminated water is not discharged into the sea. Oil-water separators to be regularly monitored.

- Silt curtains / silt screens shall be provided to contain fine particles of silt discharged into the water from construction activities
- Dedicated waste storage areas should be developed at site
- No discharge of construction waste water into sea shall be allowed at any point of construction

Water Availability

Impact

Impact on the pipeline water supply due to increase in water demand for construction activities that will last for 15-18 months.

Proposed Measures

- Explore feasibility of rainwater harvesting system at project site
- Sensitize workers on water conservation and encourage optimal use of water
- Regular inspection should be carried out for identifying water leaks and preventing water wastage from water supply tankers in order to use water efficiently.

Marine Water Quality

Impact

The project construction activities will include upgradation of existing JNPCT berth. Therefore, during civil work, there may be increase in sedimentation depending on weather conditions, tides and current at the sea. The construction activities such as piling work may increase suspended solids causing turbidity in marine water causing potential impact on the marine water quality. Generation of construction waste such as debris, sand and silt, and other wastes such as wastewater, waste oil if not handled properly may contaminate the marine water quality. Additionally, surface water runoff may also contribute towards increase in turbidity and further impacting the marine environment.

Proposed Measures

- Silt traps should be constructed to control onsite surface runoff
- Storm water at the construction site should be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea.
- The mobile mixing plants to be set up away from any drain inlet and a perimeter bund should erected all around the mixing plant. Silt curtains / silt screens shall be provided to contain fine particles of silt discharged into the water from construction activities
- Marine water quality to be monitored during construction phase and it is to be ensured that water quality is not compromised, and all the parameters are well within the prescribed standards. The parameters for the monitoring should be in line with CPCB as well as water and sediment quality monitoring as per IFC/WB EHS guidelines for ports, terminals and harbours.
- Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, 2016

Impacts on Marine Ecology

Impacts

The proposed project involves the upgradation of existing JNPCT berth. The construction activities involved in this upgradation may generate construction waste such as debris, sand, silt, wastewater, waste oil (if not handled properly) as well as surface water runoff discharge into the sea if not properly managed. These may cumulatively contribute towards the degradation of marine water quality and ultimately impact the marine ecology (phytoplankton, zooplanktons, benthos, fishes, and aquatic mammals).

The project i.e. terminal is a part of Jawaharlal Nehru Port and the study area to be dredged is a part of Mumbai and Jawaharlal Nehru Port, which already has significant ship movement. Due to this continuous ship movement, the marine flora (phytoplanktons) and fauna (zooplanktons, benthos, fishes, and aquatic mammals) are not well developed in the area. Therefore,

no significant impacts on the marine flora and fauna are anticipated. Similarly, at the disposal sites, at present large-scale marine faunal diversity has not been recorded. The existing faunal species would avoid the area during dumping operations, due to high turbidity and are expected to return only after the cessation of dumping/disposal activities. This phenomenon has been observed at many sites and the same scenario is expected at the proposed site as well. Thus, no significant impact on fish fauna is expected. There will also be increased noise and vibration levels because of the construction activities and increased anthropogenic movement. The increased noise and vibration levels underwater is also envisaged due to piling work, which may impact the marine ecology.

Proposed Measures

- Construction workers will be instructed about no disposal or dumping of any kind of waste into or in the vicinity of sea water
- Construction area will be bunded and provided with adequate drainage with silt traps to prevent runoff from construction area into the sea water
- The project shall ensure that the identified dredger type will result in minimizing the amount of silt and sediments
- A silt curtain will be installed around the dredge site
- The excavated material will not be disposed of at any other location than DS-3
- It shall be made sure that no spillage occurs while transporting the dredged material
- Acoustic enclosure for D.G. set as required in the Power Generator MoEFCC's notification
- Implementing noise mitigation techniques for offshore pile driving, including bubble curtains, pile caps, and cofferdams (where practicable) to absorb/scatter pile driving energy
- Vibration dampers and sheet barriers will be used to effectively mitigate vibration during construction phase
- Storm water at the construction site should be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea
- Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP
- Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, (2016)
- Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, (2016)
- Oil spill kits should be maintained to avoid oil spills and leakage into the sea
- Mopping system shall be deployed for cleaning of the oil from the surface waters
- An oil spill contingency plan should be developed in line with JNPA's Oil Spill Response Contingency Plan
- Marine water quality to be monitored during construction phase and it is to be ensured that water quality is not compromised, and all the parameters are well within the prescribed standards

Impacts on Terrestrial (Mangrove) Ecology

Impacts

During construction phase, construction wastes will be generated onsite in the form of construction debris, scrap materials, concrete, wooden pallets, cement, sand, silt, etc. Wastewater in the form of sewage and municipal wastes including food waste will be generated from site office and labour shed. The project will also generate hazardous waste in the form of used oil from diesel generators and construction machineries, empty containers of paints, contaminated cotton rags, hydraulic fluids etc. If such wastes are not handled adequately, it may adversely impact the mangrove vegetation after reaching in the soil. Any leaks or spills of oil and lubricants from heavy equipment during drilling activities at site or at workshop area and/or improper discharge of wastewater at site may also lead to long term negative impact on soil quality and ultimately the mangrove vegetation. Spillage from various construction vehicles and equipment if not handled properly, may result in chemical desegregation, and may reach to the mangroves resulting in stunted growth as well as death of the floral species.

Proposed Measures

- Construction workers will be instructed about no disposal or dumping of any kind of waste into or in the vicinity of sea water
- Construction area will be bunded and provided with adequate drainage with silt traps to prevent runoff from construction area into the sea water

- Storm water at the construction site should be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea
- Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP
- Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, (2016)
- Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, (2016)
- During servicing/repair of equipment or vehicles, a suitable drip tray shall be used to prevent oil/grease spills onto the soil, especially in case of emergency repairs
- Oil spill kits should be maintained onsite to handle minor leaks and spillage
- Mopping system shall be deployed for cleaning of the oil from the surface waters
- Unloading and loading protocols should be prepared for diesel, oil and used oil respectively and onsite workers should be trained to prevent/contain spills and leaks

Impacts on Migratory Birds

Impacts

During the construction phase, the migratory birds are adversely impacted by noise & vibrations. The primary sources of noise & vibrations will be the various construction equipment and construction / transportation vehicles. The sources of noise in the construction phase also include civil work, operation of construction machineries, D.G. sets and movement of vehicles at project site. There will also be increased noise levels because of increased anthropogenic movement and increased traffic at the terminal. Furthermore, increase in noise and vibration levels in underwater is also predicted due to piling work which may impact the activities of migratory birds in the area.

Proposed Measures

- Acoustic enclosure for D.G. set as required in the Power Generator MoEFCC's notification
- Implementing noise mitigation techniques for offshore pile driving, including bubble curtains, pile caps, and cofferdams (where practicable) to absorb/scatter pile driving energy
- Maintenance of high noise machinery to be undertaken at regular intervals

Influx of Migrant Workers

Impacts

As reported by NSFTPL, during the construction phase of the project, ~200 migrant construction workers will be employed at the project. The project shall provide preference to the local workers (refer to ***Table 7-13***) However, the Project will need migrant workers to overcome shortfalls in the local labour supply – as observed most of the local labour work are related to the transportation activities (truck drivers or helpers), loading and unloading activities, fishing activities and other local businesses and have limited knowledge of construction activities.

Labor influx for construction works can lead to a variety of adverse social and environmental risks and impacts. The list below provides a summary of typical adverse social and environmental impacts, but is not exhaustive[2]:

Social Impacts

- Risk of social conflict
- Increased risk of illicit behavior and crime
- Influx of additional population

2 https://thedocs.worldbank.org/en/doc/497851495202591233-0290022017/original/ManagingRiskofAdverseimpactfromprojectlaborinflux.pdf (Accessed on October 31, 2022)

- Impact on community dynamics
- Increased burden on and competition for public service provision
- Increase risk of communicable diseases and burden on local health services
- Gender based violence
- Local inflation of prices
- Increased pressure on accommodation and rents
- Increase in traffic and related accidents

Environmental Impacts

- Inadequate waste disposal and illegal waste disposal sites
- Wastewater discharge
- Increased demand for freshwater resources
- Increased use of/demand for natural resources

Proposed Measures

The following mitigation measures are suggested in order to mitigate or minimize the impact on local community's resources and utilities:

- Managing Project Induced in-migration
- Labour Assessment
- Stakeholder engagement

Stress on Local Resources

Impact

The project is located in combination of urban and peri-urban settings, a migrant workers may reside in rental accommodation and moving into existing, or project provided workers' accommodation facilities. While the influx of migrant workers may not have significant impact on the usage of local resources as they will be absorbed within the city, there may still be impacts, including an increased demand on municipal services and transport system, inflationary effects on housing renting markets, food and fuel, development of slums (far and few chances), increase in social conflict and potential increase in criminal activity.

Proposed Measures

The following additional mitigation measures are suggested in order to mitigate or minimize the impact on local community's resources and utilities:

- Minimizing in-migration into the Project area
- Staging the inflow of migrants
- Managing the migrant physical and social footprint
- Addressing negative social impacts
- Stakeholder Engagement

Labour Rights and Welfare – on-roll employees and contractual workers

Impacts

The Project will employee skilled, semi-skilled and unskilled workers, across the Project lifecycle, which will include contractual and regular (on-roll) employees. The contractual and on-roll employee may consist of local and migrant workers. As reported by NSFTPL, ~200 contractual workers will be employed by the Project.

The labour rights and welfare consist of human rights and labour rights in the workplace. For the Project, the workforce will be a valuable asset, and a sound worker-managed relationship is a key ingredient to the sustainability of the Project. Failure to

establish and foster a sound worker-manger relationship can undermine worker commitment and retention, which can jeopardize the Project. Conversely, through a constructive worker-manager relationship and by treating workers fairly and providing them with safe and healthy working conditions, project may see tangible benefits, such as the enhancement of efficiency and productivity.

Proposed Measures

The following additional mitigation measures are suggested in order to ensure compliance with labour laws/provisions as per the industry best practices:

- HR policy and management system for NSFTPL satisfactory to ADB
- The project shall establish a formal policy or commitment to support the collective bargaining for all on-roll and contractual employees
- Establish workers engagement plan and grievance redressal mechanism – to showcase the engagement mode and model of the project with workers and to allows the workers to report any concern or grievance related to work activity
- The labour accommodation facility for contractual workers and as well as for regular employees should meet the requirement of the applicable reference framework, and EBRD and IFC's guidelines on workers' accommodation – in terms of space per workers, water and sanitation facilities, first aid, lighting and ventilation, etc. Further, the project shall undertake regular (basis of fixed timeline) monitoring to ensure compliance through the Project lifecycle
- Project shall ensure the labour rights and welfare in compliance with the ILO's eleven (11) fundamental instruments

<u>Contractor and Supplier Management</u>

Impacts

As reported by NSFTPL, the Project, will appoint contractors (project management consultant (PMC), EPC and other minor sub-contractors which will be ~15 subcontractors) to undertake the construction work of the terminal. If not managed effectively, appointment of contractors will raise EHSS risks for the Project. Further, it is also challenging to ensure appointed contractors implement the necessary environmental and social (E&S) requirements in compliance with the commitment of the Project. Thus, it is critical for the Project to adopt and implement sound, consistent, and effective approaches in compliance with the Applicable Reference Framework (ARF) of this report – to manage the E&S performance of contractors, subcontractors, suppliers and any other third-parties working for the Project.

Proposed Measures

The Project shall balance local with regional concerns by:

- Contractor and supplier selection
- ESG pre-qualification requirement for contractors
- Solicitation – typically happens through the preparation and issuing of a Request For Proposal (RFP)
- Contracting
- Management of contractors and suppliers
- Deficiency and performance management of contractors and suppliers
- Labour rights and welfare assessment

<u>Gender-based violation and harassment (GBVH)</u>

Impact

The migration of male workers may have a potential high-risk of GBVH affecting community members, workers and service users. Risk factors that increase the potential for GBVH include:

- Large-scale influx of transient male workers into small and often host communities with low capacity to absorb the sudden increase of workers
- Remote locations where people have limited access to resources to report GBVH and receive support

- Male workers transporting goods (e.g. truck drivers), who can perpetrate GBVH on routes (from terminal to container depot) and at truck stops associated with the project, even if not on the project site
- Poorly designed or maintained physical spaces on project sites and in worker accommodation for example bad lighting in and around grounds and access routes
- Informal workers, whose informality means they may either be more vulnerable to GBVH due to lack of contracts or that potential perpetrators may go unidentified due to lack of background checks
- While income-earning opportunities for women through direct or indirect employment in construction or operations represents a desirable increase in access to compensation and experience, it may in some cultural and social contexts lead to an increase in household tension and create community backlash against women in the area where the perception is that they should not work outside the home

Proposed Measures

- Appoint senior focal points in both Project and contractors with responsibility for ensuring that commitments and policies to prevent GBVH
- Put in place monitoring systems at the highest levels for regular reporting on GBVH
- Include requirements around GBVH in codes of conduct, policies and protocols for contractors, including training on policies and procedures once developed
- Establish safe, confidential and accessible grievance mechanisms for local communities
- Include options to report anonymously if preferred
- Vet contractors for prior efforts to address GBVH through prevention and response
- Ensure contracts include clauses on GBVH (for example all workers and staff sign codes of conduct)
- Provide safe, secure and separate living spaces for male and female construction and operation workers

<u>Occupational Health and Safety</u>

Impact

During construction phase the following potential occupational health and safety risks are envisaged due to construction activities

- Fall from height during installation of watch tower
- Risk while working at confined spaces at excavated areas
- Slip, trip and fall due to slippery floor and objects kept in pedestrian way
- Fire hazards and accidents while handling chemicals and oils and operating construction machineries including cranes and mechanical lifting equipment
- Exposure to hazardous corrosive chemicals
- Electrocution while working with live electrical components like electrical parts
- Diseases due to unhygienic conditions at site including contaminated drinking water for workers
- Hearing problems due to noise generation from construction machineries
- Respiratory problems due to dust emissions from construction site.
- Exposure to extreme heat while working at site during summers
- Risk of accidents from being struck in machinery or moving equipment or parts
- Accidents due to hit by construction vehicles or trucks used for container transportation
- Exposed to faulty electrical devices, such as cables, cords, hand tools etc.
- Drowning of workers working at the berth area and near marine water and during underwater piling work

Proposed Measures

- NSFTPL should develop and display HSE Policy at dedicated locations and communicate the same to the workers
- Develop occupational health & safety manual and procedures, in line with ADB's requirements and applicable WB EHS guidelines. Establish a safety committee on workplace safety for construction phase
- Occupational health and safety plan (refer ***Appendix M***) should be implemented at the proposed project
- Develop and implement a COVID -19 and communicable disease prevention and response plan

- All workers (regular and contracted) should be provided with training on Health and Safety policies in place with appropriate refresher courses throughout the life cycle of the Project
- The training courses should be also aligned to IMO conventions including the International Convention for the Safety of Life at Sea (SOLAS)
- Permit to work system should be implemented to ensure that work at confined space, work at height and cranes and lifting equipment is operated by trained and authorized persons only
- Adequate firefighting system should be installed at the project site including fire extinguishers, fire hydrants, sprinklers, sand buckets etc.
- Training of the workers on climbing techniques, and rescue of fall- arrested workers should be provided
- Training on hazardous chemical and material handling should be provided to the workers and PPEs such as rubber gloves, respirator, approved eye protection etc. should be issued
- Appropriate safety harnesses should be provided for working at heights
- Safe drinking water as per IS 10500:2012 should be provided to the workers
- Signs of "no smoking" should be provided at designated locations

Community Health and Safety

Impact

JNPCT terminal is located within JN Port and surrounded by other terminals. The nearest habitation to the port is Nhava village located at an aerial distance of ~ 1.5 km in north-east direction. The construction phase activities such as use of heavy machinery, construction of facilities will lead to noise and dust emission. However, since there are no community located within 500 m of the proposed project, there will be limited impact on the community. The project will involve transportation of construction material through state highway and national highway which may result in injuries to people due to accidents. Furthermore, project might deploy migrant workers and rent workers accommodation outside the port. The community may be exposed to communicable diseases such as Typhoid, malaria, HIV, Tuberculosis, COVID-19, Influenzas etc., due to migrant worker influx and interaction with local population.

JNPCT has a dedicated gate for entry exit, however, the terminal is not fenced to restrict entry of other terminal workers at JNPCT terminal due to which the other terminal workers may be exposed to health and safety risks during construction phase of the project such as accidents due to movement of construction vehicles, exposure to hazardous chemicals and oils in case of leaks and spill, fire and explosion hazards etc.

Proposed Measures

- Traffic management plan should be implemented at site
- The traffic movement for the project in the area will be regulated to ensure road and pedestrian safety
- Dedicated route for deployment of heavy-duty vehicles should be defined
- A quantitative risk assessment (QRA) should be conducted for potential hazards, explosions, access control and a security plan should be developed based on the outcome of the QRA
- Emergency Response Plan developed for the Project should be implemented at JNPCT and communicated to the JNPCT workers and nearby terminals
- Trucks/ dumpers should be covered by tarpaulin sheets during off site transportation
- Pre medical checkup of all the workers should be carried out before hiring
- Regular medical camps should be conducted amongst the workers and the community to aware them on diseases like Typhoid, malaria, tuberculosis, STD's, COVID-19, HIV Aids etc.

Operation phase Impacts

Air Quality

Impact

During operation phase, primary sources of air emission from the project will include the following:

- Increased movement of trucks (2961 from 2440 trucks per day) for transportation of containers from vessel to container yard, at rail siding and road network.
- Exhaust emission from diesel generators used at the RMQC, RMGC and RT cranes and DGs used at substations for power back up
- Emission due to accidental leakage from containers carrying dangerous goods of IMDG class explosives of classification 2 to 9 and explosives of IMDG class 1.1 and 1.2.
- Emission due to vessel traffic at the berth for container loading and unloading
- Exhaust emissions from diesel engines used for propulsion of ships
- GHG emission due to diesel combustion in RTGC, RMQC, DG sets, diesel and petrol consumption in ITVs, forklifts and vehicles owned by NSFTPL, purchased electricity consumption in High Mast, engineering workshop, container yard, electric substation, storeroom, canteen etc.
- Gradual increase in number of vessels due to the proposed project from 220 vessels for 0.4 million TEU (terminal is currently operating under capacity) to its designed capacity of 1.5 million TEUs to 520 vessels for 1.8 million TEUs by 2029
- VOCs emissions from paints and other solvents used for maintenance of cranes, equipment, yard area etc. and transportation of crude oil generated from vessel for disposal.

Proposed Measures

- Vehicles owned by NSFTPL shall use manufacturer recommended engine maintenance program regardless of the size of the vehicle
- Drivers should be instructed on driving practices to reduce fuel consumption including measures acceleration and safe driving limits
- Implement regular vehicle maintenance and repair program
- Implement pollution prevention management plan at site
- Diesel Generators at site should be provided with adequate stack height as per CPCB guidelines. DG sets which are already installed should be maintained at regular intervals and temperature within the stacks should be regulated. Stack emission should be within CPCB limits.
- NSFTPL should install selective Catalytic Reduction (SCR) system at the DG sets to reduce exceeded NOx levels.
- Passenger Vehicles (excluding the ITVs) used by the SPV or contractors for inspection and O&M purpose should be Pollution Under Control (PUC) certified
- Separate route for movement of ITVs and construction vehicles should be provided during the first initial 15-18 months till the construction phase is completed
- Regular inspection of containers carrying dangerous goods should be conducted and a separate container storage area should be demarcated for storage of dangerous goods and explosives.
- Monthly ambient air quality monitoring shall be conducted at JNPCT and report to be shared at the corporate level as well as to the lenders

<u>Noise and Vibration</u>

Impact

During operation phase, the following sources of noise emissions area envisaged:

- Noise emission due to increased traffic and movement of trucks and rakes for transportation of containers through road network and railway siding
- Gradual increase in noise emission due to increase in number of vessels
- Operation of RMQC, RMGC and RT Cranes, forklifts for loading and unloading of containers from vessels and stacking at the container yard
- Anthropogenic activities at the workshop area
- Operation of DG sets at the substation for power back up
- Underwater noise generation due to vessel traffic

Proposed Measures

- Periodic inspection of the project equipment and cranes should be conducted

- Strict adherence to maintenance schedule of generators, as specified by vendors
- Vehicle drivers should be instructed not to blow horns until necessary.
- Equipment and cranes should be shut down when not in use
- Regular maintenance of NSFTPL vehicles and ITVs should be conducted

Coastal Soil and Land Environment

Impact

The O&M phase of the project will involve use of paints, oil and hydraulics at the workshop area. Furthermore, hazardous wastes such as contaminated rags, empty container of paints, used oil from DG sets at the substation will be stored on site. Any leakage or spills from oil and paint containers at the workshop or substation areas may seep into the ground and contaminate the land and soil at the project area. Other wastes generated at the terminal such as sewage from site office and solid waste including food wastes if not handled and disposed adequately, may have negative impact on the soil and marine water quality.

Furthermore, vessels arriving at the berth will generate garbage and hazardous oily sludge which will be handled, transported and disposed of from the vessels to authorized recyclers, only if requested by the vessel operator. Though, there will be no handling or transportation under the scope of the SPV, however, if Improper handling of such wastes is done by the recycler at the terminal, this may lead to spills causing marine water and/or land and soil contamination (depending on location of spillage).

Proposed Measures

- Demarcate dedicated storage area for hazardous and non-hazardous containers to avoid damage to non-hazardous containers in case of blast and spillage from hazardous containers
- Municipal wastes generated at site should be segregated and stored in designated color coded bins.
- Bio medical waste will be disposed as per bio medical waste rules 2016, as amended, through an authorized vendors
- Hazardous waste should be disposed to authorized MPCB/CPCB recycler only
- Oil spill kits should be maintained onsite to handle minor leaks and spillage
- Fuel/oil/ paint containers will be stored on impervious floor in the storage area having secondary containment and housekeeping/ concerned staff will be trained for safe handling of oil and lubricants etc.
- All waste should be stored in a shed that is protected from the elements (wind, rain, storms, etc.) and away from storm water drainage
- Unloading and loading protocols should be prepared for containers and onsite workers should be trained on handling of hazardous material and to prevent/contain spills and leaks.

Water Availability & Quality

Impact

Water during operation phase will be required for firefighting system, landscaping and domestic purpose. Approximately 2.5 lakh kiloliters of water will be required during operation phase at the project site. Source of water at JNPCT is through pipeline water supply from Maharashtra Jeevan Pradhikarn (MJP) and City and Industrial Development Corporation of Maharashtra Limited (CIDCO).

Potable water requirement will be met through packaged drinking water in line with WHO drinking water standards.
The connection for water supply at JNPCT has been already provided by JNPA, and no additional water supply connection will be required by NSFTPL. Currently, JNPA has a water supply scheme of 15 MLD water combined at the port area and township area. However, there has been constant use of 8 MLD water at the port area.

Proposed Measures

- Explore feasibility of rainwater harvesting system within the terminal
- Records of marine water quality monitoring conducted by JNPA shall be maintained and shared at the corporate level and with the lender.

- The treated water from STP shall be in compliance to treated sanitary sewage discharge standard as per IFC EHS guidelines and as per CPCB standards for water quality.
- The treated water from STP should be recycled and reused as per the conditions specified in Consent to Operate

Marine Water Quality

Impact

Stormwater runoff without treatment from the terminal which may contain heavy metals, toxic organics, oil and grease can have potential impact on the marine environment.

The loading and unloading of containers from the vessel to the berth may lead to accidental leaks and spillage of hazardous material and oil which may have adverse impact on the marine water quality. Furthermore, there may be accidental spill while disposing sludge from the vessel which may increase turbidity in the sea. Disposal of garbage from vessels if not handled properly, may also impact the marine water quality.

Proposed Measures

- Adequate instructions should be provided to the vendors arriving for disposal of sludge and garbage from vessels to avoid littering of garbage and accidental leakage of sludge into the sea
- NSFTPL should ensure that vendor collects oily sludge from the vessel in vehicles, or central collection systems and storage tanks. The capacity of oily waste collection should be established based on applicable MARPOL provisions
- Verify the adequacy of SOP on handling of garbage (on request) and sludge from the vessels developed by the vendor. In case such SOP is not available with the vendor, NSFTPL shall develop SOP for supervision of garbage and sludge disposal from vessel by third party from the terminal (in case this service is facilitated by terminal on request) ,in compliance with MARPOL to prevent pollution from Ships/ Vessels.
- A communication procedure should be developed for vessels operations incidents (air emissions, ballast, bilge water, discharge of oil, noxious liquid substances in bulk, harmful substances in packaged form, sewage, and terminal and vessels garbage and sewage)

Impacts on Marine Ecology

Impact

In the operational phase, the noise and vibration levels will be mainly from vessel traffic. Other impact on marine ecology will be mainly from the dredging activities and any direct discharge to sea or accidental spills or leaks.

The terminal has been in operations for many years, the modernization aspect will only bring efficiency into attending to vessels at a shorter turn-around, which will increase the existing capacity i.e. 0.4 million TEUs to 1.4 million TEUs in FY 2027and further up to 1.8 million TEUs by 2029, however it will also reduce the waiting time for the vessels. There will be anncrease in cargo or vessel traffic from 220 vessels (for 0.4 million TEUs in FY 2021-22) to 520 vessels (for 1.8 million TEUs by 2029), but after upgradation, the same channel will be used which is being used currently. There might be slightly increase in the noise due to handling of more vessels, however the other adjacent terminals which are also using the same channel are already handling a significant number of vessels (2.1 Jawaharlal Nehru Port Authority (JNPA)) and the marine fauna and mammals are already adapted to the noise from the movement of the vessels. Hence it is understood that there will not be any significant addition to marine noise and vibration, also as mentioned earlier the marine fauna and mammals have adapted to vessel movement in the area.

Proposed Measures

- Storm water drains to have oil - water separator and it is to be ensured that contaminated water is not discharged into the sea
- Oil-water separators to be regularly monitored
- Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP

- Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, (2016)
- Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, (2016)
- NSFTPL should ensure that vendor collects oily sludge from the vessel in vehicles, or central collection systems and storage tanks
- The capacity of oily waste collection should be established based on applicable MARPOL provisions
- Develop SOP on handling of garbage (on request) and sludge from the vessels
- Oil spill kits should be maintained to avoid oil spills and leakage into the sea
- Mopping system shall be deployed for cleaning of the oil from the surface waters
- An oil spill contingency plan should be developed in line with JNPA's Oil Spill Response Contingency Plan

Impacts on Terrestrial (Mangrove) Ecology

Impact

During operation phase, the loading and unloading of containers from the vessel to the berth may lead to accidental leaks and spillage of hazardous material and oil which may reach to the mangroves and cause the adverse impacts. The O&M phase of the project will involve use of paints, oil and hydraulics at the workshop area. Any leakage or spills from oil and paint containers at the workshop or substation areas may reach to the coasts and impact the mangroves. Any leaks or spills of oil and lubricants from heavy equipment during operational activities at site or at workshop area and/or improper discharge of wastewater at site may also lead to long term negative impact on soil quality and ultimately the mangrove vegetation. Spillage from various construction vehicles and equipment if not handled properly, may result in chemical desegregation, and may reach to the mangroves resulting in stunted growth as well as death of the floral species.

Proposed Measures

- Adequate instructions should be provided to the vendors arriving for disposal of sludge and garbage from vessels to avoid littering of garbage and accidental leakage of sludge into the sea and or coast
- Storm water at the construction site should be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea
- Oil-water separators to be regularly monitored
- NSFTPL should ensure that vendor collects oily sludge from the vessel in vehicles, or central collection systems and storage tanks
- The capacity of oily waste collection should be established based on applicable MARPOL provisions
- Develop SOP on handling of garbage (on request) and sludge from the vessels
- Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP
- Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, (2016)
- Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, (2016)
- During servicing/repair of equipment or vehicles, a suitable drip tray shall be used to prevent oil/grease spills onto the soil, especially in case of emergency repairs
- Oil spill kits should be maintained onsite to handle minor leaks and spillage
- Mopping system shall be deployed for cleaning of the oil from the surface waters
- Unloading and loading protocols should be prepared for diesel, oil and used oil respectively and onsite workers should be trained to prevent/contain spills and leaks

Impacts on Migratory Birds

Impact

In the operational phase, the migratory birds will be adversely impacted by noise, vibrations, marine ecology, and status of mangroves in that area. The noise & vibrations levels will be increased due to the increased traffic and movement of ITVs and

other vehicles for transportation of containers through road and railway siding. Operation of RMQC, RMGC and RT Cranes for loading and unloading of containers from vessels and stacking at the container yard will also contribute to the noise pollution. The vessel traffic will also generate the underwater noise. Operation of DG sets and anthropogenic activities at the terminal area will also generate nose.

The loading and unloading of containers from the vessel to the berth may lead to accidental leaks and spillage of hazardous material and oil which may have adversely impact the marine ecology. Disposal of garbage from vessels if not handled properly, may also impact the quality of sea water and ultimately impact the aquatic flora (phytoplanktons) and fauna (zooplanktons, benthos, fishes, and aquatic mammals). Any adverse impact on the marine and/or terrestrial (mangrove) ecology as well as aquatic flora (phytoplanktons) and fauna (zooplanktons, benthos, fishes) will disturb the foraging and roosting areas of the migratory and/or congregatory species.

Proposed Measures

- The project shall ensure that the identified dredger type will result in minimizing the amount of silt and sediments
- A silt curtain will be installed around the dredge site
- It shall be made sure that no spillage will be occurs while transporting the dredged material
- Adequate instructions should be provided to the vendors arriving for disposal of sludge and garbage from vessels to avoid littering of garbage and accidental leakage of sludge into the sea and or coast
- Acoustic enclosure for D.G. set as required in the Power Generator MoEFCC's notification
- Periodic inspection of the project equipment and cranes should be conducted
- Strict adherence to maintenance schedule of generators, as specified by vendors
- Vehicle drivers should be instructed not to blow horns until necessary.
- Equipment and cranes should be shut down when not in use
- Storm water drains to have oil - water separator and it is to be ensured that contaminated water is not discharged into the sea
- Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP
- STP discharges should also comply with WB/IFC EHS Guidelines
- Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, (2016)
- An oil spill contingency plan should be developed in line with JNPA's Oil Spill Response Contingency Plan
- Unloading and loading protocols should be prepared for diesel, oil and used oil respectively and onsite workers should be trained to prevent/contain spills and leaks.

<u>Influx of Migrant Workers</u>

Impact

The project will need migrant workers to overcome shortfalls in the local labour supply – as observed most of the local labour work are related to the transportation activities (truck drivers or helpers), loading and unloading activities, fishing activities and other local businesses and have limited knowledge of operation activities such as crane operations and other operation related activities.

Additionally, Labor influx during operation phase can lead to a variety of adverse social and environmental risks and impacts. The list below provides a summary of typical adverse social and environmental impacts, but is not exhaustive:

<u>Social Impacts</u>

- Risk of social conflict
- Increased risk of illicit behavior and crime
- Influx of additional population
- Impact on community dynamics
- Increased burden on and competition for public service provision
- Increase risk of communicable diseases and burden on local health services

- Gender based violence
- Local inflation of prices
- Increased pressure on accommodation and rents
- Increase in traffic and related accidents

Environmental Impacts

- Inadequate waste disposal and illegal waste disposal sites
- Wastewater discharge
- Increased demand for freshwater resources
- Increased use of/demand for natural resources

Proposed Measures

- The project and its contractor shall provide preferential employment or recruitment to local labour, vulnerable group and ex-employee of JNPA (provided equal qualification), if they apply in compliance with local intent policy.
- Managing Project induced in-migration
- Labour Assessment – A labour assessment shall be carried out at different levels, depending on the initial assessment of the project risk posed by labour practices. It may take place as part of a regular monitoring and auditing of on-roll workers and contractual workers. The labour assessment should include a review of the employment policies, the adequacy of existing policies, and management's capacity to implement

Stress on Local Resources

Impact

The project is located in combination of urban and peri-urban settings, a migrant workers may reside in rental accommodation and moving into existing, or project provided workers' accommodation facilities. While the influx of migrant workers may not have significant impact on the usage of local resources as they will be absorbed within the city, there may still be impacts, including an increased demand on municipal services and transport system, inflationary effects on housing renting markets, food and fuel, development of slums (far and few chances), increase in social conflict and potential increase in criminal activity.

Proposed Measures

- Minimizing in-migration into the Project area
- Staging the inflow of migrants
- Managing the migrant physical and social footprint
- Addressing negative social impacts
- Stakeholder engagement – development and use of appropriate communication media and messaging beyond the immediate project area of influence

Labour Rights and Welfare – on-roll employees and contractual workers

Impact

The Project will employee skilled, semi-skilled and unskilled workers, across the Project lifecycle, which will include contractual and regular (on-roll) employees. The contractual and on-roll employee may consist of local and migrant workers. As reported by NSFTPL, ~2,300 contractual workers[3] will be employed by the Project during operation phase.

3 As reported, the contractual workers will be a mix of local labour and migrant labour. However, the preferences shall be provided to local labour based on their skillset and available knowledge. Further, at this stage of assessment, the project has not identified the strategy for employment of these contractual workers. The same will be defined in consultation with contractors during their contracting with the Project.

The labour rights and welfare consist of human rights and labour rights in the workplace. For the Project, the workforce will be a valuable asset, and a sound worker-managed relationship is a key ingredient to the sustainability of the Project. Failure to establish and foster a sound worker-manger relationship can undermine worker commitment and retention, which can jeopardize the Project. Conversely, through a constructive worker-manager relationship and by treating workers fairly and providing them with safe and healthy working conditions, project may see tangible benefits, such as the enhancement of efficiency and productivity.

Proposed Measures

- HR policy and management system for NSFTPL satisfactory to ADB
- The project shall establish a formal policy or commitment to support the collective bargaining for all on-roll and contractual employees
- Establish workers engagement plan and grievance redressal mechanism – to showcase the engagement mode and model of the project with workers and to allows the workers to report any concern or grievance related to work activity
- Project should also ensure a monthly and regular auditing mechanism for monitoring he sub-contractors with respect to compliance with the applicable national regulations (refer to section 3 for more details on applicable national regulations on workers) and applicable reference framework of this report. The compliance shall be in terms of (but not limited to) resources, workers' working conditions, migrant workers, child labour and forced labor, GBVH (Gender-based violence and harassment), health and safety, etc.
- Project shall ensure the labour rights and welfare in compliance with the ILO's eleven (11) fundamental instruments

<u>Construction and Supplier Management</u>

Impact

As informed by NSFTPL, the Project, will appoint contractors (employee representation consultant (ERC) and other minor sub-contractors) during the operational phase of the Project. If not managed effectively, appointment of contractors will raise Environmental, Health & Safety and Social (EHS&S) risks for the Project. Further, it is also challenging to ensure appointed contractors implement the necessary environmental and social (E&S) requirements in compliance with the commitment of the Project. Thus, it is critical for the Project to adopt and implement sound, consistent, and effective approaches in compliance with the Applicable Reference Framework (ARF) of this report – to manage the E&S performance of contractors, subcontractors, suppliers and any other third-parties working for the Project.

Furthermore, as compared to the construction activity, the operational phase tends to be more longer-term engagement and have a scope of engagement of local workers. If the skillset of the available local workers does not match with the requirement of the skillset requirement of workers engaged in operation phase, then the project can undertake skillset uplifting activities and programs.

Proposed Measures

- Contractor and supplier selection
- ESG pre-qualification requirement for contractors
- Solicitation – typically happens through the preparation and issuing of a Request For Proposal (RFP)
- Contracting
- Management of contractors and suppliers
- Deficiency and performance management of contractors and suppliers
- Labour rights and welfare assessment

<u>Occupational Health and Safety</u>

Impact

During operation phase, workers will be exposed to the following health and safety hazards:

- Accidents during cargo handling, operation and maintenance of equipment, machinery and vehicle

- Accidents from ITVs and other vehicles used for transportation of containers
- Chemical hazards such as skin exposure to chemicals, hazardous oils and fuels (if used) and VOC inhalation in case of spills or emission of fumes from containers carrying dangerous goods
- Fire and explosion hazards from containers carrying explosives
- Exposure to increased noise levels due to increase in vehicular traffic during cargo handling, operation of cranes for loading, unloading and stacking of containers.
- Accident near rail siding area
- Exposure to pathogens from ship garbage
- Drowning due to container handling and maintenance work at berth area or any other area located close to marine water

Proposed Measures

- NSFTPL should develop and display HSE Policy at dedicated locations and communicate the same to the workers
- Develop occupational health & safety manual and procedures, in line with ADB's requirements and applicable WB EHS guidelines and establish a safety committee on workplace safety.
- Occupational health and safety plan should be implemented at the proposed project
- Develop and implement a COVID -19 and communicable disease prevention and response plan
- The training courses should be also aligned to IMO conventions including the International Convention for the Safety of Life at Sea
- SOPs to be developed for handling of different types of containers ((inclusive of hazardous, explosives, radioactive, flammable substances, poisonous or toxic substances, infectious substances, corrosive substances, and combustible substances) and staff (direct and indirect) to be adequately trained
- Protocol of government and JNPA to be followed for handling of explosives, radioactive & other hazardous /dangerous goods. Staff to be adequately trained on handling and storage of different types of cargos
- Appropriate sign boards should be displayed with life-saving equipment giving clear instructions for raising the alarm in the event of an emergency and for the resuscitation of a person rescued from drowning.
- Adequate and suitable life-saving equipment should be provided and maintained for the rescue of anyone in danger of drowning. These should include lifebuoys, throwing buoys or lines, boathooks/poles of sufficient length or other suitable equipment.
- Life-saving equipment should be located at suitable places at intervals of not more than 50 m. The locations should be kept free of obstructions so as to be easily visible at all times.

<u>Community Health and Safety</u>

Impact

Project deploy migrant workers and rent workers accommodation outside the port. The community may be exposed to communicable diseases such as typhoid, malaria, HIV, tuberculosis, COVID-19, influenza etc., due to migrant worker influx and interaction with local population.

Proposed Measures

- EPRP developed as part of IESE should be followed at the site and communicated to the project workers and to the nearby terminals.
- Appoint local workers to the extent possible including skilled and unskilled workers
- NSFTPL should provide an orientation to the migrant workers on the local custom and tradition followed by the local population;
- Regular medical camps should be conducted amongst the workers and the community to aware them on diseases like Typhoid, malaria, tuberculosis, STD's, COVID-19, HIV Aids etc.

<u>Cumulative Impact</u>

Impact

The following cumulative impacts are envisaged due to the proposed project:

- Overall development of capacity and increase in trade capacity will result is more vessels waiting offshore, as the approach to terminals will be limited by the capacity of channel. More vessels waiting offshore will may have greater potential for pollution to marine water due to their discharges and emissions from long waiting time. Over a period time there could be need for additional approach channels which may induce new impacts on the marine ecology. However such a situation is totally dependent on the future projections and currently not under consideration.
- Construction works in the port and adjoining access roads, rail etc. will generate fugitive dust which will be dispersed locally affecting mainly the labour and working staff. This can cause respiratory issues for vulnerable individuals. With so many construction activities there is potential for accidents and other health and safety incidents for the working population.
- The ambient air and noise quality will be affected by simultaneous operations of machinery, excavations works, handling of rail materials etc. The impact would be local and affect the immediate vicinity of the Port.
- Additional requirement of water for construction and operation activities through MJP and CIDCO may impact existing water supply at the port.
- Labour influx due to the project activities will be addition to the existing workforce of existing terminal operators' workforce. Further, the labour influx due to the project will put pressure on the existing local resources
- Large-scale influx of transient male workers with existing male workers (of existing terminal operators) into small and often host communities with low capacity to absorb the sudden increase of workers may increase the risk of gender-based violation and harassment

Proposed Measures

- In case of excessive fugitive dust, work should be phase down until source of dust is identified and suppression measures have been implemented
- Periodic water sprinkling at construction site such as concrete or unpaved areas should be done to avoid dust emission
- Periodic inspection of construction equipment and DG sets should be conducted
- Soil heaps and other dust emitting sources shall be kept covered and away from marine water to avoid sand, silt, cement flow in water causing increase in turbidity of marine water
- Ambient air and noise quality monitoring should be conducted at JNPCT (at the berth area and other under construction location) and reports to be shared at the corporate level and to the lenders
- Substitute less volatile solvents such as aqueous solvents in furnishing materials
- Construction material will be transported in covered vehicles to prevent any dust emission along the transportation route
- Select equipment with lower sound power levels
- Appoint senior focal points in both Project and contractors with responsibility for ensuring that commitments and policies to prevent GBVH
- Put in place monitoring systems at the highest levels for regular reporting on GBVH
- Include requirements around GBVH in codes of conduct, policies and protocols for contractors, including training on policies and procedures once developed
- Notice boards with all safety measures to be taken at site and accident-prone areas should be displayed at designated locations
- The assembly area, nearest hospital, ambulance, fire station and police station should be identified and displayed at designated area

1 Introduction

Jawaharlal Nehru Port Authority (JNPA) is under process of re-development of Jawaharlal Nehru Port Container Terminal (JNPCT) through Public Private Partnership (PPP) on Upgradation, Operation, Maintenance and Transfer (UOMT) basis ("the Project") to increase JNPCT's maximum capacity to 1.8 million TEUs annually. The work has been awarded for 30-year Built-operate and transfer (BOT) concession to Nhava Sheva Freeport Terminal Private Limited ("NSFTPL"). NSFTPL intends to raise loan from Asian Development Bank ("ADB") to support the Project.

In this context, NSFTPL has engaged an E&S Advisory Firm (hereinafter referred to as "ESAF") to undertake Initial Environmental and Social Examination (IESE) of the proposed upgradation works at JNPCT against the objectives, principles and requirements of ADB's Safeguard Policy Statement and other applicable environmental and social requirements as per Applicable Reference Framework ("ARF") as mentioned in ***Section 1.2.***

This IESE report identify and assess any potentially significant adverse environmental and social impacts associated with the proposed Project's expansion and operation, and determines the measures needed to prevent, minimize, mitigate and compensate adverse impacts. The IESE also identifies potential environmental and social opportunities, including those that would improve the environmental and social sustainability of the Project, in compliance with the Applicable Reference Framework ***(refer Section 1.2.)***

1.1 Objective

The primary objective of the IESE includes -

- Assessment of any potentially adverse environmental and social impacts associated with the proposed Project, including all relevant direct and indirect environmental and social aspects and impacts and the relevant stages of the project cycle
- Detailed compliance with applicable laws and the applicable reference framework
- Identification of measures needed to prevent or minimize and mitigate the adverse impacts
- Identification of potential environmental and social opportunities, including those that would improve the environmental and social sustainability of the Project.

1.2 Applicable Reference Framework

Applicable reference framework for this assignment includes:

- ADB's safeguard Policy statement (ADB SPS 2009)- Safeguard requirement (SR) 1 on Environment, SR 2 on Involuntary Resettlement (IR), and SR 3 on Indigenous People (IP).
- ADB's Social Protection Strategy (2001).
- ADB's Gender and Development Policy (1998).
- IFC's General Environmental, Health & Safety (EHS) guidelines, 2007.
- IFC's Environmental, Health, and Safety Guidelines for Ports, Harbours, and Terminals.
- Climate Risk Assessment in ADB Projects (2014).
- Operations Manual C3 on Incorporation of Social Dimensions (2010).
- ADB's Core Labor Standards.
- IFC Performance Standards on Social and Environmental Sustainability (2012).
- The International Labour Organization (ILO) conventions covering core labour standards and the basic terms and conditions of employment.
- IFC/EBRD Guidance on Worker Accommodation.
- IFC's COVID-19 and Gender-Based Violence: Workplace Risks and Responses.
- Interim Advice for IFC Clients on Preventing and Managing Health Risks of COVID-19 in the Workplace.
- IFC's Interim Advice for IFC Clients on Safe Stakeholder Engagement in the Context of COVID-19.
- Other applicable laws and regulations pertaining to environment, health, safety, social, land acquisition and resettlement, and labour in India, including county obligations under relevant international treaties such as the UN Declaration on the Rights of Indigenous Peoples, and International Covenant on Economic, Cultural and Social Rights.
- ADB's guidance on Climate Risk and Vulnerability Assessment.

1.3 Scope of Work

The scope of work for the IESE includes

- ***Review of proposed project activities:*** Review and describe the proposed project and its geographic, ecological, social, health and temporal context, including any associated facilities that may be required (e.g., access roads, contractor facilities, substations, railway infrastructure). This involves the use of maps, site plans, aerial photographs and other graphic aids and images, as appropriate, and include information on location, general layout and size, as well as preconstruction, construction, and post construction plans. Following aspects to be covered:
    - Justification for selecting the proposed project site.
    - Overview of the main features of the existing Terminal and proposed upgrades and modernization works.
    - Existing traffic volume and significant routes to and from the Terminal, both land and marine side, container capacity and projected increase due to the project.
    - Materials or products stored in the project's container yard, storage period of containers at the yard before delivery.
    - Key project construction features including the proposed pre-construction, construction sequence and timeline, and details of the proposed activities.
    - Overview of operational activities (including any maintenance dredging), and the improvement in the operations phase considering the existing project operations.
    - Overview of the JNPA port utilities and services provided to the project o Description of the other terminals in the JNPT port and the materials or products being handled.
    - Safety considerations;
    - Security measures;
    - Waste generation and emissions; and
    - Project Implementation schedule.
- ***Analysis of Alternatives:*** Compare reasonable alternatives to the proposed project site, including land use and land take alternatives and avoidance of economic displacement impacts, and operation in terms of their potential environmental and social impacts, the feasibility of mitigating these impacts, their capital and recurrent costs, their suitability under local conditions, and their institutional, training, and monitoring requirements. It would also state the basis for selecting the project design justifying recommended approaches to pollution prevention and abatement.
- ***Review of Policy, legal, and administrative framework:*** Discuss the policy, legal, and administrative framework within which the Assessment is carried out, including host country regulations, including obligations implementing relevant international social and environmental treaties, agreements, and conventions, the applicable reference framework as well as any additional priorities and objectives for social or environmental performance identified by the client.
- ***Baseline data generation:*** Collect and analyze data (primary & secondary) within the study area in consideration of existing operations and proposed development activities within the project's area of influence. The baseline data collection is primarily focus on following themes:
    - Water Quality o Marine sediment quality
    - Noise and vibration levels (including under water, as applicable)
    - Ambient Air quality
    - Waste and asbestos management
    - Geological, geotechnical and hydrological conditions
    - Seismicity
    - Meteorological conditions and seasonal variations
    - Biological environment including identification of major habitat types; screening of potential critical habitat if any; mapping the extent of modified and/or natural habitat (including critical); mapping area of interest for the assessment that includes the surrounding ecological boundary that considers the extent of biodiversity values and where such values may be negatively impacted by project activities within the broader landscape (including land and sea traffic to and from the Terminal); any watershed, interfluvial zone or other relevant defining landscape features in which the projects are located
    - Marine ecology (including an aquatic flora and fauna study)
    - Terrestrial ecology (including a flora and fauna study)
    - Land use (including data about the residential / institutional / nearest village /township / locality / housing society, etc., based on the satellite imagery)
    - Permanent and temporary land requirements of the project associated and ancillary facilities' activities during pre-construction, construction and operations phases

- Current and proposed development activities within the port
- Socio-economic information (gender disaggregated) in terms of profile of affected and nearby settlements and their socio-economic activity, demographic and key socio-economic characteristics including ethnic composition and migration pattern, vulnerable communities and gender, education, health, land use and land tenure pattern, economic profile, occupational pattern (including subsistence activities), and other socio-economic parameters including livelihood loss and likely loss of community assets
- Should the population of the region rely heavily on fishing, baseline data on fish catch (e.g., types, volumes) and mapping of fishing areas has been collected, taking into account the fishing seasons in the area. Clarity on the fishing grounds (through mapping) used by the communities has been incorporated in the baseline studies

- *Social Consultations*: On the basis of existing available information, fieldwork using participatory appraisal methods, and review of census survey 2011 socio- economic profile of the local urban/rural and seasonal communities is prepared, in the project study area:
  - Livelihood, health and welfare characteristics of affected communities (community livelihood profiles, household economies, living conditions, employment status, farming systems, income streams, village and household assets profile, education and skills profile, welfare profile, health profile, vulnerability profile, cultural profile, etc.)
  - Local infrastructure (water and energy supply systems, roads and communication systems, etc.)
  - Social and other community services and facilities such as education, health, retail/business, transport, temples/mosques, etc.)
  - Present land use patterns and infrastructure
  - With respect to IPs / ethnic minorities (if any), the baseline has covered the distribution of ST community population in the study area
- *Environmental & Social Impact Assessment and Mitigation Measures*: Predict and assess the project's likely positive and negative impacts, in quantitative terms to the extent possible. Identifies mitigation measures and any residual negative impacts that cannot be mitigated. Identifies and estimates the extent and quality of available data, key data gaps, and uncertainties associated with predictions, and specifies topics that do not require further attention. Evaluates impacts and risks must consider impacts from existing facilities and the upgradation activities. Key sections/issues as follows but not limited to:
  - Soil quality and resource management
    - understand the dredging requirements for the project and its related impacts
    - disposal of dredge spoil
  - Water quality
    - Marine water quality impacts due to various activities
    - stormwater drainage, sewage treatment and ship wastewater (e.g., ship sewage, bilge waters, ballast waters) related impacts as applicable
  - Terrestrial and Aquatic Habitat and Biodiversity, with particular attention to potential induced impacts from increased traffic volumes along land and sea routes to and from the Terminal (noting that these volumes may be increased a substantial distance from the Terminal itself)
  - Waste and asbestos management
  - Noise and vibration
  - Air emissions
  - Spill and leakage prevention
  - Hazardous Materials and Management
  - Occupational safety and health of the workers
  - Community health and safety and security or Labor and working conditions
  - Influx management
  - Construction labor management
  - Contractor and supplier management
  - Social economic impacts
  - Gender
  - Participation and grievance management
  - Cultural heritage, if applicable
  - Impact of the project on supporting infrastructures of the port such as road and rail network
  - Environmental and Safety monitoring programs which shall include details of monitoring programs during the operation, construction, and decommissioning phases

- *Climate Change-Related Risk.* Undertake and incorporate a climate risk and vulnerability assessment into the IESE. This includes a detailed assessment and summary of the climate change adaptation and climate change mitigation aspects of the project.
- *Development of Environmental & Social Management& Monitoring Plan (ESMP):* Develop ESMP consisting of the set of mitigation and management measures to be taken during implementation of the project to avoid, reduce, mitigate, or compensate for adverse social and environmental impacts, and their timelines. Where the client identifies measures and actions necessary for the project to comply with applicable reference framework requirements, the management program includes an Action Plan, which is subject to disclosure to the affected communities and ongoing reporting and updating. An itemized budget for all environmental and social management, monitoring, resettlement activities (if applicable), including implementation of the ESMP shall be presented. The institutional arrangements and schedules for the implementation of the ESMP and its monitoring shall be detailed. The ESMP should be split into a) Construction and b) Operations Phase mitigation measures and should define monitoring requirements for the project based on national regulations and/or lender requirements. The management plans should cover the following (but are not limited to):
    - Water quality and wastewater Management Plan
    - Hazardous Materials Management Plan
    - Traffic Management Plan
    - Waste and asbestos management Plan
    - Workers' Accommodation Management Plan
    - Construction Labour and Working Conditions Management Plan
    - Sub-contractors and suppliers' management plan
    - Stakeholder Engagement Plan (SEP) and Grievance Redressal Mechanism (GRM)
    - Gender Development and Management Plan
    - Workers' Code of Conduct
    - Chance find procedure
    - Pollution Prevention Plan on Occupational Health and Safety Management Plan.
    - Community Health and Safety and Security Management Plan
    - Emergency Preparedness and Response Plan

1.4 Approach & Methodology

The approach and methodology for the IESE has been provided in subsequent sections

1.4.1 Project Kick Off

The independent E&S advisory firm (ESAF) organized a kick-off discussion with the Client (which comprised of representatives from both the consortium partners i.e., JM Baxi and CMA) to obtain an overview of the status of the project, and their expectations. Kick off meeting also included discussion on timelines for the site assessment and the deliverables. After project kick off, indicative list of details/ documents required to be reviewed were shared.

1.4.2 Documents Review

The kick-off was followed by a desk-based review of information shared with independent E&S advisory firm/ E&S advisor. Documents reviewed as part of this assignment included Concession Agreement, resource requirement, sustainability report of JNPA, HR related documents etc. Detailed list of documents reviewed is attached as ***Appendix I***

1.4.3 Site Assessment

Team comprising of an EHS expert, biodiversity expert and a social expert conducted site visit to JNPCT site. The details of site visit and key activities undertaken during site assessment have been presented in the table below:

Note: A detailed site assessment activity has been presented in ***Section 5.1***

Date	Key Activities
15th September 2022	• Meeting with the NSFTPL's representative [4](team from JM Baxi) to understand Project and its status • Site reconnaissance at the JNPCT berth, container yard and container entry gates. • Meeting with JNPA team comprising of Environment Officer, Safety Officer, Chief Fire Officer to get an overview of JNPA port and the existing facilities within JNPCT.
16th September 2022	• Discussion with JM Baxi on proposed plans of expansion, existing EHS management system of JM Baxi at other ports which they propose to replicate at JNPCT • HR Team of JM Baxi • HR representative of JNPA • Transit walks in the then affected village and consultations with local community • Site walkthrough at the JNPCT berth, fire safety office, container yard, container scanning area, common hazardous bund area and common solid waste treatment plant to identify environmental, social and ecological sensitivities in and around the terminal • Consultation with JNPA on the fire safety arrangement within JNPCT premises, disposal of dredged soil, handling of crude oil from vessels. • Consultation with the Environment Manager of JNPA and Ecological survey to understand the surrounding habitats.

[4] Project will be developed and implemented by NSFTPL (consortium formed by JM Baxi Ports & Logistics Limited and CMA Terminals). As on the date of site visit, organisation structure for NSFTPL was not established, hence site visit was facilitated by representatives from one of the consortium partners i.e. J M Baxi.

1.4.4 Initial Environmental and Social Examination (IESE) Reporting

This IESE report has been prepared by an Independent E&S advisor based on the site assessment, documents made available till 20th October 2022 by the client, consultation with representatives from JNPA, JM Baxi, CMA and nearby communities and information available on public domain. The structure for the IESE study report has been presented below:

- Project Description- An overview of the existing facilities within JNPCT and proposed as part of project and its associated facilities, resource requirement etc. are presented based on the data provided by client and information collected as part of the IESE study.
- Baseline Condition- A detailed baseline condition of the project area presented has been based on secondary data available for the study area.
- Stakeholder Consultation and Analysis: Details on profile of the stakeholder groups identified as part of the scoping study, their key interests and concerns and the way they may be involved in the project lifecycle have been provided.
- Impact Assessment: Based on the project details, outcomes of scoping exercises and baseline information collected, an assessment of impacts on the Environmental, Ecological and Social components was undertaken which typically include:
    - Predicting and assessing the project's likely positive and negative impacts and assigning significance to each type of impact.
    - Identifying mitigation measures and any residual negative impacts that cannot be mitigated.
    - Evaluation of risks and impacts associated with the proposed project.
- Environmental and Social Management and Monitoring Plan: Environmental and Social Management and Monitoring Plan (ESMP) suggesting economically feasible technologies and procedures to minimize any impact on environment and social receptors throughout the project life cycle have been developed and presented as part of the IESE.

1.5 Limitations

- Since the project is in initial phase, the master plan for the proposed project is yet to be developed
- The current terminal of JNPA's is operational for last 33 years and the proposed project involves the capacity augmentation and replacement of existing cranes with modern cranes to improve the overall capacity of terminal. The proposed project does not require additional land acquisition therefore there are no potential land based impacts on the community. However, discussion with JNPA was carried out to understand the historical land legacy associated with land acquisition and R&R which was done in year 1986 for the construction of entire JNPA. Therefore, land acquisition related documents such as village boundary from where the land has been acquired, project affected households, adopted R&R schemes, status of the R&R initiatives. Thus, the relevant information and section has been prepared based on the information understood during the consultation with JNPA and the reliable secondary information.
- As, the site survey (for this report and IESE) was conducted in the rainy season and during the survey period there were continuous rains in the study area; therefore, survey inside the mangroves, greenbelt and other plantation due to the rains could not be undertaken. The main objective of the survey was to verify the findings of the secondary information. Therefore, the secondary information was discussed and verified during the consultation with Environment Manager of JNPA.
- As JNPCT is an operational terminal and four more terminal in the same port are also operative, so it is very long and difficult process to get an approval for marine survey; thus, no marine survey was conducted.
- As there are several restricted areas due to the presence of Indian Navy in the proximity of the project and it is very long and difficult process to get an approval for a survey with GPS, binocular, and camera in and around these areas, no detailed avifaunal survey was conducted.
- Due to restriction, photographs of JNPCT were not taken during site visit
- The secondary data utilized for the purpose of baseline assessment is limited to that available in the public domain or documents made available by Client
- The project report is not intended to meet any national, state, or local statutory requirements and for any regulatory submission (as part of any permitting process or otherwise)
- This is a non-assurance work with no audit/loan staffing services to be provided and there are no other client-side / other-side parties involved in this engagement.

- As a part of the study consultations were carried out with relevant stakeholders which includes JNPA management, community, project and HR team of JM Baxi etc. however JNPA has reservations in doing consultations with their workers and union therefore these consultations were not carried out with them.
- Currently there is no workforce of NSFPTL at proposed site therefore labour management practices could not be assessed however inferences on labour management practices are derived from the existing operations of JM Baxi.
- Due to the reservations of JNPA regarding consultations with their workers the consultation with rounded representation of (age, gender, occupation & skills) workers could not be done

1.6 Structure of the Report

Chapter 1	Introduction (This Section)
Chapter 2	Project Description
Chapter 3	Applicable Legislative Regulatory & Administrative Regime for Proposed Project
Chapter 4	Environment & Social Baseline Conditions
Chapter 5	Stakeholder Identification & Analysis
Chapter 6	Climate Change Vulnerability Assessment
Chapter 7	Impact Assessment & Mitigation Measures
Chapter 8	Environment & Social Management and Monitoring Plan
Chapter 9	Impact Summary & Conclusion
Appendix 1	Documents Reviewed
Appendix 2	Map from World Bank's Loan Proposal document
Appendix 3	Management Plans

2 Project Description

This section provides an overview of the existing facilities of the JNPCT and details of the proposed project, in terms of location, associated facilities, site settings, resource requirement, land details and status of the project.

2.1 Jawaharlal Nehru Port Authority (JNPA)

The Jawaharlal Nehru Port Authority (JNPA)[5] at Navi Mumbai (formerly known as the Jawaharlal Nehru Port Trust) is handling 55% of the container cargo across all major ports in India. Commissioned on 26th May 1989, the port is located on land admeasuring 3402-hectare JNPT name was changed to Jawaharlal Nehru Port Authority (JNPA) by Central Government order reference No. JNP/MPA/367 dated 3rd November 2021 under Major Port Authorities 2021.

JNPA port has five container terminals, one liquid terminal and one shallow water berth. The total capacity of these terminals is 7.7 million twenty-foot equivalent units (TEUs). Out of the five container terminals, one of the terminals is operated by JNPA (i.e., JNPCT), whereas the other four container terminals are operated by private players through BOT concession. Details of the terminals are as presented below:

- *Jawaharlal Nehru Port Container Terminal (JNPCT) (hereinafter referred to as "Project")*

JNPCT is currently owned and operated by JNPA. The terminal is well connected to road and railway network. JNPCT has back up infrastructure like 34 Cargo Facility Charge (CFC), connectivity with 50 Inland Container Depot (ICD) and custom house. JNPCT also has a shallow draught berth commissioned on 1st September 2002 of length 445 meters. However, the shallow berth is not Part of the proposed project. Container Vessels, Cement, General Cargo and Liquid Cargo Vessels are being handled at the shallow berth with a total capacity of 4.5 million Tonnes. More details on JNPCT and its existing and proposed infrastructure has been presented in subsequent sections.

- *Nhava Sheva International Container Terminal (NSICT)*

In July 1997, JN Port signed a license agreement with M/s. Nhava Sheva International Container Terminal (NSICT), led by M/s. P&O Ports, Australia, for the construction, operation, and management of new 2-berth container terminal on a build, operate and transfer (BOT) basis for 30 years. The terminal was commissioned in April 1999 and the current capacity of the terminal is 1.2 million TEUs per year.

- *Gateway Terminals India (GTI) Container Terminal*

Gateway Terminals India (GTI) is a joint venture between APM Terminals and the Container Corporation of India Ltd (CONCOR). GTI is responsible for operating the third container terminal at Jawaharlal Nehru Port on a build, operate and transfer (BOT) basis for a period of 30 years. The operations in the terminal commenced in March 2006 and the current capacity of the terminal is 1.8 million TEUs per year.

- *Bharat Mumbai Container Terminal (BMCT)*

BMCT - Fourth Container Terminal was developed on Design, Built, Fund, Operate and Transfer (DBFOT) basis for the concession period of 30 years. The terminal is operated by M/s Bharat Mumbai Container Terminals Pvt. Ltd. (the subsidiary of Port of Singapore Authority). The current capacity of the Terminal is 4.8 million TEUs per year.

- *Nhava Sheva (India) Gateway Terminal*

In view of continuous growth in container traffic and meeting growing demand of business community and trade partners to have additional facilities for handling the same, the Port introduced private participation in India to develop new Container Terminal to augment its container handling capacity[6]. The terminal is operational since 2016 and operated by DP World. The current capacity of the terminal is 0.8 million TEUs per year.

- *Bharat Petroleum Corporation Limited (BPCL)- Liquid Terminal*

[5] Under the provisions of the Major Port Authorities Act, 2021, the name of the Jawaharlal Nehru Port Trust (JNPT) has been changed to Jawaharlal Nehru Port Authority (JNPA)

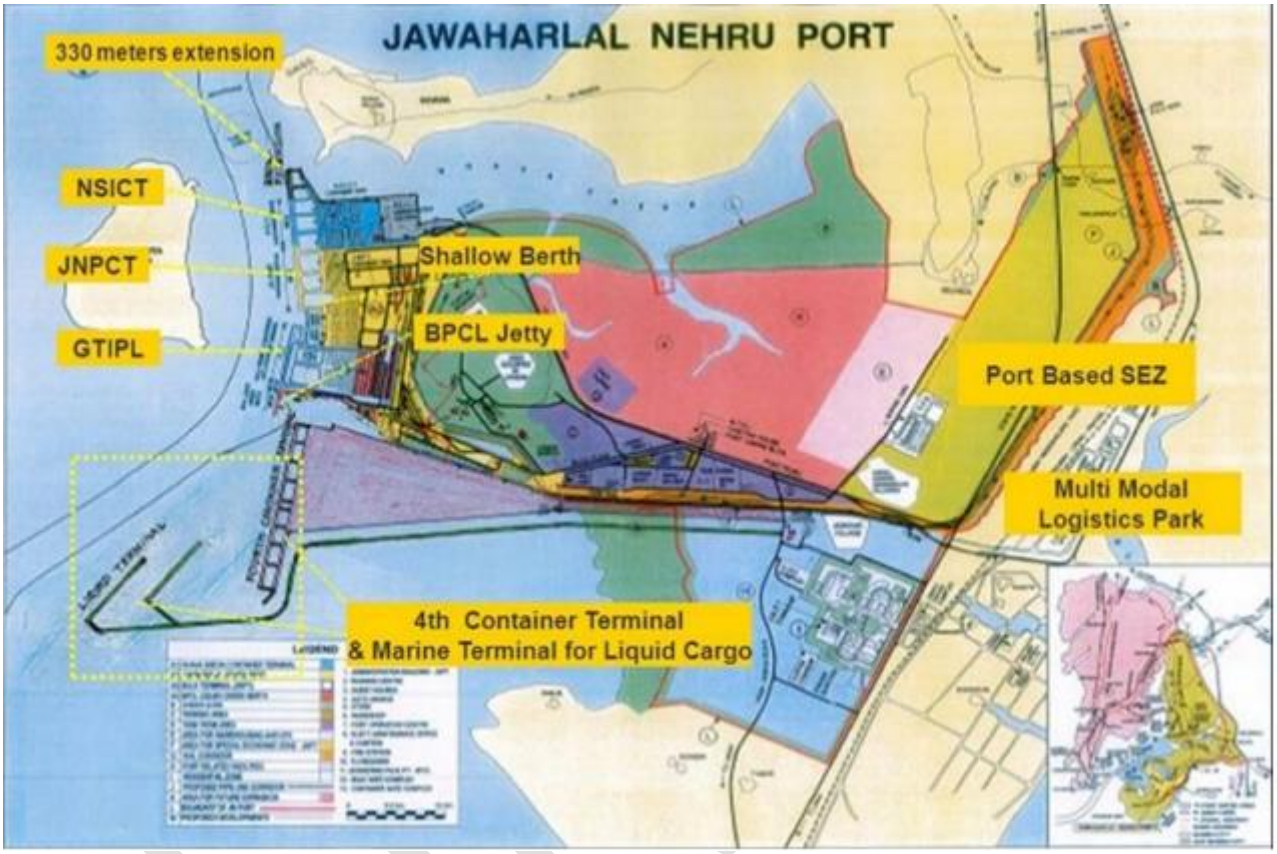
[6] https://www.jnport.gov.in/terminals

A license on BOT basis was awarded to M/s. Bharat Petroleum Corporation Limited and M/s. Indian Oil Corporation Limited in August 1999 for the construction and operation of a twin-berth liquid cargo jetty. The twin-berth liquid cargo jetty is functional since 2002 and has capacity of 7.2 million TEUs per year.

JNPA is running its day-to-day operations with the help of Information Technology (IT) including Electronic Data Interchange (EDI) and Vessel Traffic Management System (VTMS).

Map showing container terminals within Jawaharlal Nehru Port has been presented in ***Figure 2-1***.

Figure 2-1: Map showing container terminals within JNPA



Source: Feasibility Report by KPMG dated January 2020

2.1.1 Ongoing Projects at JNPA

As on August 2022, ongoing projects within the study area in JN Port are as presented below:

Table 2-1: Ongoing Projects at JNPA

Sr. No.	Name of Project	Status
1.	**Development of fourth container terminal at JN port** The project comprises of two phases – each phase comprises 1 Km of quay line, dredging of maneuvering area, 12 quay cranes, 46 RTG Yard cranes, and 4 RMGC cranes for its rail yard generating capacity of 2.4 Million TEU each (total 4.8 MTEU). As per schedule, the work of Phase I was completed on 22nd December 2017 and put into operation with a capacity of 30 MTPA. The commencement of Phase II of 30 MTPA capacity was delayed due to Covid -19 pandemic and confirmation of revised layout.	Phase I is put to in Operation since 22nd December 2017. Phase II work commenced on 17th April 2022 and it is planned to be completed by April 2025.

Sr. No.	Name of Project	Status
2.	**Development of Additional Liquid Cargo Jetty** To meet the growing demand of the liquid cargo, JNPA has decided to develop a liquid jetty of 4.5 MTPA. Detailed Project Report (DPR) for the project is completed. The jetty will have twin berths to handle 70,000 DWT vessels on one side and 25,000 DWT vessels simultaneously on both sides of the jetty. The EPC work has been awarded to M/s. ITD Cementation.	The work is in progress and about 77.22% work has been completed
3.	**Development of Integrated Common Rail Yard Facility at JNPA** To handle Dedicated Freight Corridor (DFC) rakes, JN Port has undertaken infrastructure work for the Common Rail Yard. Two lines for handling double stack and long haul rakes (length 1.5 Kms) will be commissioned. The existing 2 lines of NSICT will be decommissioned. The other terminal lines will continue the handling of non-DFC rakes.	Development of DFC compliant common rail yard inside Port Development of DFC common rail yard - Modification of ROB involved raising and widening of existing ROB near Administration Building of JNPA

Source: JNPA Website (https://www.jnport.gov.in/projects_ongoing)

2.2 Jawaharlal Nehru Port Container Terminal (JNPCT)

Jawaharlal Nehru Port Container Terminal (JNPCT) is a dedicated container terminal having association with EXIM trade[7] for past 30 years. The existing salient features of JNPCT has been presented in ***Table 2-2***.

Table 2-2: Existing Salient Features of JNPCT

Sr. No.	Components	Existing Features
1.	Total Berth	2 no.s
2.	Quay Length	680 m
3.	Draft	15 m
4.	Capacity	1.5 million TEUs
5.	Reefer Plugs	576 no.s
6.	Tractor Trailers	53 (hired) +7 (owned)
7.	Back up area (container yard)	54.742 ha
8.	Reach Stackers	4 (hired)
9.	Railway Siding Tracks for Inland Container Depot (ICD)	4
10.	Maximum Permissible LOA (Length overall) of The Vessel	370 m

Source: JN Port website and feasibility report by KPMG dated January 2020

2.2.1 Location & Site Setting

JNPCT is located at the eastern end of Mumbai on the Sheva Island and is situated at latitude 18° 56' 43" N and longitude 72° 56' 24" E. It is situated at an aerial distance of ~50 km and ~27 km from the Mumbai and Navi Mumbai cities, respectively. JNPCT is surrounded by NSICT towards the north, GTI towards south and rail yard towards east. Nearest habitation to JNPCT is Nhava village located at an aerial distance of ~ 1.5 km in north-east direction. Mumbai Port is at an aerial distance of ~ 31 km towards west of JNPT.

The terminal is well connected via major roads including NH4B (26.43 km road connecting Jawaharlal Nehru Port Authority to Mumbai and other cities in Maharashtra and Gujarat), NH4 (1253 km road connecting Pune and other southern states of India),

[7] EXIM INDIA is a reputed and all-India recognised premier publishing house. It publishes a daily newspaper "Exim Newsletter" from Mumbai + Western India, Gujarat, New Delhi / NCR / North India and Exim India - 'Shipping Times' from Kolkata, Chennai, Cochin and Tuticorin for the last 44 years [Source: https://www.eximin.net/about-us.aspx?aboutid=7 (accessed on October 21, 2022)]

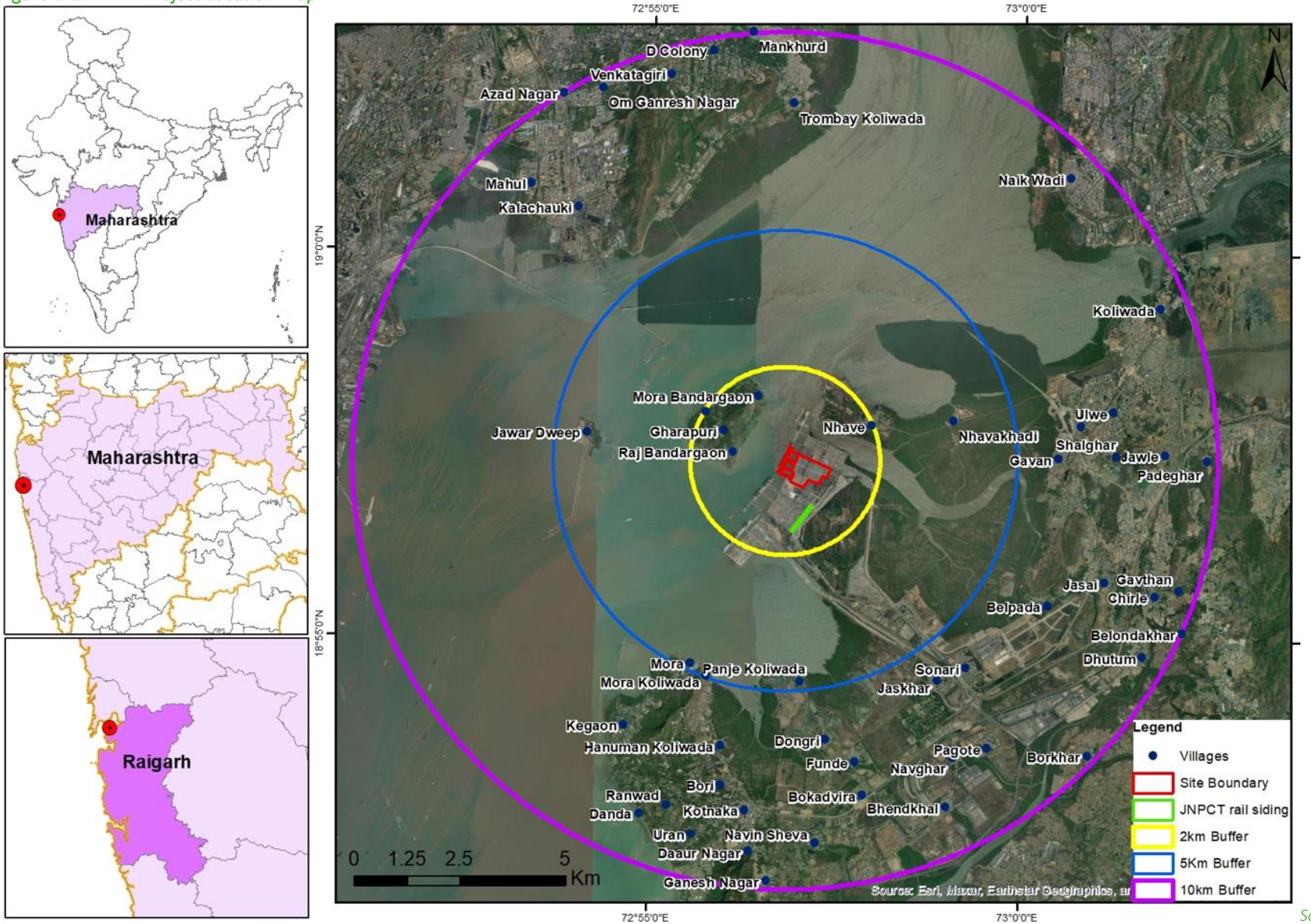
NH17 (1269 km road connecting Panvel in Maharashtra to Edapally in Kerala), NH3 (1161 km road connecting Agra in Uttar Pradesh to Mumbai in Maharashtra) & NH8 (1375 km road connecting Delhi to Mumbai in Maharashtra) and State Highway 54. NH-4B and SH-54 are directly connected to the JN port and is used for transportation of containers. NH-4B and SH-54 further gets connected to other aforementioned highways for transportation of containers from port to the container owner sites.

It is also connected to the Indian Railway network through a lead line connecting the port with Central Railway Division (Jasai), located ~ 9 km from the Project. The rail system at the port, which is operated and maintained by the Indian Railways, has 8 full-length railway lines serving the existing container terminals including the Project.

UNESCO World Heritage Site, Elephanta Caves are located ~2 km from the terminal. A newly recognized Ramsar Site, Thane Creek (Thane Creek Flamingo Sanctuary) which supports more than 100,000 birds during winter is also present ~12.5 km from the terminal. Karnala Bird Sanctuary (also an Important Bird Area (IBA)) is present in the west of the terminal. The boundary of eco-sensitive zone of the sanctuary is about 10 km from the terminal.

The JNPCT location map has been presented in ***Figure 2-2.***

Figure 2-2: Project Location Map



Source: Google Earth Imagery

2.2.2 Area Details

The Project is spread across a total of 54.742 ha of land which includes berth area, yards, common service roads. Break up of area is as presented in Table below:

Table 2-3: Area Break up

Sl. No.	Description of areas	Area in Ha
1	Gravel Yard CY -10 to 17 and 30 to 37	10.12
2	Yard Behind the SWB CY -40-50	9.7
3	Private Yard CY -90-98	7.78
4	Import Yard CY -80-88	7.3
5	ICD Yard including railway tracks	9.4
6	ICD Modification Work	0.3
7	Common Service Road	6.2
8	Berth Approaches	1.12
9	Berth area	2.822
	Total area	**54.742**

Source: JM Baxi

2.2.3 Berth Details

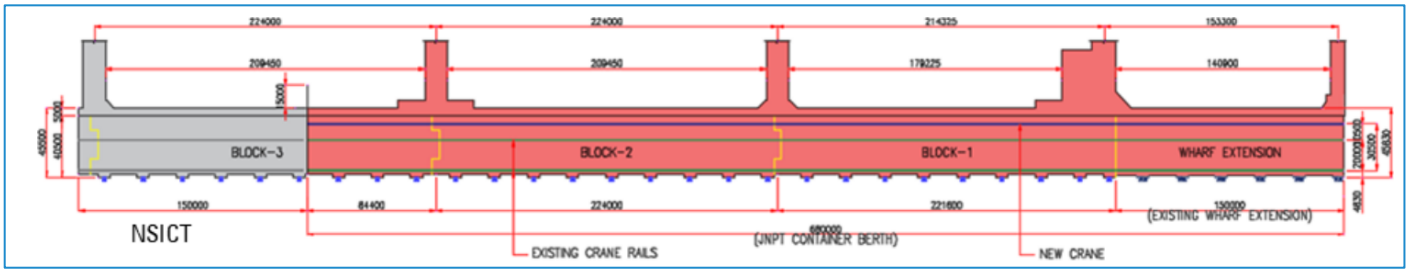
JNPCT has two (02) operational berths capable of handling 1.5 million TEUs. Details of berths are as below:

- Length of the berth: 680 m (530 m berth + 150 m wharf)
- Width of the berth: 45.5 m
- Designed dredged depth: 15 m
- Design vessel size: 12200 TEU

The existing container berth at the terminal is of 830 m length. The layout for existing container berth includes 150m wharf extension. Out of 830m of berth length, 680m (530 m berth + 150 m wharf) is used by JNPCT and the remaining 150m is used by NSICT which is another terminal and not part of the proposed project.

Design layout of existing container berth has been presented in ***Figure 2-3.***

Figure 2-3: Layout of Existing Container Berth



Source: Feasibility Report dated January 2020

2.2.4 Vessel Characteristics

The existing container berth at JNPCT has been designed to accommodate vessel size of 6000 TEU. However, according to the feasibility report prepared by KPMG dated 26 January 2020, it has been assessed by JNPA that the existing berth can accommodate vessel size up to 9000 TEU.

The characteristics of the vessels that can be handled at the JNPCT berth has been provided below:

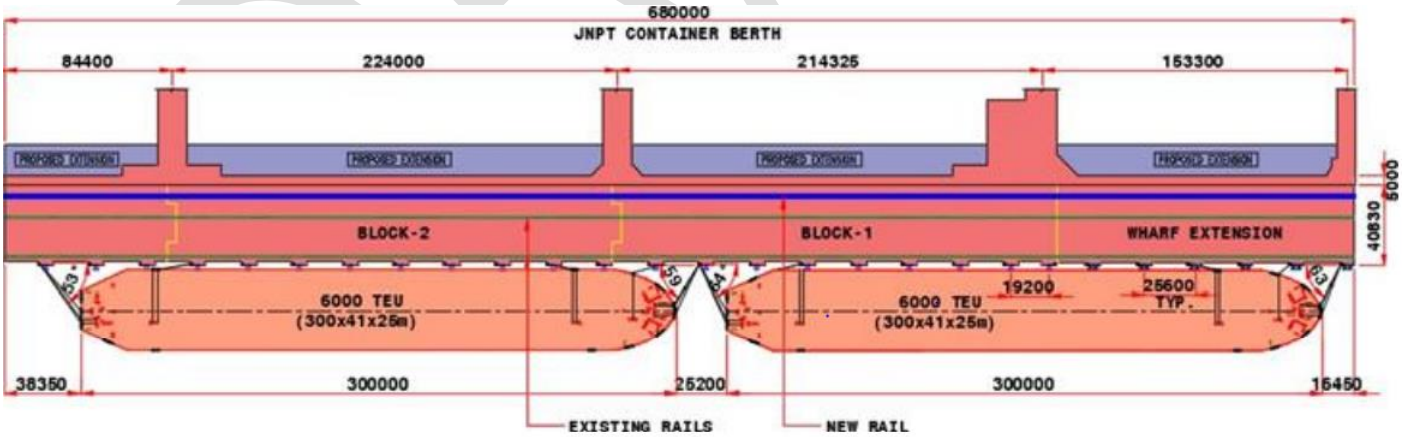
Table 2-4: Vessel Characteristics

Capacity	Displacement Tonnage	Length Overall (m)	Beam (m)	Loaded Draft (m)
6000 TEU	110,000	300	41	13.5
9000 TEU	150,000	340	51	14.5

Source: Feasibility Report prepared by KPMG dated 26 January 2020

The mooring layout for 6000 TEU vessel has been presented in ***Figure 2-4*** and the mooring layout for 9000 TEU vessel has been presented in ***Figure 2-5.***

Figure 2-4: Mooring Layout for 6000 TEU vessel



Source: Feasibility Report dated January 2020

Figure 2-5: Mooring Layout for 9000 TEU vessel

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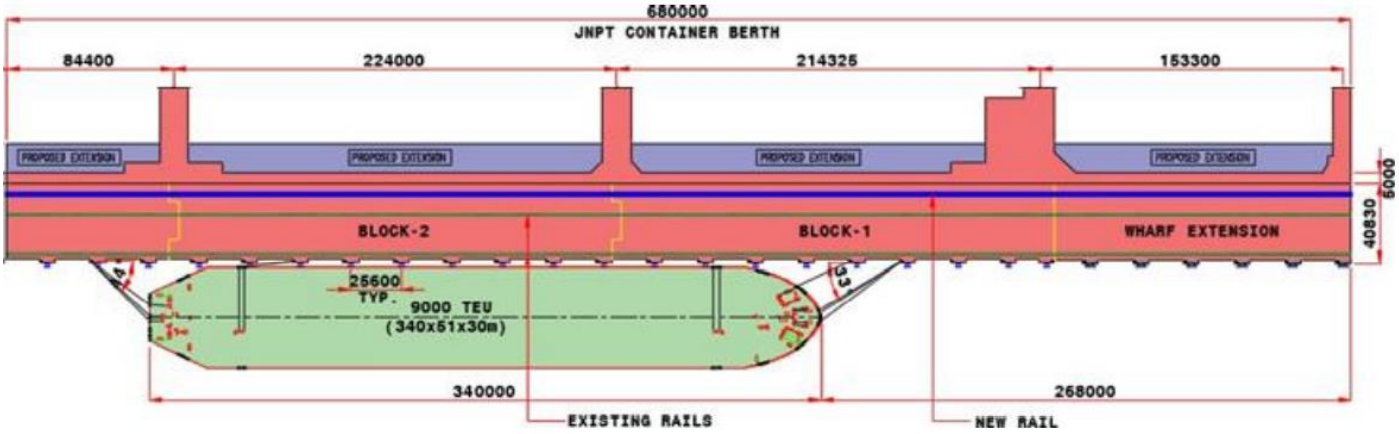


Source: Feasibility Report dated January 2020

Depending on the size of the vessel, currently maximum two (2) vessels of capacity 6000 TEU each can moor at the same time.

2.2.5 Anchoring Areas

Anchorage areas at JNPA are located at the pilot station about 27.8 to 29.6 km (15 to 16 knots) away from the terminal. As reported by JNPA, adequate waiting area for the vessels has been provided, which are declared at the time of arrival of the vessels as per agreed time of arrival at the port.

Vessels do not have to wait for a longer period of time since the berthing window concept ensures that there are no delays at the terminal.

2.2.6 Container Handling

Jawaharlal Nehru Port Authority has been notified by Ministry of Ports, Shipping and Waterways in 2007 via notification No. G.S.R. 2009 (E) for handling of dangerous goods (arrival, receipt, transport and storage) for IMDG class explosives of classification 2 to 9. In addition, container berth No. 1 (JNPCT) has been notified by Minister of Defense for handling their own explosives (IMDG class 1.1 and 1.2) under the supervision of Naval Armament Depot (NAD) Karanja. Recently JNPA has been notified by Petroleum and Explosives Safety Organizations (PESO) for handling (for export) IMDG class 1.4S explosives (via notification dated 14th June 2022) at container berth No.1 (JNPCT) and 6.

The classification of IMDG class goods which are handled at the Jawaharlal Nehru port and JNPCT terminal has been presented below:

Table 2-5: IMDG Class Goods handled by JNPA and JNPCT

IMDG Class	Description
1	Explosives
2.1	Gases-Flammable
2.2	Gases- Non-Flammable
2.3	Gases- Poisonous
3	Flammable Liquid
4.1	Flammable Solids

IMDG Class	Description
4.2	Solids liable to spontaneous combustion
4.3	Solids which in contact with water emits inflammable gases
5.1	Oxidizing Substances
5.2	Organic Peroxides
6.1	Poisonous or toxic substances
6.2	Infectious Substances
7	Radioactive Substances
8	Corrosive Substances
9	Miscellaneous dangerous goods i.e., other substances which experience have shown or may show to be of such dangerous character, are to be treated as dangerous goods.

Source: JNPA

JNPCT has a dedicated container storage yard for storage of containers before it is dispatched to the container owner through road and/or rail route. According to the container dwell time in the month of August 2022, the average container dwell time for JNPCT was 35 hours for import cycle and 64 hours for export cycle.

The containers are divided into hazardous and nonhazardous, however there is no separate storage of containers as per hazardous and nonhazardous labels. All the hazardous and nonhazardous containers are stacked together through Rail Mounted Gantry Crane (RMGC), Rubber Tyre Gantry Crane (RTGC) and forklifts at the container yard. Furthermore, due to confidentiality, no information on kind of material stored within the container remains with the Terminal operator. The containers are recognized and transported based on the container number and label printed on each container. JNPCT is responsible for facilitating import and export of containers through inland and maritime mode of transport. No activities related to packing and/or unpacking of containers are carried out within the terminal.

Containers carrying radioactive substances are not stored in the container yard and transported directly from the vessel to the owner through railway or road network. As per Section no. 23 of Dangerous Goods (Arrival, Receipt, Transport, Handling and Storage) Jawaharlal Nehru Port, Regulation 2007, radioactive materials which spontaneously emit a significant radiation and of which the specific activity is greater than 70 kBq or Kg. need to seek advice of Atomic Energy Regulatory Board (AERB), Government of India for instructions regarding the handling of these materials. The containers carrying radioactive substances are escorted by fire brigade and no traffic zone (green channel) while transferring container from the terminal.

Containers carrying radioactive goods are and will be handled in line with Section 23 of Ministry of Shipping, Road Transport and Highways Notification dated 20.03.2007 and as per the advice by AERB and JNPA and under the supervision of AERB and JNPA officials. As understood by JNPA officials, owner of the radioactive material will be mandated to use the type of containers, as specified by AERB which will depend on the nature, physical form and activity of the radioactive material. Also the container will be marked and labelled as per AERB safety code on Safe Transport of Radioactive Material.

Containers carrying dangerous goods at the terminal are handled and transported in line with provisions of IMDG Code and International Convention for the Prevention of Pollution from Ships (MARPOL) established by International Maritime Organization (IMO). As understood from JNPA officials, the containers arriving at JNPCT are stacked at the container yard through RTGCs and forklift[8] (only if feasible) for an average monthly dwell time of 64 hours before it is exported via ship as per provisions of Code. The containers arrive at the berth via Internal Terminal Vehicles (ITVs) and loading of the containers on the ship is done through RMQCs before it is exported via ship as per provision of IMDG code. Similar procedure is followed for import of containers at the terminal. JNPA has developed a dedicated Standard Operating Procedure for handling explosives and dangerous goods at JNPCT berth which is followed at the terminal during operations.

[8] Signage of "Forklift use prohibited" are displayed on containers which are heavy or contain dangerous goods

2.2.7 Equipment Details

JNPCT is equipped with the following machinery & equipment for unloading/ loading of containers.

Table 2-6: Details of machinery / equipment present at JNPCT

Sl. No.	Description of Machinery & Equipment	Number
1.	Rail Mounted Quay Crane (RMQC)	6
2.	Rubber Tired Gantry Crane (RTGC) (Electrical)	15
3.	Rail Mounted Gantry Crane (RMGC)	3
4.	RT Crane (Diesel)	12

Source: JM Baxi

In addition to the above, JNPCT is also equipped with the following assets for operation of the terminal.

Table 2-7: Other Equipment at JNPCT

Sr. No.	Equipment	Quantity	Make	Capacity
1.	Over high spreader	2	Se Yeon Machinery Co., Korea	40 T
2.	Over high spreader	2	Bromma	9 Kl
3.	Tractor (01 to 20)	20	M/s Terberg	9 Kl
4.	Trailer	20	M/s. TMA	-
5.	Forklift	4	Godrej/Kion	-
6.	Forklift	2	Godrej	-
7.	Forklift	1	Godrej	-
8.	Forklift	1	Godrej	-
9.	Mobile Crane	1	M/s. TIL	-
10.	Diesel Dispensing Unit	1	M/s. Seehra Engg., Ambernath	-
11.	Diesel Dispensing Unit	1	M/s IPWT	-
12.	Tempo (Mini Truck)	2	TATA	-
13.	Air Compressor	2	Ingersol rand, ConAir	-
14.	Diesel Welding Machine	2	Ador	-
15.	Hydra Crane	1	M/s. ACE	-
16.	Man lift	1	Runshare, China	350 Kg
17.	Water jet washing pump	2	Power jet	-
18.	Hydraulic Filtration unit	1	-	-
19.	Portable welding machine	1	Power jet	-
20.	Portable welding machine	2	Warpp	-
21.	Spare spreader STS 45	3	Bromma, STS 45	-
22.	Spare spreader YTS 45	1	Bromma, YTS 45	-

Sr. No.	Equipment	Quantity	Make	Capacity
23.	Spare spreader (electrical RTGC)	2	Bromma, YTS45E	-
24.	Spare spreader	2	Bromma, YSX45	-
25.	Low bed trailer	2	-	-
26.	Lashing cage	2	-	-
27.	Spares of CHE at main stores	-	-	-
28.	Spares of CHE at sub store	-	-	-
29.	Oil & Water Separator Unit	1	Jangam Hydraulics	-

Source: Feasibility Report dated January 2020

2.2.8 Internal Cargo Conveyance

A network of internal roads is developed to facilitate the movement of containers. These roads are connected to yards within JNPCT premises and railway siding at a distance of ~1.5 km from JNPCT berth. Internal roads are built using bituminous concrete.

Containers arriving at JNPCT port are loaded and unloaded from the vessel through Rail Mounted Quay Cranes (RMQCs) and transported through trucks to the container yards or directly to the container owner. There are 6 RMQCs at one berth used for loading and unloading of containers from vessel to the trucks and vice versa. Furthermore, there are 36 internal terminal vehicles (ITVs) (assuming 6 trucks per RMQC) used per berth for internal transportation of containers from berth to container yards. The container stacking at the container yard is through RTGC, RMGC and RT cranes. JNPCT has its own trucks for internal transportation of containers from berth to the container yard and from container yard to railway network where containers are stored till it is transported to the container owner. Furthermore, there is movement of trucks outsourced by container owners within the port for transportation of containers from berth to directly to the container owner.

JNPCT has a dedicated container scanning area where random check on entry and exit of containers at the terminal is carried out to ensure prevention of illegal import as per the Customs Act, 1962. The containers arriving at the terminal through trucks or ships are scanned through the scanning equipment randomly on weekly basis to identify kind of goods within the container. Furthermore, JNPA has deployed Central Industrial Security Force (CISF) team at all the port entry gates for entering details of trucks and containers moving to and from the port.

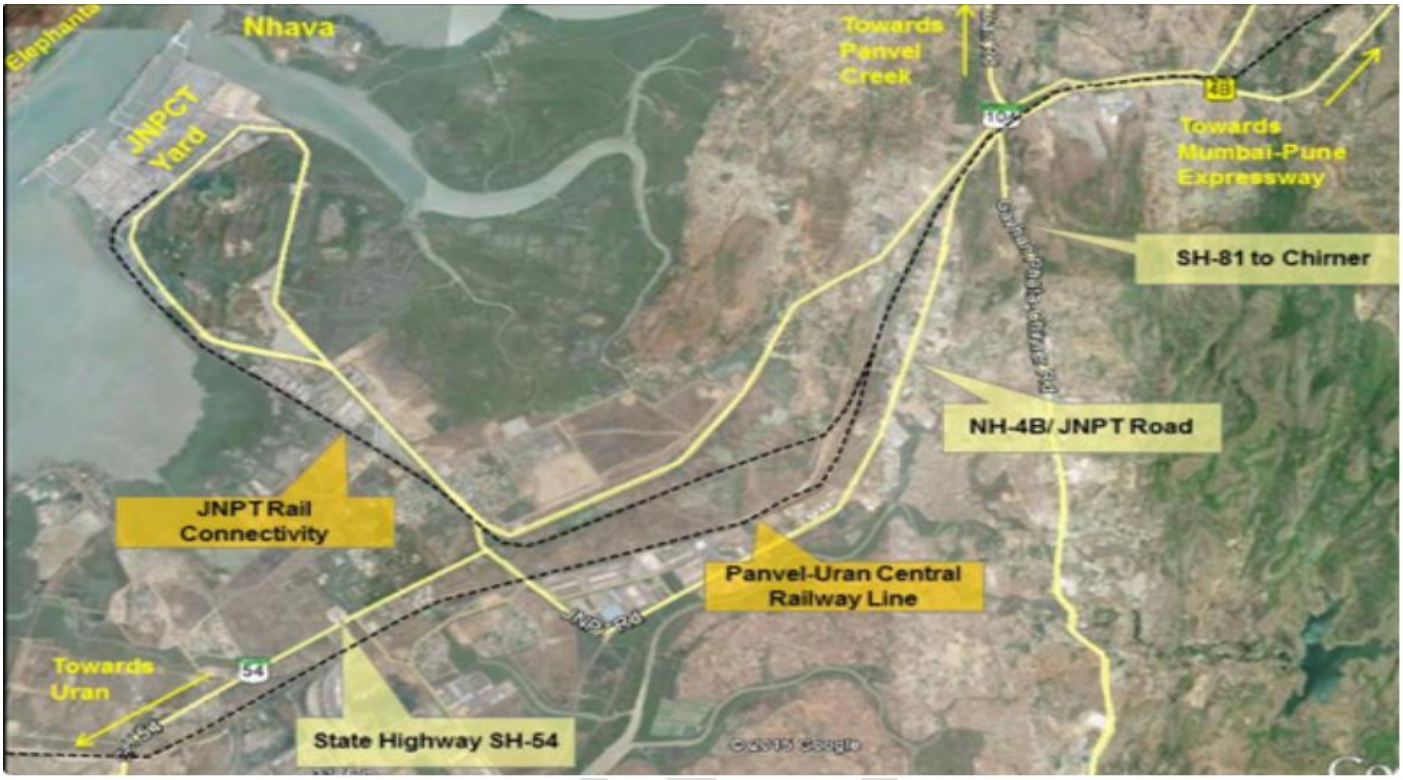
2.2.8.1 Road Connectivity

JNPA transports almost 84% of the containers through the road. The major road linkages connecting JNPA with the hinterland road network are NH4B, NH4, NH17, NH 3 & 8 and State Highway 54. The NH 4B mainly serves the heavy traffic of containerized vehicles to and from JNPA. It has a length of 26.43 km and branches at km 108/800 of NH4. The port also utilizes Amarga Marg which begins at km 125/800 of Sion Panvel highway (SH42) and passes through Belapur, Nerul and Ulwa and ends at km 13/900 of SH54. The road is an important link between northern and southern parts of Navi Mumbai and JNPA.

JN port currently handles approximately 16,413 trucks per day for transportation of containers via road.

Map showing road connectivity to the JNPCT yard has been presented in ***Figure 2-6.***

Figure 2-6: Road Connectivity to JNPCT



Source: https://www.jnport.gov.in/road_access

In addition to the above, JNPA has initiated an infrastructural development project to enhance the existing road network connecting to the port for smooth container traffic management. These include:

- Widening of NH-4B, SH-54, and Amra Marg from 4 lanes to 6/8 lanes
- Widening of existing container road towards east side of 'Y' Junction to North Gate Complex
- Construction of Flyover near to North Gate Complex on Container Road in JN Port
- Construction of Flyover at Y Junction near Port Users Building.

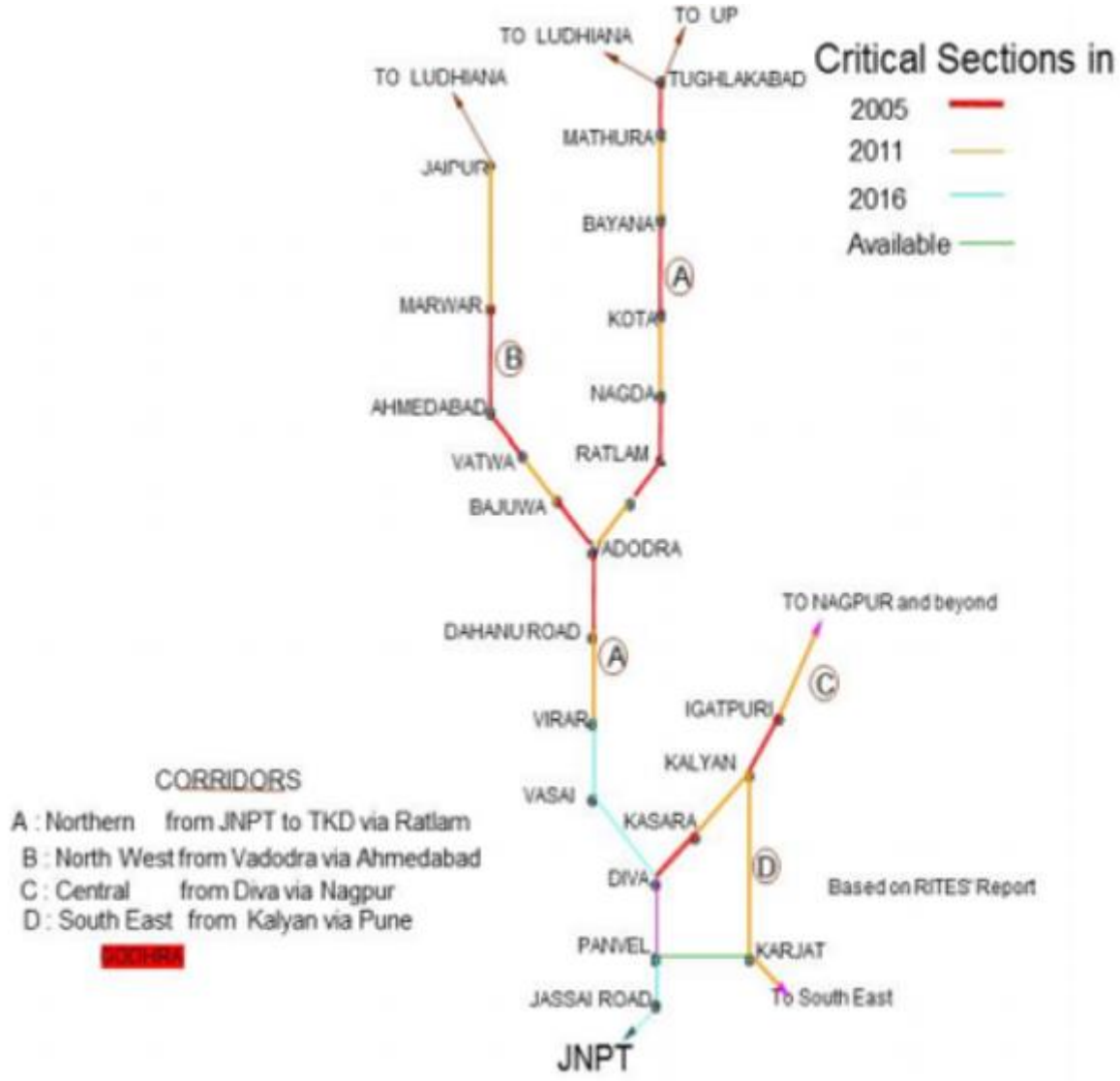
This initiative by JNPA will reduce travel time between national highway and port.

2.2.8.2 Rail Connectivity

JNPA's 16% container transportation is through rail networks. Railway transport serves as an economic transport mode as compared to road transport, hence Ministry of Shipping (MoS) in collaboration with Ministry of Railways (MoR) has taken various initiatives to increase the modal share of railways at JN Port. JNPA is linked with the Indian Railways through a lead line connecting the port with serving station Jasai. Jasai is located on the Panvel-Uran branch line section of Mumbai division, Central Railway at a distance of 9 km from the port. The rail system at the port, which is operated and maintained by the Indian Railways is located at a distance of ~ 1.5 km from JNPCT berth and has 8 full-length railway lines serving all the container terminals. JNPCT has a dedicated rail siding within the port rail system for transportation of containers from the terminal. Besides these, there is a 4 line intermediate holding yard between Jasai and the port. The 4 lines intermediate holding yard between Jasai and the port also serves to hold back and regulate traffic in the event of congestion at JNPA or at Jasai yard. The northern corridor from JNPA connects to Ludhiana via Diva, Vasai road, Vadodara, Ratlam, Kota, Bayana, Mathura junction, Tughlaqabad and Delhi. Furthermore, the north western corridor from JN Port connects to Rewari via Vadodara-Ahmedabad, Sabarmati Palanpur, Marwar Junction Jodhpur and Jaipur.

Rail connectivity route of JN Port for container transportation has been presented in ***Figure 2-7.***

Figure 2-7: JN Port Rail Connectivity Route



Source: https://www.jnport.gov.in/rail_access

In addition to the above, to enhance the rail connectivity and enable faster movement of containers, JNPA has strategically planned the following:

- Dedicated Freight Corridor (DFC) to reduce haulage charges and make rail connectivity to Port more viable
- Western DFC: Connecting Dadri to JNPA (1,504 Km)
- Indore Manmad New Rail Line Project: Indore-Manmad Rail Project is a 362 Km electrified railway line between Indore and Manmad. The rail line project will reduce the rail distance between Indore and JNPA by ~200 km vis-à-vis the existing route, with 47% of the proposed route falling in Maharashtra and 53% in Madhya Pradesh. The route map for the proposed rail line project was not available at the time of IESE.

All terminals put together handle 15 to 17 trains per day. The dedicated freight corridor which is scheduled to start operations in a year and half, frequency is expected to increase. Rail coefficient is expected to increase to more than 30 % with the dedicated freight corridor. Proposed frequency of trains is to start with 20 trains which shall increase gradually to 25.

2.2.8.3 Shipping Route

JNPA has connectivity to all major ports of the world either through direct calls or through transshipment. Major region covered are:

- Middle East / Gulf
- Far East
- Red Sea
- US East Coast
- Europe
- Mediterranean region
- East Africa
- West Africa
- Sub-Continent Region.

Services / Shipping Routes that will be served by NSFTPL will only be known post commercial operations. Routes to and from India are already established & are not expected to undergo any change.

The size of vessels which are currently deployed is expected to change as Indian exports grow to cater to the worldwide demand. It is expected that currently deployed vessels of 6500 to 8000 TEU will be phased out and 9000 to 11500 TEU vessels would be deployed in Indian trade lane going to European Union and east coast of US. Similarly, vessels going into Africa would also undergo upsizing in the coming period.

2.2.9 JNPCT Operating Profile

A comparison of the operating profile of JNPCT for FY 2020-21 and 2021-22 has been presented below

Table 2-8: JNPCT Operating Profile

Sr. No.	Details	FY 2020-21	FY 2021-22
1.	Container Traffic (in TEUs)	5,44,027	4,40,210
2.	Vessels Handled (in numbers)	270	220
3.	Average berths stay of vessels (Average on berth in days)	1.14	1.25
4.	Average pre- berth waiting time of vessel (Average pre berth waiting time in days)	0.03	0.02
5.	Average Turn round time of vessels from Pilot Boarding to Pilot De-Boarding (Average in days)	1.25	1.37
6.	Berth occupancy (%)	41.73	45.37

Source: https://www.jnport.gov.in/operating_performance_profile

As per the above table, the container traffic and number of vessels handles at JNPCT decreased in FY 2021-22 as compared to FY 2020-21. There was an increase in average turnaround time of vessel during FY 2021-22. Furthermore, there was an increase in average berth stay of vessel at the terminal in FY 2021-22. However, there was slight increase in berth occupancy during FY 2021-22 (45.37%) as compared to FY 2020-21 (41.73 %).

Note: The existing capacity of the terminal is 1.5 million TEUs, however, the terminal is currently operating under capacity and handled only 0.4 million TEUs in FY 2021-22. According to the Project Harbour Traffic Assessment draft report developed by an independent traffic consultant appointed on behalf of ADB dated, October 2022, JNPCT operated at its full capacity of 1.5 million TEUs in FY 2017 and FY 2018, post which the terminal faced a gradual decline in its operating capacity where it operated at a capacity of 1.06 million TEUs in FY 2019 and 0.72 million TEUs in FY 2020 due to damage of cranes leading to operational

inefficiency. Additionally, due to onset of COVID-19 in 2020, the container traffic volume was impacted across the port that resulted further decline in the operating capacity of the terminal. The terminal handled 0.5 million TEUs in FY 2021 and 0.4 million TEUs in FY 2022.

2.2.9.1 Container Traffic Management

JNPA has a dedicated Vessel Traffic Management System for regular coordination of vessel movement through collection, verification, organization and dissemination of information through this system in association with master control station at Mumbai Port Trust[9]

JNPA maintains records of traffic handled at the container terminals on monthly basis. The container traffic handled at JNPCT for FY 2021-22 has been represented in ***Table 2-9.***

Table 2-9: Container Traffic at JNPCT for FY 2021-22

Month	Number of Vessel	Discharge TEUs	Load TEUs	Total TEUs
April 2021	28	24,697	18,989	43,686
May 2021	18	21,243	18,919	40,162
June 2021	20	22,917	19,321	42,238
July 2021	23	20,875	16,533	37,408
August 2021	20	23,218	19,547	42,765
September 2021	13	17,340	12,014	29,354
October 2021	15	21,595	17,994	39,589
November 2021	16	20,294	15,660	35,954
December 2021	19	18,872	15,378	34,250
January 2022	20	22,514	21,364	43,878
February 2022	12	14,415	11,680	26,095
March 2022	16	13,715	11,115	24,830
Total	**220**	**2,41,695**	**1,98,514**	**4,40,209**

Source: JNPA Monthly Performance Report

2.2.10 Buildings

Buildings present within JNPCT include the following:

- Shift in-charge's building (G+1)
- Port canteen building
- Port canteen new building
- Spreader Maintenance Shed
- North Gate Complex
- Sub store shed
- Ambulance Room
- Public Toilets (2 units)

[9] https://www.jnport.gov.in/marine_services

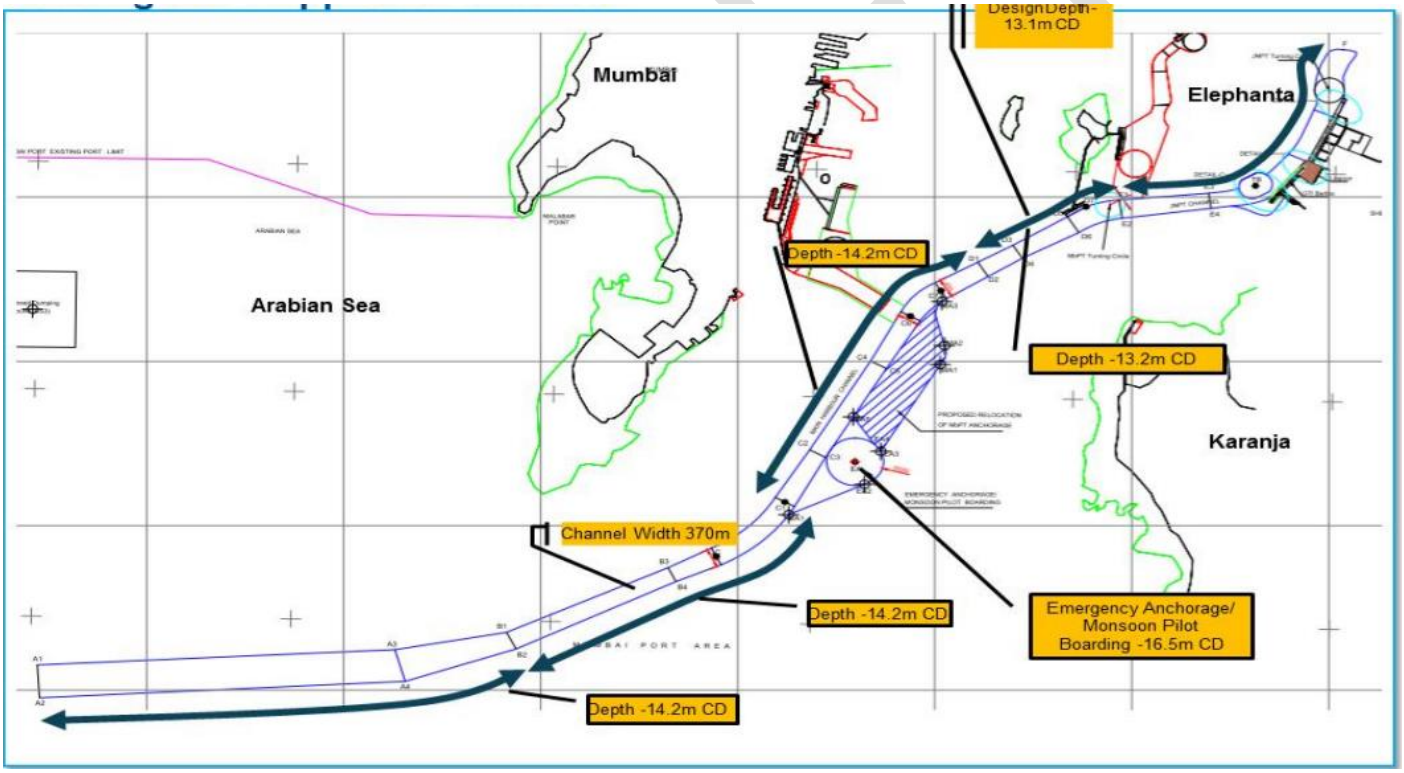
2.2.11 Channel Dimensions

JN Port approach channel is a Common Harbour channel for JNPA and Mumbai Port. The characteristic of the approach channel is as below:

a) Channel Length of 33.54 km
b) Designed Channel depth (below CD)
    i. 13.1 m in JNP channel
    ii. 14.2 m in outer harbour channel.
c) Channel Width
    i. 370 m at straight reach
    ii. 460 m at the berths.
d) Turning Circle/ Anchorage of 600 m diameter

The existing JN Port channel has been dredged to handle 15 m draft container ship taking tidal advantage of 2.2m. The existing JNPA approach channel has been presented in ***Figure 2-8.***

Figure 2-8: JNPA Existing Approach Channel



Source: Master Plan for JNPT developed by AECOM dated August 2016[10]

2.2.12 Dredging Activities & Disposal

JNPA has obtained Environmental and Coastal Zone Regulation Clearance from MoEFCC on deepening and widening of the existing Mumbai Harbour Channel and Jawaharlal Nehru Port Channel dated 31st March 2017. Details of dredging permitted to JNPA as per EC obtained are as below:

- Length: 35490 m

[10] http://sagarmala.gov.in/sites/default/files/4.Final_Master_Plan_JNPT.pdf (Accessed on October 21, 2022)

- Width: 450 m to 800 m
- Depth: 14.7 to 15.9 below CD
- Total soil to be dredged: 33.3 million cum
- Total rock to be dredged: 1.73 million cum

As per discussion with JNPA official it was noted that 20 million cubic meter of maintenance dredging is undertaken by JNPA annually and material is not tested prior to disposal. The dredged material is disposed off at the pre-designated site DS-3 (18° 55.000'N, 72° 42.000'E, offshore at an aerial distance of ~ 28 km from JNPCT) as per Central Water and Power Research Station (CWPRS) recommendations. Reporting Water Injection Dredger / Bed Levelers along with Trailer Suction Hopper Dredger are used.

As reported by NSFTPL, no additional dredging is required for the terminal upgrade. After takeover by NSFTPL, dredging activities will continue to be the responsibility of JNPA.

2.2.13 Facilities for Crew

The crew from vessels are not allowed to disembark from the vessel; however, support is provided on request. Hence no additional facilities are considered.

2.2.14 Resource Conservation Initiatives

JNPA has also undertaken various initiatives towards the goal of being deemed as a Green Port. Some of the initiatives includes:

- Switched from diesel to electrically powered e-RTGCs which also help in cost saving
- Inter-Terminal Transfer (ITT) of tractor-trailers
- Use of nine number of e vehicles inside the port area.
- Total 822.6 KW of rooftop solar panels are installed at various public buildings of JNPA with a generation capacity of approximately 10,00,000 units per year

2.2.15 Storm Water Drainage

JNPT has developed storm water drainage for collection and discharge of storm water. Storm water is directly discharged into sea without treatment. The existing stormwater drainage layout of JNPCT has been presented in ***Figure 2-9.***

Figure 2-9: Existing Stormwater Drainage at JNPCT

Source: JM Baxi

2.3 Proposed Project Overview

JNPCT is currently being operated by JNPA, however, the terminal experienced a decline in the container traffic over the last few years and also experienced a decrease in overall share in JNPA traffic. The reason for decline in container traffic at JNPCT was attributed to the following facts:

- JNPCT is a government operated terminal with less competitive advantage when compared to other privately operated terminals within JNPA
- Private terminals at JNPA have modern infrastructure with higher operational efficiency
- JNPCT has negligible international presence when compared to other privately operated terminals.

Therefore, due to the above reasons, JNPA had decided to develop JNPCT terminal through Public Private Partnership (PPP) on upgradation, operation, maintenance and transfer (UOMT) basis.

In August 2021, JNPA released Request for Proposal (RfP) inviting applications from interested parties for the proposed project. Post evaluating the proposals from interested parties, a letter of Intent for award of concession was issued to a consortium consisting of M/s. JM Baxi Ports and Logistics Limited and M/s. CMA Terminals on 28 June 2022.

2.3.1 Nhava Sheva Freeport Terminal Private Limited (NSFTPL)

Nhava Sheva Freeport Terminal Private Limited (NSFTPL) is a special purpose vehicle (SPV) established as a consortium between JM Baxi Ports and Logistics Limited and CMA Terminals (100% subsidiary of CMA CGM Group). The SPV was formed for the operation of JNPCT Terminal. Concessionaire Agreement (CA) was executed between JNPA and NSFTPL on 29 July 2022 for upgradation, operation, maintenance and transfer of JNPCT on Public-Private Partnership (PPP) basis for 30 years.

As previously mentioned, currently the terminal is being operated by JNPA and handover is planned by January 2023 post which NSFTPL will undertake expansion as well operation in parallel for initial 15 to 18 months. As reported JNPA will hand hold NSFTPL for around 15 days before handing over all the operations to NSFTPL. Post-handover of the operations, JNPA will monitor operational performance of terminal. JNPA will also grant (permits those are within its authority)/ assist in obtaining all the applicable permits / approvals required by NSFTPL and make available all the records/ documents related to JNPCT on request.

2.3.2 Proposed Expansion/ Upgradation Plan

The following are the development activities that the Port has planned to implement at JNPCT through the concessionaire i.e., NSFTPL:

- Berth upgradation activity to increase capacity to 1.8 million TEUs11
- Width of the berth will increase from 45.5 m to 60.5 m towards land side
- Relocation of Quay Substation and Fire Pump House
- Overall refurbishment of fenders and bollards, existing buildings, yards, if required IT infrastructure upgradation and installation of terminal operating system.

The expansion has been proposed to be undertaken in 2 phases as per concession agreement as detailed in ***Table 2-10.***

Table 2-10: Proposed Expansion/ Upgradation

S.No.	Phase I	Phase II
1.	Detailed engineering for berth upgradation activity	Equipment Procurement: New Rail Mounted Quay Crane (RMQC)-3
2.	Upgradation and strengthening of 340 m berth to accommodate design vessel of size 12200 TEU	Upgradation and strengthening of remaining 340 m berth to accommodate design vessel of size 12200 TEU

[11] The project will upgrade the JNPCT capacity to 1.8 million TEUs which will upgrade the total port capacity to 8.0 million TEUs.

S.No.	Phase I	Phase II
3.	Upgradation of fenders and bollards	Upgradation of fenders and bollards
4.	Increase of crane rail span (Rail Mounted Quay Crane) from 20 m to 30.5 m (width) for the 340 m berth	Increase of remaining crane rail span (Rail Mounted Quay Crane) from 20 m to 30.5 m (width)for the remaining 340m berth
5.	Equipment Procurement: New Rail Mounted Quay Crane (RMQC)-2	

Source: Concession Agreement

2.3.2.1 Proposed Expansion Activities

Activities as part of the upgradation has been listed in ***Table 2-11***. Implementation Schedule is presented as ***Section 2.3.9.***

Table 2-11: Proposed Upgradation Activities

Sr. No	Description	Phase I	Phase II
A	**Preliminary Works (Tender)**		
1	Structural Consultant	√	√
2	Consultant for Master planning	√	√
3	Topography Survey Agency.	√	
4	Soil Investigation	√	
B	**Marine Works**		
1	Extension, Refurbishment, Modification& Upgradation of Berth	√	√
C	**Yard Works**		
1	Yard and services repairs/modification, IT& Watch tower foundation, Weighbridge and Crash Barrier works	√	√
2	Jersey Barrier	√	√
D	**Chain link fencing works**		
1	Chain Link Fencing Works	√	
E	**Buildings (New Structures and Modification work)**		
1	Toilet Block, Workshop, Labour Shed[12]	√	
2	Relocation of E7 Substation, Seawater Room	√	
3	Refurbishment of existing Structures	√	
4	Workshop PEB	√	
5	Interior of Toilet block	√	
6	Porta Cabins	√	
F	**Misc. Works**		
1	Reefer Platform, Gate Fabrication Works	√	
2	IT Tower Structural Work	√	
3	Watch Tower Structural Work	√	
G	**MEP Work**		
1	Electrical Distribution System	√	

[12] Labour shed is defined as a resting place or eating inside the terminal used by labour engaged in construction and operation phase. For this project, the labour shed is different from workers' accommodation which will be rented by the project outside the port.

Sr. No	Description	Phase I	Phase II
2	High mast (Repairing & New Luminaries)	√	
3	STP Works	√	
4	Weighbridge	√	
H	**Signages And Painting**	√	√
I	**Landscaping**		√
J	**IT works**	√	
K	**Equipment**	√	√

It is to be noted that

- All the buildings would be refurbished based on the assessment of the master planning consultant.
- No facilities would be demolished or reconstructed.
- No facilities are envisaged to be shared with the Port.
- The timeline for construction phase for the project is 15-18 months from start date

Further details of existing and new structures are as presented in Table below.

Table 2-12: New and Existing Structures Proposed as part of the Project

Sr. No.	Items	Remarks
1	ADMIN OFFICE (Incl. Civil and Interior) - New Construction	Near shift In-charge office
2	Existing Shift In charge office refurbishment	Existing structure
3	TOILET – 4 no.s (Incl. Civil and Interior) - New Construction	In the yard area
4	Existing Toilet Block Refurbishment	Existing structure
5	Existing GATE COMPLEX (Only repairs and painting)	Existing structure
6	Existing Canteen Building refurbishment	Existing structure
7	RE LOCATION OF SUBSTATION E7	New Superstructure Work
8	UG TANK	New construction
9	PUMP ROOM	New construction
10	Relocation of SEA WATER PUMP ROOM	New Superstructure Work
11	WORKSHOP (New Construction)	New construction
12	LABOUR SHED- 2 Nos (New Construction)	
13	PORTA CABINS	

Sr. No.	Items	Remarks
14	Watch Tower - (New Construction)	New construction
15	Spreader Maintenance Shed (Any other requirement to be specified)	Existing structure
16	Sub store Shed	Existing structure
17	Ambulance room	Existing structure

Source: J M Baxi

2.3.3 Proposed Equipment Details

As part of the concession agreement, NSFTPL is required to deploy the following equipment.

Table 2-13: Proposed Equipment Details

S. No	Description	Cumulative Quantity	
		Phase I	Phase II
1.	Rail Mounted Quay Crane (RMQC)	6 no. s	9 no.s
2.	Rubber Tyred Gantry Crane (RTGC)	18 no. s	27 no.s
3.	Rail Mounted Gantry Crane	3 no. s	3 nos.

Source: Concession Agreement

2.3.4 Proposed Vessel Characteristics

Details of the proposed vessel characteristics has been provided in ***Table 2-14***.

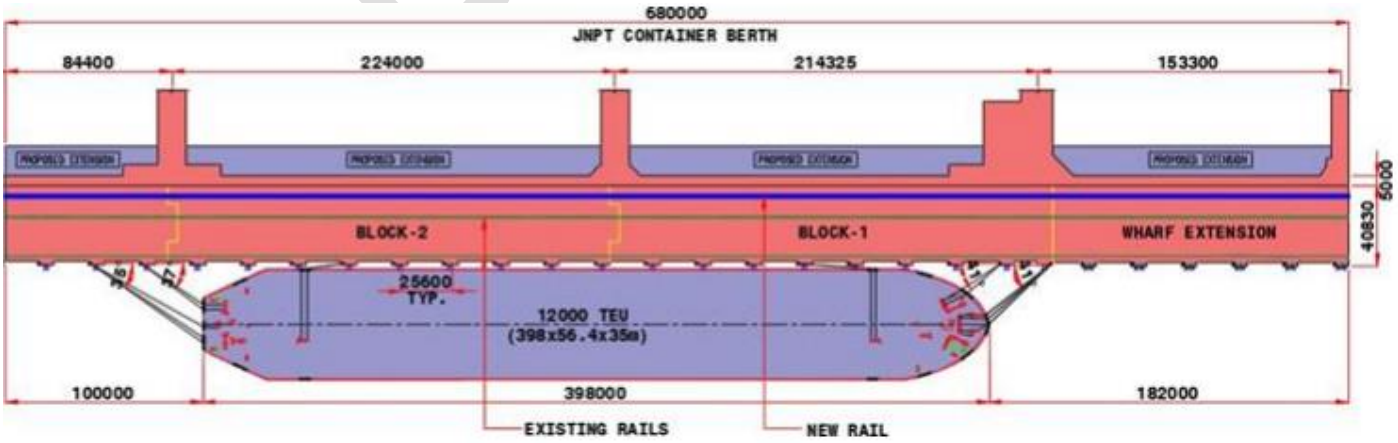
Table 2-14: Proposed Vessel Characteristics

Capacity	Displacement Tonnage	Length Overall (m)	Beam (m)	Loaded Draft (m)
12200 TEU	215,000	398	56.4	15

Source: Feasibility Report prepared by KPMG dated 26 January 2020

The mooring layout to accommodate 12200 TEU vessel has been presented in ***Figure 2-10.***

Figure 2-10: Mooring layout to accommodate 12200 TEU vessel



Source: Feasibility Report dated January 2020

Other activities to be undertaken includes:

- Fine tune of traffic management plan within and to the terminal in consultation with JNPA
- Computer communication: automate the operations of the Container Terminal and provide for information to be available online
- Firefighting requirement: provide for adequate fire-fighting equipment, fire hydrants etc. at the berths and in the back up area
- Security arrangement: The security of the port is vested with Central Industrial Security Force (CISF). NSFTPL shall abide by the security regulations/procedures as stipulated by JNPA. However, shall make its own arrangements for security in the container terminal, CFS etc.

2.3.5 Proposed Container Handling

As mentioned in ***Section 2.2.6,*** JNPA has been notified by Ministry of Ports, Shipping and Waterways for handling containers as per IMDG class 2 to 9 at JNPCT. Furthermore, JNPA has been also notified by Minister of Defence for handling their own explosives (IMDG class 1.1 and 1.2) at JNPCT under the supervision of Naval Armament Depot (NAD) Karanja and JNPA has been also notified by PESO for handling IMDG class 1.4S explosives at JNPCT. As understood, since JNPA has been notified by competent authorities (as mentioned above) for handling of containers as per IMDG class at JNPCT, NSFTPL will be obligated to handle the containers at the terminal as per the aforementioned IMDG classes.

It is expected that due to the proposed project the average monthly container dwell time will be reduced for both import and export cycle. However, the estimated percentage of reduction in container dwell time is yet to be calculated by NSFTPL. Furthermore, according JNPA's sustainability report for FY 2020-21, the overall container dwell time at the port for FY 2020-21 was 44.80 hours and JNPA is committed to reduce the overall container dwell time hours at JN port to less than 40 hours by 2030.

Containers at JNPCT will be loaded and unloaded through RMQC and electric based RTGC and the stacking at the container will be done through electric based RTGCs and forklifts. Adequate training will be provided to the workers as per container loading and unloading protocol including handling of containers carrying dangerous goods. The protocol for handling containers will be developed by NSFTPL along with training requirements for workers in line with the JNPA's SOP on handling of explosives and dangerous goods at JNPCT berth. As mentioned, in ***Section 2.2.6,*** due to confidentiality, no information on kind of material stored within the container will remain with NSFTPL. The containers will be recognized and transported based on the container number and label printed including IMDG label on each container.

2.3.6 Proposed Internal Cargo Conveyance

The estimated container traffic, road traffic and rail traffic due to the proposed project have been presented in subsequent sections.

2.3.6.1 Estimated Container Traffic

With the expansion of the project (with additional capacity) it is estimated that the project will increase the overall EXIM traffic from existing 0.4 million TEUs in FY 2022 to 1.4 million TEUs in FY 2027 and further 1.8 million TEUs by 2029[13].

There will be an increase in vessel size from 6000/9000 TEUs to 12200 TEU. Additionally, there will be enhancement of efficiency of the terminal due to the proposed project, thus, waiting time of the vessels to arrive at the terminal will decrease in the initial years of the proposed project. As mentioned in ***Table 2-8,*** JNPCT handled 220 vessels in FY 2021-22 and 270 vessels in FY 2020-21. As per data shared by JM Baxi, NSFTPL will handle 520 vessels per year for 1.8 million TEU capacity. It is anticipated that JNPCT will first attain its actual capacity of 1.5 million TEUs by FY 2027-28 and then it will operate under 100% proposed capacity of 1.8 million TEUs by 2029. Therefore, though, there will be no immediate increase in vessel traffic due to the proposed project, however, the traffic may increase by 2029 which will be further restricted by the vessel channel.

13 Draft Report on Conatiner Traffic at NSFTPL dated 31st October 2022

2.3.6.2 Estimated Road Traffic

The existing container transportation by road is ~ 84 % which is expected to decrease to 70% by FY 2027-28 due to increase in transportation through rail network. As reported by JM Baxi , JNPCT can handle 2440 trucks per day for 1.5 million TEU capacity. According to the technical assessment report developed by Mott Macdonald dated 02.11.2022, JNPCT is expected to handle 2961 trucks per day after upgradation (i.e., 1.8 million TEUs) for container transportation. As reported by JM Baxi and JNPA, total traffic volume of JN Port is currently around 16413 trucks per day (±5% variation), the proposed increase due to the upgradation will only add 3% to the current traffic which is well within observed daily variation of ±5% .

2.3.6.3 Estimated Rail Traffic

JNPCT has a dedicated rail siding for transportation of containers to and from of the terminal. As understood, currently all terminals put together handle 15 to 17 trains per day. It is expected that with operation of DFC, the frequency of trains including for the proposed project will increase to start with 20 trains per day which will gradually increase to 25 trains per day. Furthermore, the rail traffic increase is expected to be between 5 % to 6 % year on year from October 2024 post completion of DFC construction.

According to the technical assessment report developed by Mott Macdonald dated 02.11.2022, for the proposed project after upgradation, there will be 4 rakes availability per day with a capacity of 90 TEUs. Currently also JNPCT is handling 4 rakes per day with a capacity of 90 TEUs.

The overall evacuation capacity for the proposed project (after upgradation) will be the summation of rail infrastructure and road infrastructure i.e. 2961 trucks per day and 4 rakes per day with a capacity of 90 TEUs. According to the technical assessment report developed by Mott Macdonald dated 02.11.2022, out of the total 1.8 million TEUs container capacity, 1.7 million TEUs/annum will be evacuated via road and 0.12 million TEUs/annum will be evacuated via rail.

2.3.7 Vessel Waiting Time at Proposed Project

With the expansion of the project (with additional capacity) and enhanced efficiency, it is expected that the vessels will have no waiting time unless there is a restriction of tide. It is likely that vessels will come alongside of arrival.

2.3.8 Proposed Dredging Activities

No additional dredging is required for the proposed project. The dredging activity at the channel as well as in the turning radius, and manoeuvring area falls under the purview of JNPA, and no dredging activity will be undertaken by NSFTPL.

2.3.9 Project Implementation Schedule by NSFTPL

Upgradation of 1st 340 m berth length will be undertaken in Phase 1 to allow non-hindered operations in the balance 340 m berth length and remaining will be completed after handing over of 1st 340 m of berth length. Target completion of the entire 680 m of berth execution will be around 15 to 18 m as detailed below.

The tentative project implementation schedule has been presented in *Table 2-15*.

Table 2-15: Project Implementation Schedule

Project Activities	2022					2023												2024		
	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Preliminary Investigation																				
Consultant Appointment																				
Marine Works																				
Pre Design, tendering, award of EPC contract, approval																				
Berth Extension and Modification						Phase 1								Phase 2						
Yard Repair and Services																				
Building Works																				
Chain Link Fencing																				
Misc. Fabrication																				
MEP Works																				
IT Works																				

Source: JM Baxi

2.4 Land Details

2.4.1 Total Land of JNPA and Land Use

As per the discussion with the JNPA, it was informed that land acquisition for JNPA was initiated in the year 1984-85. The land was acquired under the appropriate provisions of the Land Acquisition Act 1894. The land acquisition was done by CIDCO (City and Industrial Development Corporation of Maharashtra) and then handed over to JNPA for the construction and operations of port. Per the JNPA's comprehensive land use plan report, the total land available with JNPA is around 3,402 hectares.

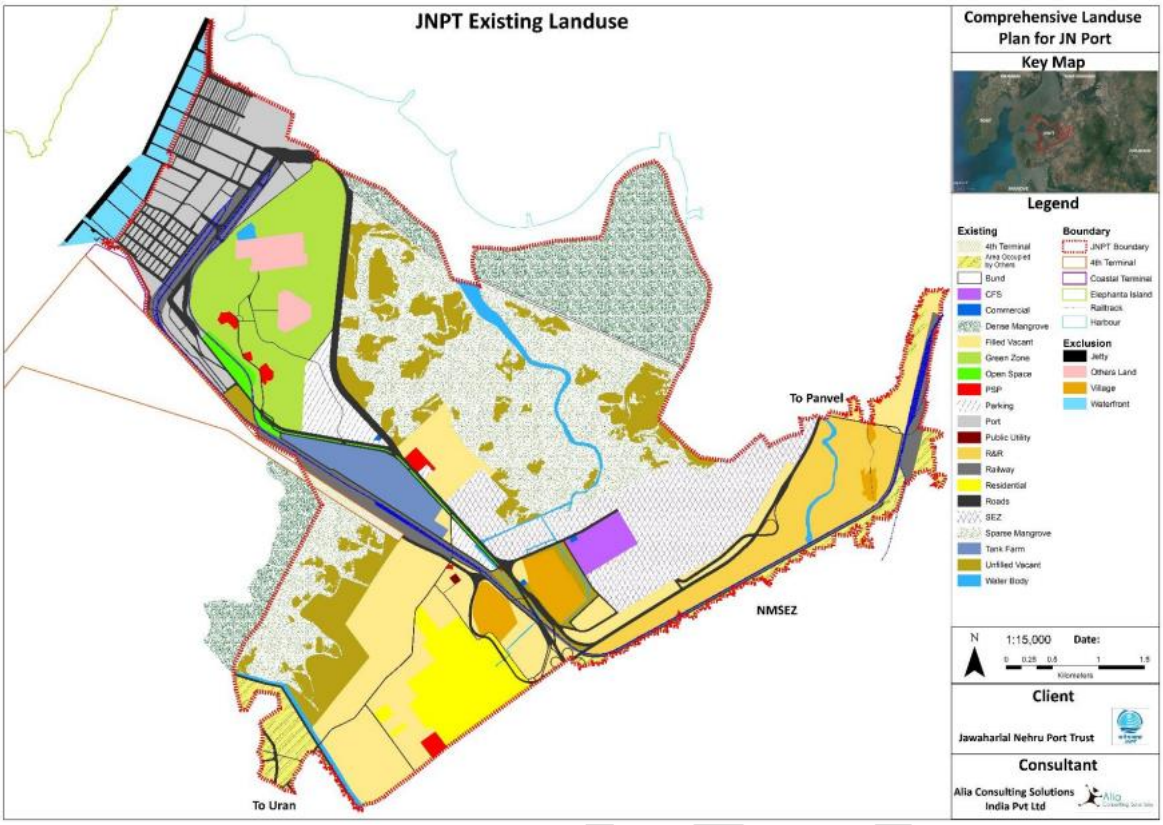
Details of land usage of available 3,402 hectares of land are provided below:

Table 2-16: Details of Land use

Land Use	Area in hectare	Percentage of total 3,402 hectare
4th Terminal	62.32	1.83%
Area occupied by others	157.17	4.62%
Area under berthing	82.77	2.43%
Bund	7.09	0.21%
Commercial	1.06	0.03%
Container Freight Station (CFS)	27.33	0.80%
Dense Mangrove	295.7	8.69%
Filled Vacant	386.5	11.36%
Green Zone	233.3	6.86%
Open Space	17.29	0.51%
Parking	53.68	1.58%
Port	176.9	5.20%
Public and Semi-public usage (PSP)	14.11	0.41%
Public Utility	0.78	0.02%
Railway	123.7	3.64%
Resettlement and Rehabilitation (R&R)	159.8	4.70%
Residential	111	3.26%
Roads	214.2	6.29%
Sparse Mangrove	617.9	18.16%
Special Economy Zone (SEZ)	270.5	7.95%
Tank Farm	60.48	1.78%
Unfilled Vacant	285.2	8.38%
Water Body	44.17	1.30%
Total	**3402.95**	**100.00%**

Source: JNPA's Comprehensive Land Use Plan – Final Report

Figure 2-11: JNPA Existing Land use



Source: JNPA's Comprehensive Land Use Plan – Final Report

2.4.2 Review of JNPA's Land Acquisition Process and Compensation Status

Review of google satellite imagery indicates that there are no human settlements within 5 Kms of the proposed project site. The nearest village Sheva is located approximately 8km and Uran is located 14 kms from the project site. The existing port has been operational for more than 33 years. As the proposed project is located within the port area, the project itself is not expected to have a resettlement or economic displacement impact or negative social impact on the nearest communities.

The current port area is 3,402 Ha. As per the discussion with the JNPA, land acquisition for JNPA was initiated in year 1984-85. The land was acquired under appropriate provisions of Land Acquisition Act 1894. The land acquisition was primarily done by CIDCO (City and Industrial Development Corporation of Maharashtra) and then handed over to JNPA for the construction and operations of port. Reportedly The land was acquired from 12 surrounding villages (Sheva, Karal, Sonari, Sawarkhar, Jaskhar, Pagote, Navghar, Jasai, Belpada, Funde, Dhutum, Chirle). Village Sheva including its hamlet Koliwada was displaced due to land acquisition and was shifted to two different locations near Uran, District : Raigad, one at Bokadvira (near Navin Sheva) and the other at Bori Pakhadi (Hanuman Koliwada).

World Bank (formerly known as IBRD) financed the JNPA (formerly known as Nhava Sheva Port Trust) in 1984. The total finance amount was $250 million dollar. The land for the port was acquired in three (3) phases – Phase I (820 hectare), Phase II (420 hectare), and Phase III (412 hectare). The quantity of land acquired provided in the proposal was primarily of privately owned land (1,652 hectare) and rest of the land is government land. Per the proposal, the JNPA has paid ~INR 40,000 per acre of privately owned land in 1984. The price was finalized in negotiation with private owner (previously, the anticipated amount of land acquisition for privately owned land was lower than INR 40,000). Thus, to pay INR 40,000/acre JNPA has formally taken permission from Public Investment Board (presently known as Department of Investment and Public Asset Management, Ministry of Finance, GoI). After the receipt of permission, the Cabinet (Government of India) had directed Government of Maharashtra to acquire the land and then transfer it to the JNPA.

The due compensation for the acquired land and R&R cost was paid by JNPA to the concerned land acquiring body (CIDCO) and accordingly the land which was acquired was transferred in the name of JNPA.

Reportedly total 3,584 families were issued Project Affected Person (PAP) Certificates by Dy. Collector (Land Acquisition) who were entitled to receive R&R benefits. The R&R benefits broadly include employment of one of the family members in JNPA. As part of R&R benefits nearly 907 PAPs were provided direct employment and 840 people got employed indirectly. 150 PAPs were given free of cost space in Vending zone (Hawker zone). The remaining 1,687 PAPs were yet to be provided employment under R&R scheme. As per the consultations with JNPA and community it was understood that some PAPs (from the Sheva and Hanuman Koliwada community) have claims that the rehabilitation of displaced families was not done as per the agreement with the affected people. PAPs were claiming that land acquiring body had resettled them on the smaller land parcels (villages Sheva & Hanuman Koliwada) and as per R&R scheme they were to be provided with bigger land parcels. These claims are on-going and are being addressed by the concerned District collector Raigarh. Besides that, there are some disputes regarding the rates of property tax levied by the respective Gram Panchayat. As informed, JNPA is due to reach the final settlement regarding property tax rates. JNPA did not provide further details of villages, plots, or claims so further detailed assessment on any aspect pending from past acquisition was not possible.

Out of the 3,402 Ha of land which is under possession of JNPA 54.74 Ha of land is under existing terminal (about 1.6% of total area). The concession authority (JNPA) will indemnify the concessionaire against any land related claims/ dispute. Any land related legacy does not affect the proposed project because the entire land ownership is vested with JNPA and only 54.74 Ha of land is given for 30 years of concession period.

Further, the overlay of map from WB's loan proposal on the existing land use map of JNPA. It is indicatively showing that the most impacted village is outside the Project Boundary as well as the Project's associated facilities (road and railway). For more detail, please refer to the map given below:

Figure 2-12: Image from WB's Loan Proposal

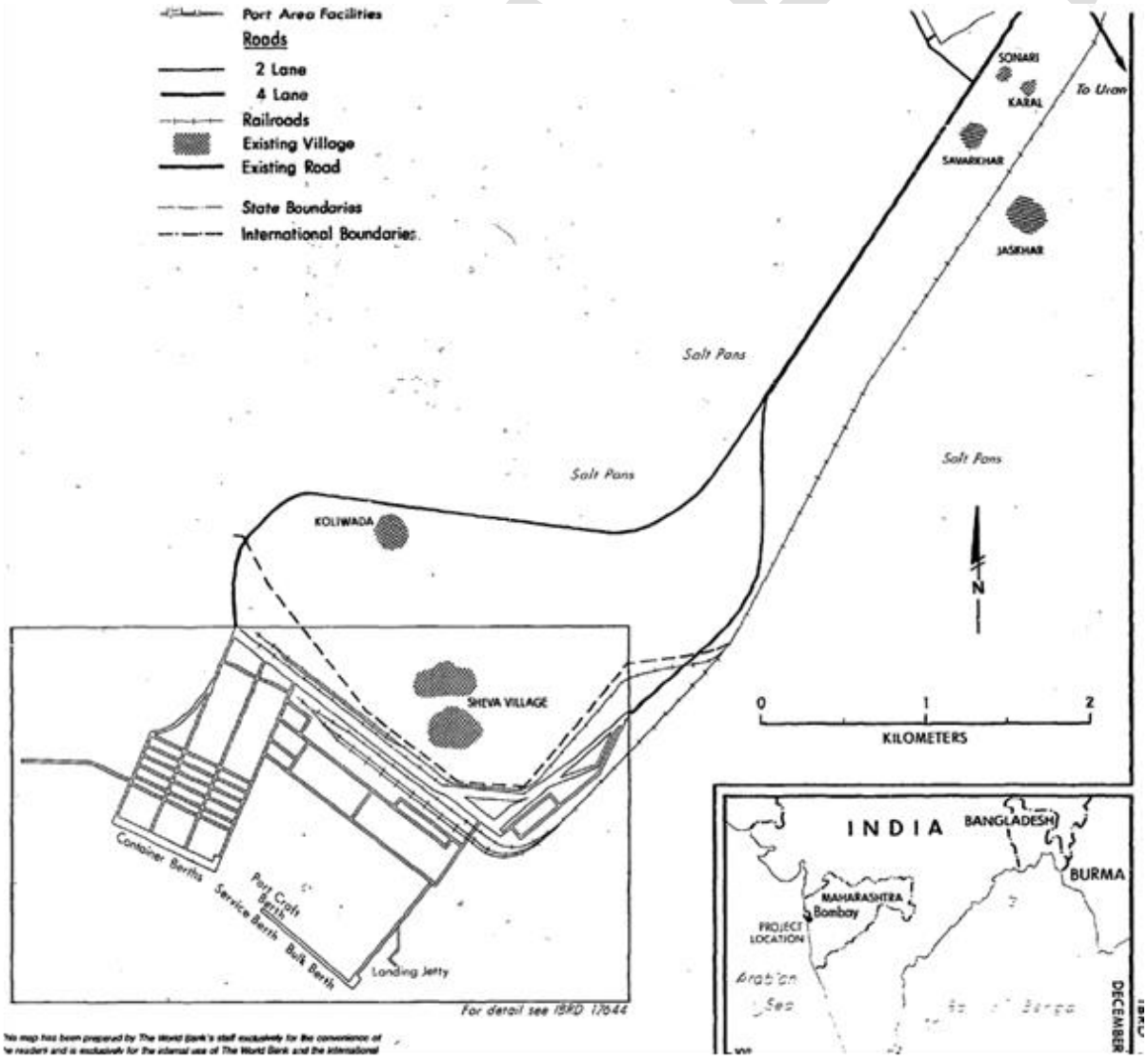
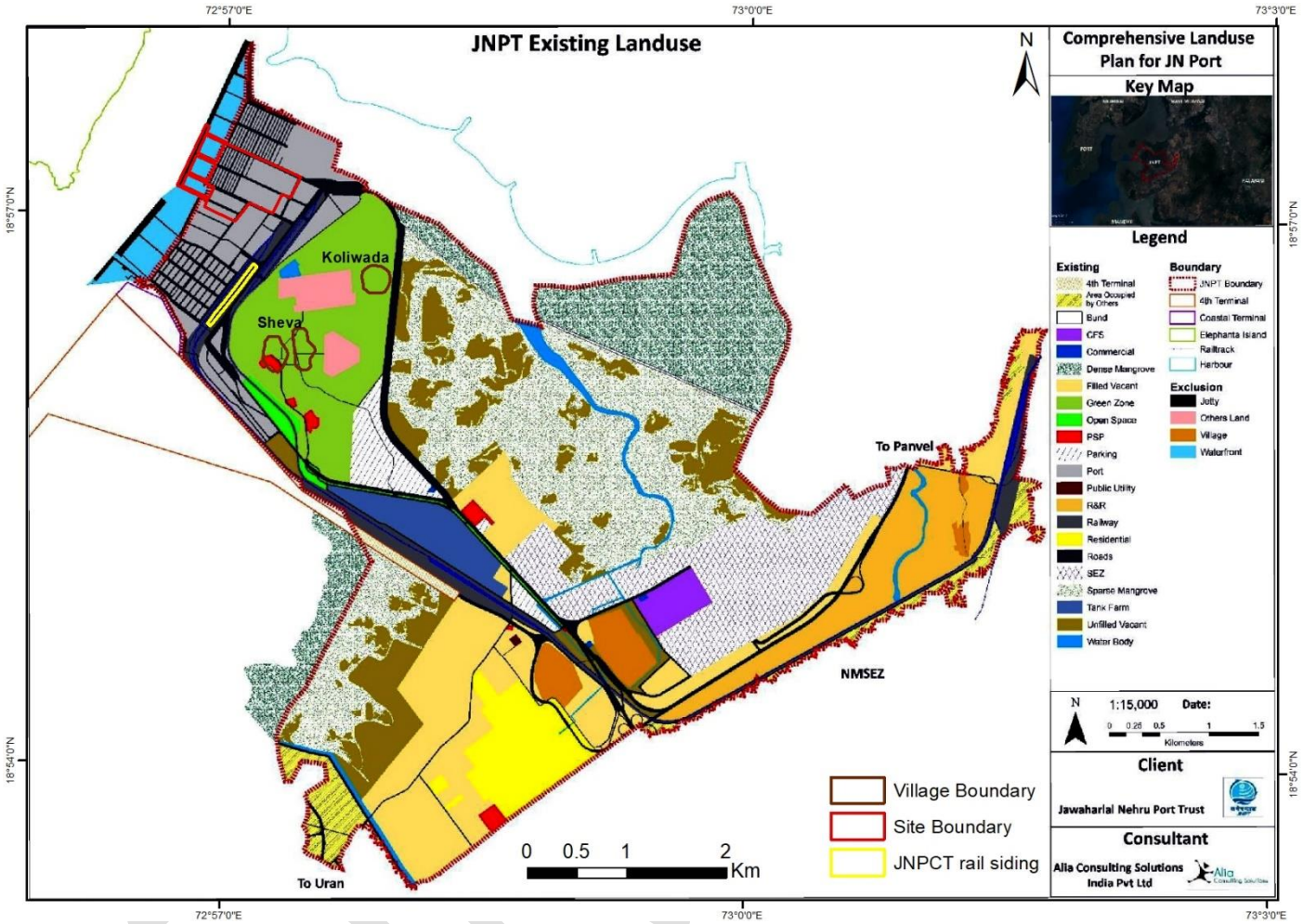


Figure 2-13: Overlay of Sheva village boundary into the existing JNPT Land use map shows that one of the displaced village Sheva by the land acquisition carried out for JNPA in 1984. Coordinates for another project affected village is not available. As shown in map the Sheva village is far from the existing JNPT and the project area.

Figure 2-13: Overlay of Sheva village boundary on existing JNPT land use map



Source: World Bank's Loan Proposal document vide report number 4826 – IN dated February 17, 1984, Google Imagery and JNPA's Comprehensive Land Use Plan – Final Report

2.4.3 Land availability for the Project

As per the discussions with JM Baxi project team and as per concession agreement, JNPA will lease out 54.742 hectare of land to the Project. The leasing period of 54.742 hectares of land to the project is for 30 years (equivalent to concession period). Further, it is to be noted that no additional land will be acquired by the Project for construction (upgradation) and operation of the terminal. Details of land use of 54.742 hectares of land are provided ***Table 2-17***.

Table 2-17: Details of land use of Project's available land

Description of areas	Area in Hectare	Percentage of total 54.742 hectare
Gravel Yard CV-10 to 17 and 30 to 37	10.12	18.49
Yard Behind the SWB CY -40-50	9.7	17.72
Private Yard CY -90-98	7.78	14.21

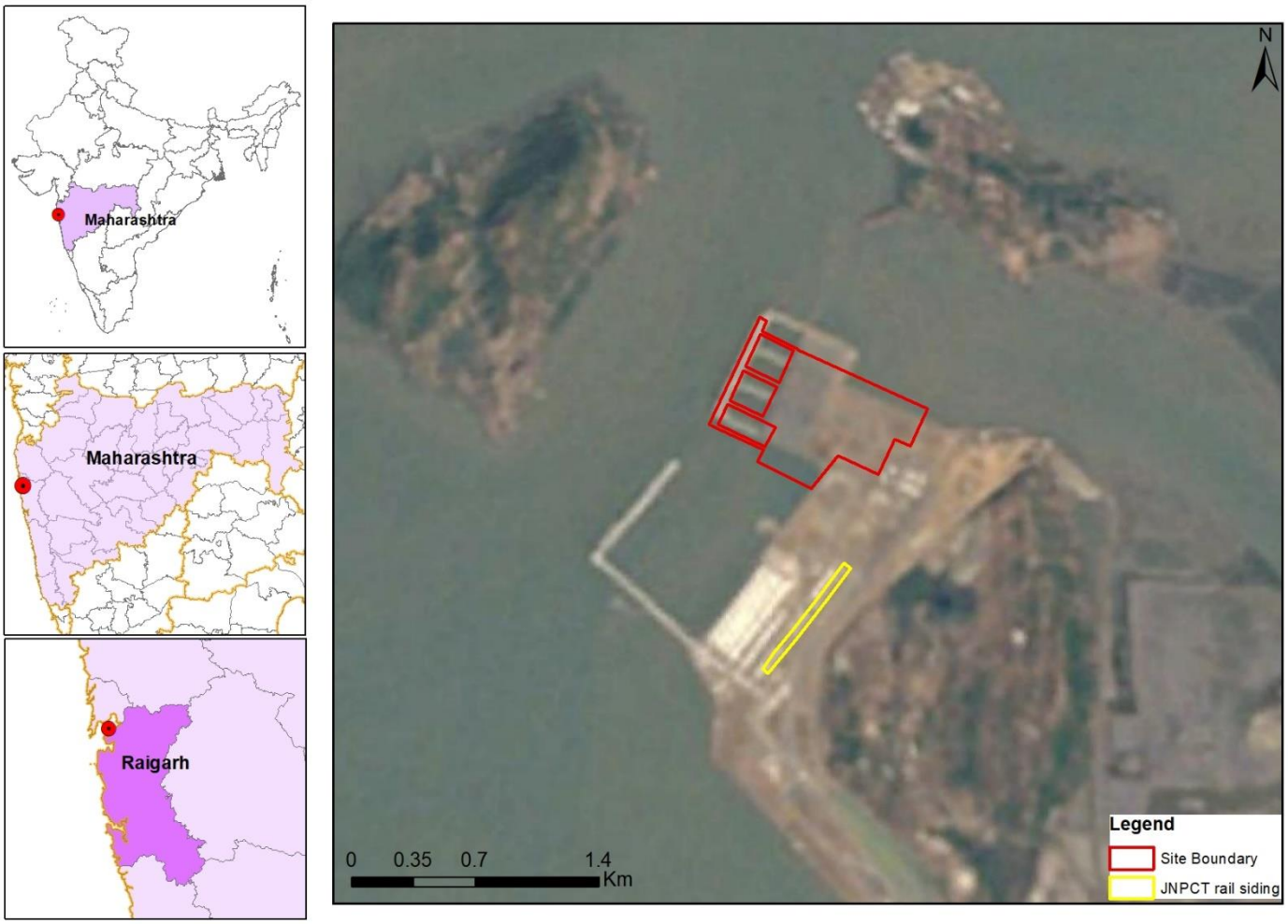
Description of areas	Area in Hectare	Percentage of total 54.742 hectare
Import Yard CY -80-88	7.3	13.34
ICD Yard including railway tracks	9.4	17.17
ICD Modification work	0.3	0.55
Common Service Road	6.2	11.33
Berth Approaches	1.12	2.05
Berth Area	2.822	5.16
Total	**54.742**	**100.00**

Source: Concession Agreement

2.4.4 Reclamation of Land for the Project

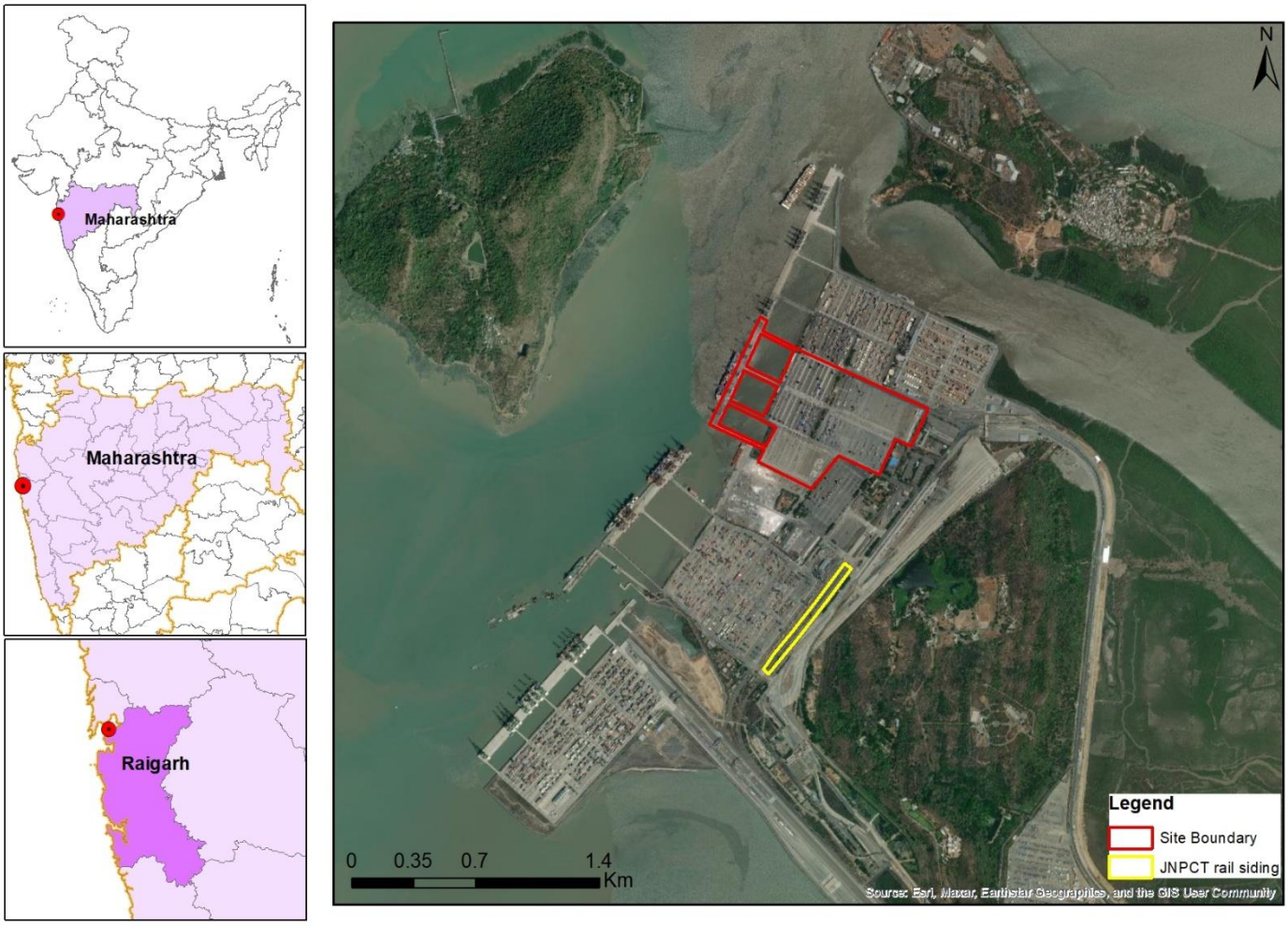
Based on the review of the 1985 Google imagery it can be inferred that marginal land has been reclaimed for the project, since 1985. Details on project land boundary and reclaimed land are provided below:

Figure 2-14: Map presenting reclaimed land for the Project – imposing project boundary in 1985 google imagery



Source: Google Imagery, JM Baxi and JNPA

Figure 2-15: Map showing Project's current land boundary



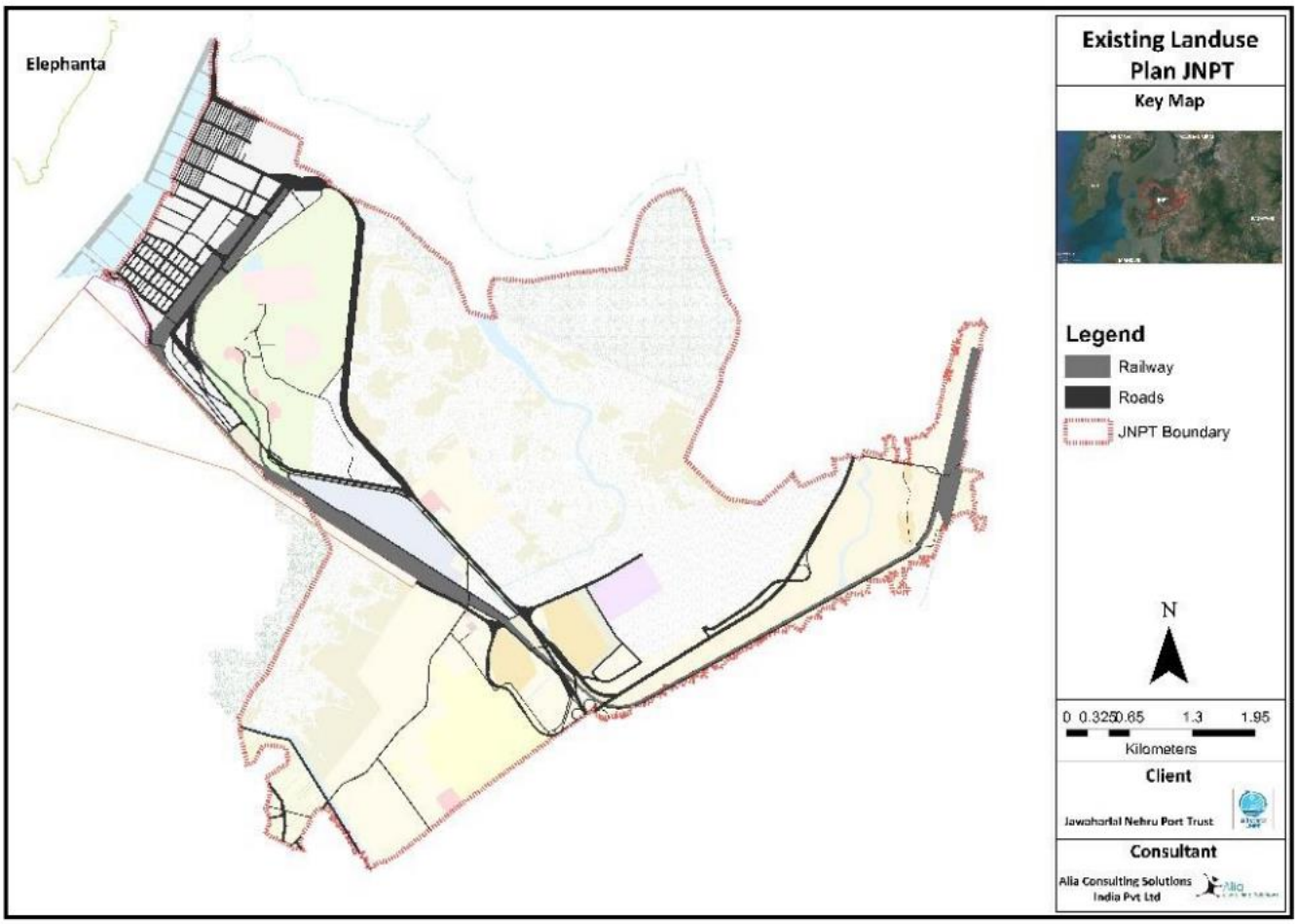
Source: Google Imagery, JM Baxi and JNPA

2.4.5 Land for Associated Facilities

The associated facility for the Project is considered to be the Roads and Railway network of the Jawaharlal Nehru Port. As per the JNPA's land use report, there are two (2) major roads that are serving the port and will be used by the Project. The total area of the road (as associated facility of the Project) is 208 hectares (214.2 total area under road – 6.2 area of road as part of the Project).

The Port has an aligned railway network which connects all the terminals and ICD yards, and finally the main railway network including the dedicated freight corridor. The total land under the railway network (as an associated facility of the project) is 114.3 hectare.

Figure 2-16: Map showing road and railway network of the Port



Source: JNPA's Comprehensive Land Use Plan – Final Report

2.4.6 Land Requirement for Workers' Accommodation

As informed by NSFTPL, the Project appointed contractor(s) will provide the workers' accommodation to contractual workers. The contractor will rent out the already constructed structure in the nearby places to be used as workers' accommodation and no additional land will be required for workers' accommodation. The proposed workers' accommodation will be outside the port boundary (for more details refer to section 2.5.2.4)

2.5 Workforce

2.5.1 Social Legacy – Labour Management

As per the discussion carried out with the HR Head of JNPA, reportedly 820 on-roll employees (most were in the age of 52-55 years) and 212 contractual workers were working at the JNPCT, out of which 460 on-roll employees have opted for SVRS (Scheme of Voluntary Retirement) on February 28, 2022 (details of retrenchment – end of contract and relocation process are provided below).And 37 on roll staff of JNPA already shifted to other operations of JNPA.

Presently, there are 323 on-roll employees, and 212 contractual workers are engaged in the JNPCT's operation.

Details of 323 on-roll employees with their designation is provided below:

Table 2-18: Details of on-roll employees

Designation	Number of employees
Officers (engaged administrative work)	34
Junior engineer	72
Technician	82
Assistant Technician	32
Checkers	84
Automobile Operators	12
Establishment staff	7
Total	**323**

Source: JNPA

Details of 212 contractual workers with their nature of work are provided below:

Nature of work	Number of workers
Rubber Tire Gantry (RTG) cranes maintenance and operation	5
Gate Automation	7
Track Tower (TT) cranes' operation	200
Total	**212**

Source: JNPA

2.5.1.1 Relocation process of employees (on-roll employees and contractual workers) – Retrenchment

Under this scheme, 460 employees of JNPA retired on February 28, 2022. Reportedly, the Scheme of Voluntary Retirement[14] (which was open for 6 months) entirely was voluntary in nature and there was no enforcement on employees to opt in for the scheme.

JNPA has divided all of its on-roll workers in four (4) categories- i) employee who have left with 3 years of working period before their retirement age (retirement age is 60 years); ii) employees who have completed their 30 years of job and have left working period of more than 3 years before their retirement age; iii) employees who have not completed their 30 years of job; and iv) contractual workers. Details of Retrenchment benefits (ex-gratia) provided to different category of employees:

Employees who have left with 3 years before retirement: this category of employees benefits from a 60 days' salary for a period of 3 years. Formula for calculation of retrenchment benefits is provided below:

- Retrenchment benefits = 60 days' salary * 3 (years)
- Employees completed their 30 years of job: this category of employee benefits from a 60 day salary per year for a maximum period of 5 years. Formula for calculation of retrenchment benefit is provided below:
- Retrenchment benefits = 60 days' salary * 5 (years)
- Employees who have not completed their 30 years of job: this category of employees benefits from a 45 day salary per year for a maximum period of 5 years. Formula for calculation of retrenchment benefits is provided below:
- Retrenchment benefits = 45 days' salary * 5 (years)

In addition to the retrenchment (ex-gratia) benefits, on-roll employees also received other benefits such as balance in the Provident Fund (PF) account, cash equivalent of accumulated earned leaves (exact details of number of days of earned leave is not known), gratuity, pension, commutation and all medical benefits at par with regular employees.

[14] The Special Vountary Retirement Scheme (SVRS) as per the compliance with the JNPA issues circular vide circular number JNP/A/P&IR/SVRS-JNPT/2021/12 dated August 01, 2021. Per the circular, provisions of SVRS is in accordance with the Standard Guidelines issues by the Ministry of Ports, Shipping and Waterways vide its letter No. LB-16016/4/2014-L dated November 13, 2020

After opting out of SRVS, 360 on-roll employees left at the JNPCT – who will be relocated to different operations of JNPA. Details of the number of employees and JNPA's operation opted for relocation are provided below:

Table 2-19: JNPCT's employees to be relocated to JNPA's operations

Number of Employees	JNPA's operation opted for relocation
180	Railway operation[15]
50	Marine operation
70	Mechanical & engineering and Port planning development
60	JNPA statistic department (out of 60, 30 are those employees who will be retiring in March 2023 and the remaining 30 will remain employed in the statistic department)
360	**Total employees**

Source: JNPA

Contractual workers: As mentioned above 212 contractual workers were engaged at the JNPCT, these contractual workers are engaged through contractors. As reported by JNPA, these contractors generally have one (1) year contract with the possibility of extending contracts. But due to the leasing of JNPCT to NSFTPL, the contract with these contractors has not been extended after December 2022, hence, as with other time-bound contracts ending these contractors along with their respective staff have to look for other opportunities.

Furthermore, as reported by JNPA, there is a possibility these contractual workers may be contracted by other private terminal operators as these contractual workers have specific skill set and experience of working at port-terminal.

2.5.1.2 Applicability of Definition of Retrenchment on JNPA

As per Section 2 of the Industrial Disputes Act, 147, retrenchment is defined as –

"*the termination by the employer of the service of a workman for any reason whatsoever, otherwise than as a punishment inflicted by way of disciplinary action, but does not include -*

a) *voluntary retirement of the workman, or*
b) *retirement of the workman on reaching the age of superannuating if the contract of employment between the employer and the workman concerned contains a stipulation in that behalf; or*
c) *termination of the service of the workman as a result of the non-removal of the contract of employment between the employer and the workman concerned on its expiry or of such contract being terminated under a stipulation in that behalf contained therein; or*
d) *termination of the service of a workman on the ground of continued ill-health*"

Thus, considering the above definition, the retrenchment is not applicable on the JNPA – as the lay-off of on-roll employees under the SVRS is voluntary in nature [which has been established in above section - Lay-off and relocation process of employees (on-roll employees and contractual workers) – Retrenchment], and for the contractual workers it is the ending of their contract with JNPA (the employer).

The process of management on-roll employees and contractors is solely the domain of the JNPA and the SPV does not have influence on the process. However, should there be interest from existing workers or contractors to work for the project, nothing prevents them from making corresponding applications with the SPV.

[15] Ministry of Railway is under the process of construction of Decdciated Freight Corridor (DFC) for transportation of commercial good throughout the country. The western limit of the DFC ends at the JNPA and will be under the operation of JNPA in collaboration with Ministry of Railway.

2.5.2 Proposed Workforce for the Project

2.5.2.1 Proposed workforce during the construction phase

As reported, by the Project, the project will require ~200 workers during the peak construction of the Project. The majority of the workers will be appointed on a contractual basis (~150) by the Engineering and Procurement contractors (EPC) and ~50 employees to supervise the work will be appointed as on-roll employees of the Project.

2.5.2.2 Proposed workforce during the phase of the project where the construction and operation will go side by side

As reported, there will be ~200 workers employed during this phase. However, the Project has not finalized the requirement of number of employees for the operation of the project during this phase.

2.5.2.3 Proposed workforce during the operation phase

As reported and considering the precedent of JM Baxi operating other multi-purpose terminals in India, it is envisaged that ~2,400 employees (100 on-roll employees of NSFTPL and 2,300 contractual employees) will be employed in the full-fledged operation phase of the Project.

2.5.2.4 Workers' Accommodation

As reported by NSFTPL, during the construction and operation phase of the Project, contractual workers will be provided with accommodation. The responsibility of providing the workers' accommodation will be with the appointed contractor(s). Further, as reported, no new workers' accommodation will be constructed by the contractor(s) and existing structure or building outside the port boundary will be rented out for workers' accommodation. NSFTPL will ensure the selected building or accommodation shall meet the requirement of European Bank for Reconstruction and Development (EBRD) and International Finance Corporation (IFC) – guidelines on workers' accommodation prior to finalization for providing the workers' accommodation. Therefore, prior to allotting the accommodation to workers, NSFTPL to ensure the compliance with EBRD/IFC requirement will undertake following step:

- Step 1 – Audit of selected building or accommodation: the audit confirm that the selected building meets the requirement of European Bank for Reconstruction and Development (EBRD) and International Finance Corporation (IFC) – workers' accommodation: process and standards[16] (minimum requirement shall be provided in the workers' accommodation management plan), and identified changes need to be made in the building so that the compliance with the requirement shall be fulfilled. Furthermore, the project will also ascertain that the chosen rented accommodation will not have any land or resettlement-related legacies or liabilities
- Step 2 – Changes made in selected building or accommodation: make changes and alteration in the building accommodation based on the gap identified by the audit (undertaken as part of Step 1)
- Step 3 – recheck audit of selected building: recheck audit shall be undertaken to confirm that the changes proposed by the audit in Step 1 have been made and the selected building is in compliance with the requirement of EBRD/IFC workers' accommodation.
- Step 4 – allotment of accommodation to workers: after the step 3, the accommodation shall be allotted to workers.

Worker's accommodation management plan to be implemented has been prepared as part of this IESE report (Refer to ***Annexure E*** for more details).

2.5.2.5 Stakeholder Engagement Plan (SEP) and Grievance Redressal Mechanism (GRM)

As part of this IESE report, SEP and GRM are prepared which will be implemented at the Project level during the construction and operation phase (refer to ***Annexure H*** for more details).

Stakeholder Engagement Plan (SEP)

The SEP details out the following key aspects:

- Identify and prioritize key stakeholder groups, focusing on affected communities
- Provide a strategy and timetable for sharing information and consulting with each of these identified groups

[16] https://www.ebrd.com/downloads/about/sustainability/Workers_accomodation.pdf (accessed on December 08, 2022)

- Describe resources and responsibilities for implementing stakeholder engagement activities

Grievance Redressal Mechanism (GRM)

The GRM will provide fair, transparent, and timely redressal of grievances without costs, with special consideration of females. GRM details out the following key aspects:

- The process by which the person or group of people can bring their grievance to the Project for consideration and redress
- Appointment or delegation of responsibility to a person – who will receive grievance, and how and by whom the received grievance will be resolved
- Process of response to be communicated back to the complainant
- Maintaining records of received and resolved grievances

2.6 Resource Requirement for Proposed Project

Table 2-20: Resource Requirement

Sr. No.	Resource	Approximate Quantity	Source
1.	Water	**Construction Phase:** Water during construction phase will be required for civil work and domestic purpose. Approximately, 1.2 crore litres of water will be required for civil work and ~45 lakh litres of water will be required for domestic purpose. **Operation Phase:** Water during operation phase will be used for domestic purposes, firefighting and landscaping. Approximately 2.5 lakh kiloliters of water will be required during the operation phase.	Source of water at JNPCT is pipeline water supply from Maharashtra Jeevan Pradhikarn (MJP) and City and Industrial Development Corporation of Maharashtra Limited (CIDCO). The same source will be used during both construction and operation phase. Potable water requirements will be met through packaged drinking water and the water must meet the local or WHO drinking water standards.[17]
2.	Raw Material	**Construction Phase:** Details on the quantity of raw materials to be procured for civil work is not available at this stage. As reported, the quantification will be done during the detailed engineering stage.	Local authorised suppliers will be used for sourcing raw materials during the construction phase
3.	Fuel	**Construction Phase:** During construction phase, fuel will be used in the form of diesel in construction machineries and DG sets. Approximately, 2 lakh litres of fuel will be required during construction phase **Operation Phase**: During operation phase, fuel consumption at the terminal based on 1.8 million TEUs will be ~ 55,068 kilolitres per annum *Note: Since the Inter Terminal Vehicles (ITV) will be outsourced, the quantity of fuels for ITV could not be ascertained at this stage*.	Source of fuel during construction and operation will be nearby petrol pumps.
4.	Power	Power requirement for the terminal is sourced from Maharashtra State Electricity Distribution Company Limited (MSEDCL). During construction phase, the same source will be used for power supply. The terminal is equipped with four (04) D.G. sets of capacity 1000 kVA (2 no.s) and 1500 kVA (2 no.s) as a source of power back up. The current electricity consumption specifically for JNPCT is not available, however, as reported by representative of JM Baxi, the total electricity consumption at JNPCT after project handover to NSFTPL will be approximately 59,76,000 Kwh / year.	
5.	Electrical Installation	The Project will involve: • Shifting of equipment to the newly relocated substation • Old Equipment with end of life will be replaced with new ones. • Powering would be done to 5 Nos. of quay cranes which will be procured along with 17 Nos. of RTGC's, where 12 RTGCs will be converted from diesel to electrical and 5 new E-RTGC's will be procured. • Sodium Vapour lamps will be replaced by LED's and lux level assessment would be carried out to improve the illumination.	

[17] https://www.who.int/water_sanitation_health/water-quality/guidelines/en/

Sr. No.	Resource	Approximate Quantity	Source
		• Further Electrical Installations will depend on the detailed assessment by the master planning consultant.	
6.	Road Traffic	According to the technical assessment report developed by Mott Macdonald dated 02.11.2022, JNPCT is expected to handle 2961 trucks per day after upgradation at full operational capacity for container transportation. As part of the project, NSFTPL will not be responsible for upgradation or maintenance of roads within the terminal	
7.	Rail Siding	According to the technical assessment report developed by Mott Macdonald dated 02.11.2022, for the proposed project after upgradation, there will be 4 rakes availability per day with a capacity of 90 TEUs. It is expected that with operation of DFC, the frequency of trains including for the proposed project will increase to start with 20 trains per day which will gradually increase to 25 trains per day. Furthermore, the rail traffic increase is expected to be between 5 % to 6 % year on year from October 2024 post completion of DFC construction.	
8.	Vessel	As part of the proposed project, the vessel size will be upgraded to 12200 TEUs. As per data shared by JM Baxi, NSFTPL will handle 520 vessels per year for 1.8 million TEU capacity which is expected by 2029	
9.	Reefer Points	As part of the project, NSFTPL plans to have 576 number of reefer points. The energy consumption at one reefer point is about 8 units per hour for one container i.e., 192 units per day. Therefore, the energy consumption at 576 reefer points where container will be stacked is estimated to be 110,592 units per day.	
Note: Material potentially containing asbestos will not be used for the proposed project. Furthermore, no material containing asbestos was observed by E&S advisor at the terminal during site visit and none was reported by the site representative.			

Source: JM Baxi

2.6.1 Proposed Resource Conservation Initiatives

As part of the proposed project, NSFTPL has plans to convert all diesel-based RT cranes used within JNPCT to electrical driven RT Cranes. Furthermore, NSFTPL also plans to outsource electric Internal Terminal Vehicles (ITVs). There will be 54 electrical ITVs deployed at the terminal.

NSFTPL also plans to install rooftop solar panels[18] wherever feasible generating approximately 400 KW of electricity and energy conservation measures like installation of LED lights, motion detected sensors will be implemented. However, the supplier and source of solar panels are not known at this stage.

Measures will be taken to control water consumption and save freshwater requirement. Water audit will be undertaken and necessary actions on recommendations will be implemented by the NSFTPL management. NSFTPL also plans to conduct energy audit and take steps for effective energy management.

A sewage treatment plant of capacity 5-10 KLD will be developed within JNPCT. Sewage generated during operation phase will be treated and reused for landscaping and in washrooms for flushing purpose. Rainwater harvesting system will be explored during detailed engineering stage.

2.7 Waste Management for Proposed Project

The types of waste anticipated from the construction and operation of the proposed project and its associated management practices has been provided in the ***Table 2-21***.

It is confirmed by NSFTPL that there will be no transboundary movement of wastes.

Table 2-21: Waste Management at Proposed Project

Waste Type	Project Phase	Proposed Management Practice
Hazardous Waste		

[18] Rooftop solar will not be financed by ADB

Waste Type	Project Phase	Proposed Management Practice
Waste Drum (Oil drums/ Chemical drum/ Misc. drum) & Used & Waste Oil from DG sets and construction machinery and operational cranes	Construction and Operation Phases	DG sets will be maintained by NSFTPL inhouse team and hazardous waste generated to be sold to approved MPCB recycler named Mumbai Waste Management Limited (MWML). The recycler has been currently appointed by JNPA for collection of hazardous waste from port. The same recycler will be used by NSFTPL. As mentioned in JNPA website, the pollution control cell of JNPA carries out regular inspection of JN Port channel and berth area to check the Oil Spill.
Contaminated cotton rags and paint containers from painting work	Construction Phase	Disposal through authorised MPCB recycler
Sludge from Vessel	Operation Phase	Disposal of oily waste and bulk noxious liquid substances from vessels is facilitated through MPCB authorized recyclers/ re-processors as per Annex-I of MARPOL 73/78. JNPA has identified 12 authorized vendors for disposal of oil waste from ships. The same vendors will be used by NSFTPL, and the facility will be provided to the vessels on request. However, any kind of repair and maintenance and refueling area for the ships/ vessels will not be provided by the terminal.
Bilge Water and Ballast Water	Operation Phase	Bilge water and ballast water from vessel is not allowed to be discharged at the port area. Therefore, the proposed project will not be responsible for disposal of bilge water and ballast water from the vessels.
Non-Hazardous Waste[19]		
Municipal Solid Waste from Terminal	Construction and Operation Phases	Municipal solid waste will be collected and disposed to common solid waste facility of JNPA.
Garbage from Vessel	Operation Phase	The Port has provided reception facility for ship generated garbage as per Regulation 7(1), Annex-V of MARPOL 73/78 through private party named M/s. Harikrupa Prakalpagrastha Berojgar Seva Sahakari So. Ltd to the vessels. NSFTPL will provide facility to the vessels through same vendor.
Wastewater from Terminal	Construction and Operation Phases	Wastewater from terminal will be in the form of sewage. Sewage generated at existing JNPCT is disposed through septic tank which is cleaned at regular intervals. Generation of trade effluent is nil. During construction phase of the proposed project, sewage will be disposed through septic tanks. However, NSFTPL will develop STP of capacity 5-10 KLD. . The treated water from STP will be used for landscaping and reused in washroom for flushing purpose (if feasible).
Wastewater from vessel cleaning	Operation Phase	No provision of vessel cleaning falls under the scope of the terminal, therefore, the proposed project will not be responsible for disposal of wastewater from vessel cleaning.
Battery Waste	Operation Phase	Provision in Purchase order for buy back will be added. Old batteries will be sold to approved recyclers
E-waste	Operation Phase	Sale / Disposal through approved recycler/ dismantler (MoEF&CC approved)
Bio-medical waste	Construction and Operation Phases	Disposal to Common Waste Treatment and Disposal Facility (CWTDF) approved by CPCB/SPCB/ MoEF&CC
Construction and demolition waste	Construction Phase	Construction waste will be in the form of scrap from crane wire ropes, tires, etc. which will be disposed through authorized scrap dealer.
Dredge Disposal	Operation Phase (To be disposed by JNPA)	Disposal of dredging material is under the scope of JNPA and it is disposed of at the pre-designated site DS-3 (18° 55.000'N, 72° 42.000'E, offshore at an aerial distance of ~ 28 km from JNPCT) as per CWPRS recommendations.

[19] As per specific waste management rules, 2016 in India

Waste Type	Project Phase	Proposed Management Practice
		No dredging activity falls under the scope of the proposed project.

2.8 Fire Safety and Security Considerations at JNPCT

JNPA has a separate fire and safety section under Marine Department comprising of one (01) fire and safety Assistant Manager, one (01) Station Officer, seven (07) Class III sub officers, two (02) senior driver/pump operator, three (03) driver/pump operator and thirty (30) Firemen. The existing fire safety and security at JNPCT is under fire and safety section of JNPA who has outsourced the maintenance of the firefighting equipment at the container berth to third party. However, after project handover the same will be under the supervision of NSFTPL. NSFTPL may appoint the same third party for maintenance of the firefighting system at JNPCT or appoint a new contractor after intimating the same to JNPA. The firefighting equipment available for JNPCT has been described in subsequent section. It is expected that NSFTPL will use the same infrastructure at the terminal for the proposed project in addition to the firefighting equipment (if any), installed by the SPV.

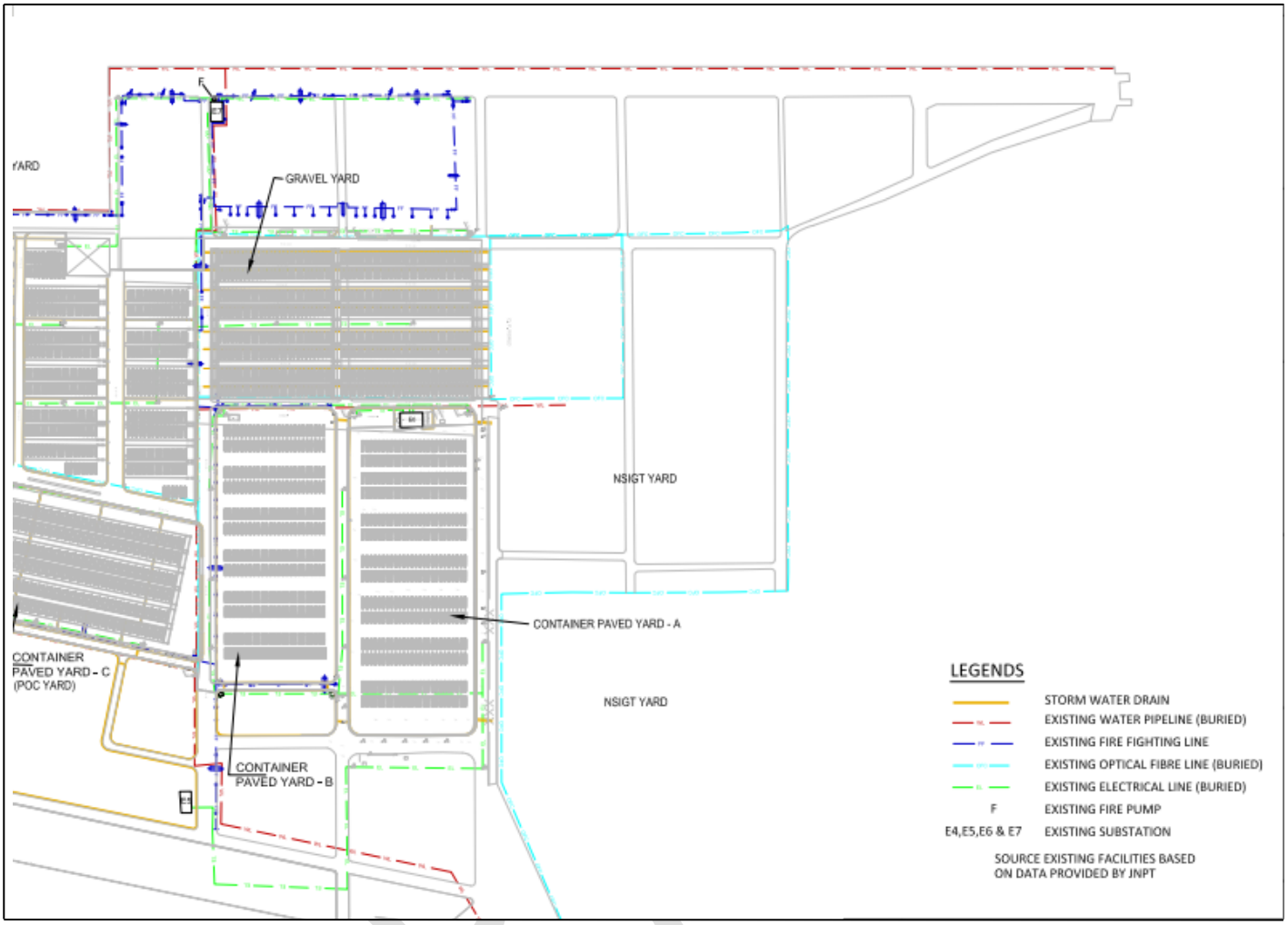
2.8.1 Fixed Fire Fighting System

JN Port is equipped with the following firefighting equipment to combat fire hazards at the terminals. The firefighting systems are designed and commissioned as per the standard of National Fire Protection Association (NFPA), Bye-Laws of Government of Maharashtra Fire Protection System and latest National Building Code guidelines.

- Sea Water Fixed Fire Fighting System at JNPCT Berth
- Pressurized Water Yard Hydrant System and Water Sprinkler System & Alert Public Alarm, Wireless Smoke Detection System installed at the Port User Building of JNPA.
- High Velocity water spray system is installed at E6(A) Sub-Station and E-7 Sub-Station of JNPA

Layout showing existing firefighting arrangement at JNPCT has been presented in ***Figure 2-17***.

Figure 2-17: Layout showing Existing Fixed Fire Fighting Arrangement at JNPCT



Source: JM Baxi

2.8.2 Mobile Fire Fighting System

JN Port is equipped with the following mobile firefighting system to combat fire hazards at the terminal. These are shared facilities provided by JNPA which can be used at JNPCT terminal in case required.

Table 2-22: Mobile Fire Fighting System at JNPA

Sr. No.	Equipment	Quantity
1.	Fire Water Tenders:– Water tank capacity: 6000 l. Pump discharge capacity – 2000 lpm	2 no.s
2.	Fire Foam Tender :- Water tank capacity: 3000 l Foam Tank Capacity : 800 l. DCP Fire Extinguishers(70 kg) :02 no.s CO_2 Fire Extinguishers(22.5 kg) :04 no.s Pump discharge capacity – 2000 lpm	1 no.
3.	Multipurpose Fire Tender Water tank capacity: 5000 l Foam Tank Capacity : 500 liters.	1 no.

Sr. No.	Equipment	Quantity
	DCP Vessel :500 kg CO_2 Fire Extinguishers (22.5 kg) :02 no.s Pump discharge capacity : 4000 ipmLPM @ 10 bar pressure	
4.	Hazmat Cum Emergency Rescue Tender :- With several type of life saving equipment, cutting, spreading, lifting tools and water mist system to combat small fires, Light Mast with Generator facility.	1 no.
5.	Self-Contained Breathing Apparatus Sets	26 Sets
6.	Fire proximity suits	10 no.s
7.	Fire Entry Suits	2 no.s
8.	Chemical handling PVC suits	10 no.s
9.	Total portable Fire Extinguishers (different type and capacity to tackle all types of fires during incipient stage.)	1014 no.s

Source: JNPA

2.8.3 Proposed Fire Fighting Installations at JNPCT

As part of the proposed Project, NSFTPL will use the existing firefighting system at JNPCT. However, the project may install additional firefighting system (if required) based on the detailed master plan which is yet to be developed. Therefore, information on proposed firefighting installations is not available at this stage.

In addition to the installation, the project will also undertake the following activities:

- Shifting of existing Pumps to the newly relocated Pump House.
- Replacement of damaged hydrants.

However, exact details on the location of new pump house, replacement of number of fire hydrants etc., will be available post detailed engineering stage.

2.9 Estimated GHG emission due to the Proposed Project

To ascertain the GHG emissions, the following direct and indirect sources have been identified as the major GHG contributors due to the proposed Project.

Scope 1: Direct Emission

- Combustion of Diesel in DG sets within substation
- Diesel Consumption in vehicles and equipment including trucks, forklifts, cranes etc.
- Fuel consumption in JNPA vehicles

Scope 2: Indirect Emission

- Purchased electricity consumption at High Mast
- Purchased electricity consumption at Electric Substations, workshop, sea water room
- Consumption of purchased electricity at Store rooms, toilet block, porta cabin
- Consumption of electricity at e-RTGCs

2.9.1 Scope 1 GHG Emission

Based on the above GHG emission contributors, the following equation as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories has been used to calculate GHG emission.

$$\text{Emission} = \sum_a \quad [\text{Fuel}_a \times \text{Emission Factor}_a]$$

Where,

Emission = Emissions of CO2 (tCO_2)

$Fuel_a$ = fuel sold

EF_a = emission factor

a = type of fuel (e.g. diesel)

As per data provided by JM Baxi, approximately 55068 kilolitre of diesel per annum will be consumed by NSFTPL.

Based on the above formula, it has been estimated that overall Scope 1 emissions due to combustion of fuel from DG sets, vehicles, cranes will be approximately *145,635 tCO_2 per annum*.

2.9.2 Scope 2 GHG Emissions

Based on the Scope 2 GHG emission contributors, the following equation has been used to calculate Scope 2 emissions.

Emission= Electricity Units Consumed (MWh) * CEA Grid Emission Factor (tCO_2e/ MWh)[20]

As per data provided by JM Baxi, approximately, 5976000 KWh per annum of purchased electricity will be consumed at the terminal by NSFTPL.

Based on the above formula, it has been estimated that overall Scope 2 emissions due to purchased electricity will be approximately *4,721 tCO_2 per annum*

2.10 Analysis of Alternatives

2.10.1 No Project Scenario

According to the feasibility report, 2020, containerization of general & break-bulk cargo traffic has progressed steadily in the last decade, and currently almost 90% of the world general & breakbulk cargo traffic is containerized. The containerization rate in India has steadily progressed from 37% to 65% in the last decade. However, the rate is far behind the international rate of 90%. The container penetration level in India is continuously growing and it is expected to witness higher growth in coming years. Growth in the Indian container industry can largely be attributed to economic growth and increasing penetration of containers into the general cargo market. Efficiency brought in by the private sector has also led to growth. In addition to good facilities, mapping of container demand with the supply of better quality and efficient support infrastructure facilities at the right location is of primary importance to attract more and more containers to the port.

According to the operating performance profile of JN Port for FY 2021-22, JN Port handled 76 million tonnes of total cargo during FY 2021-22, which is 17.26% higher as compared to previous year. Furthermore, the port handled 5.68 million TEUs of container traffic during FY 2021-22 which is 21.55% higher as compared to 4.68 million TEU containers handled in FY 2021-22. Out of the total container traffic in FY 2021-22, JNPCT contributed to a share of only 7.74% as compared to other privately owned terminals. A comparison between the container traffic profile of JNPCT and other privately operated terminals within JN Port for FY 2020-21 and FY 2021-22 has been presented below.

Table 2-23: Container Traffic Profile at JN Port (TEUs)

Terminal	Container Unload		Container Load		Container Transhipment		Total Container Traffic	
	FY 20-21	FY 21-22	FY 20-21	FY 21-22	FY 20-21	FY 21-22	FY 20-21	FY 21-22
JNPCT	290,842	240,762	246,991	195,225	6,194	4,223	544,027	440,210
NSICT	337,217	450,507	400,284	459,535	13,477	37,845	750,978	947,887
APMT	799,586	922,920	815,558	910,806	53,759	31,861	1,668,903	1,865,587

[20] As per Central Electricity Authority CO_2 Baseline Database [https://cea.nic.in/cdm-co2-baseline-database/?lang=en]

Terminal	Container Unload		Container Load		Container Transhipment		Total Container Traffic	
	FY 20-21	FY 21-22	FY 20-21	FY 21-22	FY 20-21	FY 21-22	FY 20-21	FY 21-22
NSIGT	371,226	569,183	396,649	605,619	11,894	11,379	779,769	1,186,181
BMCT	489,775	631,662	419,486	601,412	23,893	11,620	933,154	1,244,694

Source: JNPA Website

As observed from the above table, there has been decline in the container traffic at JNPCT in FY 2021-22 as compared to FY 2020-21. The share of container traffic of other terminals was observed to be higher than JNPCT during both FY 2020-21 and FY 2021-22. Furthermore, there has been a significant increase in container traffic at all the other terminals in FY 2021-22 as compared to FY 2020-21 except for JNPCT.

The reason for decline in container traffic at JNPCT was attributed to the fact that JNPCT is a government operated terminal with less competitive advantage when compared to other privately operated terminals within JNPA. Furthermore, private terminals at JNPA have modern infrastructure with higher operational efficiency.

It is anticipated that a "No Project Scenario" will lead to a decline in the container traffic at the terminal year on year basis. It is expected that proposed project will help to increase the share of container traffic at JNPCT by increasing the operational efficiency of the terminal.

2.10.2 Sea Freight vs Air Freight – Cost Comparison

Cost is one of the key deciding factor in selecting the mode of shipments. Compared to air freight, sea freight is less expensive. For example – a package that costs $200 by ocean freight air freight cost up to $1000 by air[21]. Hence, with more carrying capacity than air transportation, sea freights are low-priced and are optimum for carrying large quantity of cargos. The expanding landscape of Indian trade requires an efficient mechanism for sea freight movement; hence modernization and expansion of existing terminal will support such a requirement.

2.10.3 Sustainability – Carbon Footprints

International bodies, governments, and individuals are increasingly taking responsibility for their impacts on the environment. Even smaller businesses are considering how they contribute to a more sustainable future. CO2 emissions from ocean freights are smaller compared with air freight. A Defra study concludes that two (2) tonnes of freight carried for 5,000 km by a small ship created 150 kg of CO2 (a measure of relative global warming potential) compared to 6,605 kg of CO2 if the freight is carried by air for the same distance[22].

Thus, considering the above ocean freight is more sustainable in terms of carbon foot printing as compared to air freight.

2.10.4 No Land Acquisition

No land will be acquired for the Project, the project is expansion and capacity enhancement of the existing terminal. Thus, the project will not trigger any land acquisition related resettlement and rehabilitations impacts such as:

- Landlessness
- Livelihood impact (Economic Displacement)
- Homelessness
- Marginalization
- Food Insecurity
- Gender Based Sexual Violence and Harassment

[21] https://www.gocomet.com/blog/air-freight-vs-ocean-freight/ (Accessed on October 20, 2022)
[22] https://www.theguardian.com/environment/2014/nov/02/environmental-impact-of-shipping-goods (Accessed on October 20, 2022)

- Loss of access to common property and services[23]
- Social Disarticulation

Note: The design and technology for the project will be finalized by the contractor under the guidance of technical consultant during detailed engineering stage. Therefore, E&S implications on the alternatives considered for design and technology could not be assessed at this stage.

Also equipment specified in the Concessionaire Agreement will be installed, alternatives will not be considered for equipment.

23 As stated above the project will not require procurement or acquisition of new land. Further, as per the google imagery the residing nearest local community is ~`.5 km (Gharapuri).

3 Applicable Legislative, Regulatory and Administrative Regime for proposed Project

This section highlights the environmental and social regulations applicable to the proposed Project.

3.1 International and National Administrative Requirements

The JN Port and JNPCT follow both international and national guidelines, rules, conventions and standards for safe operation of the port and the terminal.

In India, the national level laws are formulated by Ministry of Environment Forests and Climate Change (MoEFCC) and state governments are required to consider these regulations as base level for implementation. The State Pollution Control Boards (SPCBs) are responsible for securing compliance under the Environmental Protection Act, 1986, the umbrella legislation regulating environmental issues in the country.

A brief description of the relevant enforcement agencies at international and national (central level and state level) with respect to the institutional framework is described in ***Table 3-1*** below.

Table 3-1: Relevant Enforcement Agencies

Sr. No	Agency	Function
		International Level
1	International Maritime Organization	The International Maritime Organization (IMO) is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships. The mission of the International Maritime Organization (IMO) as a United Nations specialized agency is to promote safe, secure, environmentally sound, efficient and sustainable shipping by adopting the highest practicable standards of maritime safety and security, efficiency of navigation and prevention and control of pollution from ships, as well as through consideration of the related legal matters and effective implementation of IMO's instruments with a view to their universal and uniform application.
		National Level
Central Level		
2	Jawaharlal Nehru Port Authority	Jawaharlal Nehru Port Authority (JNPA) is the governing body of the JNPCT as per the provisions of the Major Port Authorities Act, 2021.
3	Ministry of Environment Forests and Climate Change (MoEFCC)	The Ministry of Environment and Forests (MoEFCC), Government of India is responsible for the environment management at Union of India level. The specific functions of MoEFCC are as follows: • Environmental policy planning • Effective implementation of legislation • Issuing guidelines under EP Act for environment protection • Monitoring and control of pollution through Central Pollution Control Board and State Pollution Control Boards • Environmental clearance for industrial and development projects covered under EIA Notification • Monitoring of compliance conditions stipulated in Environmental clearance through its regional offices • Promotion of environmental education, training, and awareness • Forest conservation, development, and wildlife protection • Protection of Coastal areas. MoEFCC is responsible for the implementation and enforcement of the Environment Protection Act, 1986, and Rules issued under the Act, including the EIA notification. Under sections 3 and 5 of the EP Act, 1986, it retains enormous powers to issue directions in the interests of environment protection.
4	Central Pollution Control Board	The Central Pollution Control Board (CPCB) has been constituted for the control of water, air and noise pollution, land degradation and hazardous material and waste management. The specific functions of CPCB are as follows:

Sr. No	Agency	Function
		• Prevent pollution of streams • Advise the Central Government on matters concerning prevention, control and abatement of water and air pollution • Co-ordinate the activities of SPCB's and provide them with technical and research assistance • Establish and keep under review quality standards for surface and groundwater and for air quality • Planning and execution of national programme for the prevention, control, and abatement of pollution through the Water and Air Acts.
5	The National Green Tribunal (NGT)	National Green tribunal was constituted in 2010 for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto. It is a specialized body equipped with the necessary expertise to handle environmental disputes involving multi-disciplinary issues. The tribunal will have jurisdiction over all civil cases relating to implementation of the following regulations: • The Water Act, 1974 • The Water Cess Act, 1977 • The Forest Conservation Act, 1980 • The Air Act, 1981 • The Environment Protection Act, 1986 • The Public Liability Insurance Act, 1991 • The Biological Diversity Act, 2002.
6	Petroleum and Explosives Safety Organization (PESO)	The PESO is under, Ministry of Commerce and Industry, Department of Industrial Policy & Promotion, Government of India. The Chief Controller of explosives is responsible to deal with provisions of: • The Explosive Act 1884 and Rules, 1983 • The Petroleum Act 1934 and the Rules 2002 • The Static and Mobile pressure vessels {Unfired} Rules, 1981 and amendment 2000, 2004 • Gas Cylinder Rules, 2004 • Manufacture, Storage, and Import of Hazardous Chemical Rules, 1989 and amendment, 2000.
State Level		
7	Maharashtra Coastal Zone Management Authority (MCZMA), Department of Environment, Government of Maharashtra	MCZMA , under Government of Maharashtra is responsible for protecting and improving the quality of the coastal environment and preventing, abating and controlling environmental pollution in the coastal Regulation zone areas in the state of Maharashtra. The roles and responsibility of the authority include: • Receive application for approval of project proposal and examine the same if it is in accordance with the approved Coastal Zone Management Plan and complies with the requirement of the Coastal Regulation Zone notification issued by the Government of India in the erstwhile Ministry of Environment and Forests vide number S.O. 19 (E), dated the 6th January 2011 • Regulate all developmental activities in the coastal regulation zone areas • Examine the proposals received from the State Government for changes or modifications, in the classifications of coastal Regulation Zone areas, and in the coastal zone Management Plan and make specific recommendations thereon, to the National Coastal Zone Management Authority.
8	Maharashtra Maritime Board	Maharashtra Maritime Board (MMB) was established in 1996 to develop the maritime sector. The agency is responsible for management, control and administration of non-major ports and drive development initiatives for the state's maritime sector The key objectives of MMB are: • To be a facilitator for the maritime sector • To promote maritime infrastructure development • To encourage port-led industrial and economic development
9	Maharashtra Pollution Control Board (MPCB)	MPCB is responsible for implementing various environmental legislations in the state, mainly including Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981, and some of the provisions under Environmental (Protection) Act, 1986 and the

Sr. No	Agency	Function
		rules framed there under like, Biomedical Waste (M&H) Rules, 1998; Hazardous Waste (M&H) Rules, 2008; Municipal Solid Waste Rules, 2000 etc.
10	Directorate of Maharashtra Fire Services	Under the Maharashtra Fire Prevention & Life Safety Measure Act, 2006, the Directorate of Maharashtra Fire Services is responsible for the following duties: • Promote Fire Safety • Prepare fighting fires and protecting people and property from fires • Rescuing people from Road Traffic Accidents • Dealing with other specific emergencies, such as flooding or terrorist attack which are set out by Statutory Order and can be amended in line with how the role of the Service may change in the future • Ensuring that fire and rescue authorities can do things that are not specifically set out in the act but which will help them meet their statutory duties
11	Labour Department	The Department of Labour is responsible for formulation, implementation, and enforcement of the labour laws in the State of Maharashtra. It also undertakes prevention and settlement of industrial disputes, industrial safety, health and promotes welfare of workers in the undertakings falling within the sphere of the state.
12	Private Security Agency, Maharashtra	It's a state government body, with aim to establish provide licenses to the private security agencies under the Private Security Agencies (Regulations) Act, 2015. Per the Act, no person shall carry on or commence the business of private security agency, unless he/she holds a license under the Act.

3.2 Maharashtra Maritime Policy, 2016[24]

In order to facilitate the development of maritime sector in the state, Maharashtra Maritime Policy was introduced in 1996 which was latest revised in 2016. The key objectives of the policy are as follows:

- Handholding private sector in undertaking maritime projects
- Cross-sector coverage in maritime policy and adequate integration
- Ensuring transparency and fairness in awarding of projects
- Enhancing viability of projects awarded
- Synchronising maritime and industrial development
- Developing connectivity infrastructure
- Adapting policies to changing external environment

The MMDP 2016 is valid for five years from the date of notification. Subsequently, is revised every five years to align with the changes in requirements and the external environment. However, the new updated policy is yet to be released by Maharashtra Maritime Board.

[24] https://maitri.mahaonline.gov.in/PDF/Maritime_Development_Policy_2016.pdf

3.3 Applicable National Environmental and Social Acts and Rules

Table 3-2: below summarizes the key regulations that are relevant to the project across its lifecycle. This table should be used to update/develop a comprehensive legal register for the project that can be regularly monitored for compliance as well as updated to reflect changes/non-applicability of regulations, policies, and standards.

Table 3-2: Applicability of key E&S regulations in the different phases of Project lifecycle

Sr. No.	Applicable Regulation/Permit	Pre-Construction	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
Environment Protection						
1.	Coastal Regulation Zones Notification, 2019	√	×	×	Maharashtra Coastal Zone Management Authority	The Coastal Regulation Zone (CRZ) Notification, 2019, came into effect to regulate development of various projects in coastal zones of the country as defined in the Notification. As per the Notification, project proponent is required to submit the following to the State or Union territory Coastal Zone Management Authority for seeking CRZ clearance The proposed expansion will require CRZ clearance from Maharashtra Coastal Zone Management Authority (MCZMA). Obtaining CRZ clearance is in the purview of Jawaharlal Nehru Port Authority (JNPA). As reported JNPA is in process of applying for CRZ clearance for the proposed expansion. As indicated by representative from J M Baxi, the Company is following up with JNPA and expect CRZ clearance to be secured before start of construction at site.
2.	EIA Notification 2006 under Environment Protection Act, 1986	√	×	×	Ministry of Environment Forests and Climate Change (MoEFCC)	Environment Protection Act is an umbrella legislation on environmental protection. Under the act, notifications and rules have been issued to regulate and control the pollution aspects of all industrial activities including offshore exploration and production activities The EIA Notification, 2006, states that port, harbour, breakwater, dredging projects falling within schedule of the notification are required to seek prior environmental clearance (EC) from Ministry of Environment Forests and Climate Change (MoEFCC). JNPA has received environmental clearance for the entire JN port (formerly known as Nhava Sheva Port). However, based on discussion with JNPA officials, it is understood that CRZ clearance will suffice proposed construction/ modification. However, if CRZ committee suggests requirement of EC for proposed expansion, JNPA accordingly will apply for EC. As per the Concession Agreement, environment clearance will be procured/ made available by the Concessioning Authority (i.e., JNPA) before the commencement of the Project. As discussed with JNPA, two separate agencies have been engaged, one for undertaking CRZ mapping and another for preparation and submission of CRZ application to MCZMA in the month of December 2022, before start of the Project.
3.	The Air (Prevention and Control of Pollution) Act, 1981. The Water (Prevention and Control of Pollution) Act 1974	×	√	√	Maharashtra Pollution Control Board (MPCB)	The Act prohibits establishment or operation of any industry, which is likely to discharge sewage or trade effluent into a stream or well or sewer or on land and/or cause air pollution, without prior Consent from the SPCB/ PCC. Under the consent management system, CTE is required prior to construction activities while CTO is required prior to operational activities.

Sr. No.	Applicable Regulation/Permit	Pre-Construction	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
						As per MPCB[25], ports and harbour fall under red category and therefore require CTE and CTO. Since JNPCT is an operational terminal, it has obtained consent to operate (CTO) vide RED/L.S.I (R46) No:-Format1.0/CAC/UAN No.0000097172/CR-2103001085 dated 19th March 2021 valid up to 30th September 2025. However, the CTO is a combined permit for JNPCT and shallow berth terminal (adjacent to JNPCT). Therefore, the conditions specified in the CTO is applicable for both the terminals. CTO is required to be amended as per the proposed construction and to be specifically for JNPCT. JNPA plans to get the CTO amended after getting expansion related details from the Project SPV. It is understood that CTO is expected to be amended before start of construction.
4.	The Noise (Regulation & Control) Rules, 2000 and as amended up to 2010 Ambient Noise Standards	×	√	√	MPCB CPCB	As per the Noise Pollution (Regulation and Control) Rules 2010, every operating facility is required to take all possible steps to meet the ambient noise level standards prescribed in the Rules. The rules prescribe maximum permissible values of day and nighttime noise levels for zones A, B, C and D representing industrial, commercial, residential and silence zone respectively. The project is required to comply with noise emission standards for industrial area during construction and operation phases.
5.	Solid Waste Management Rules 2016 as amended	×	√	√	MPCB/ local municipal body	Per the waste management rules, the solid waste (biodegradable and non-biodegradable) needs to be disposed properly through authorized vendors as per requirement.
6.	Construction and Demolition Waste Management Rules 2016	×	√	×	MPCB/ local municipal body	Construction waste generated at site need to be disposed of as per the requirements of the Construction and Demolition Waste Management Rules 2016.
7.	Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989 and as amended	×	√	√	MPCB	Rules will be applicable during construction and operation phases if hazardous chemicals as per Schedule 1, 2 and 3 of the rules are stored at site and satisfy the criteria laid down in the Rules.
8.	The Batteries (Management and Handling) Rules 2001 as amended later	×	√	√	MPCB	Batteries waste, if any generated in construction and operation phase to be disposed of as per Batteries (Management and Handling) Rules 2001.
9.	E-waste (Management) Rules, 2016	×	√	√	MPCB	E waste generated on site to be collected, stored, and disposed of as per E waste Management Rules.
10.	Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 as amended till date	×	√	√	MPCB	Generation of waste oil from D.G. sets, machineries, contaminated cotton rags, empty container of paints at site attracts the provisions of Hazardous and Other Wastes Rules, 2016. Hazardous waste authorization must be obtained prior to operational phase. The hazardous wastes have to be disposed through approved recyclers only. Handling of hazardous waste including collection, storage, transportation, and disposal/recycling as well as documentation needs to be maintained as per the requirements of Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016. Since JNPCT is an operational terminal, Hazardous Waste Authorization (HWA) has been obtained for JNPCT and shallow

[25] https://mpcb.gov.in/sites/default/files/consent-management/CPCBCategorizationdirection.pdf

Sr. No.	Applicable Regulation/Permit	Pre-Construction	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
						berth as part of the CTO. However, HWA along with CTO will be required to be amended specifically for JNPCT.
11.	Plastic Waste Management Rules 2016	×	√	√	MPCB	The project must comply with the plastic waste management rules. As per the rules, if the project generates plastic waste, then the same must be disposed of through authorised recyclers.
12.	Bio-Medical Waste Management Rules, 2016	×	√	√	MPCB	Bio-medical waste generated at site (medical/ first aid facility) will attract provisions of Bio-Medical Waste Management Rules, 2016. Biomedical waste generated to be disposed of through authorized agency.
13.	Petroleum Rules, 2002	×	×	√	Ministry of Petroleum and Natural Gas	The rules provide provisions for import, export, storage of petroleum in ports and harbours.
14.	The Explosives Act, 1884, The Explosive Substance Act, 1908 and Explosive Rules, 1983	×	×	√	Petroleum & Explosives Safety Organization	The act and rules regulate transport, import and export of explosives
15.	Maharashtra Fire Prevention & Life Safety Measure Act, 2006 and Rules, 2009	×	√	√	Directorate of Maharashtra Fire Services	The project must comply with the provisions of the acts and rules and obtain Fire NOC from competent authority.
Social and Labour						
16.	The Major Port Authorities Act, 2021	√	√	√	Jawaharlal Nehru Port Authority	The Act provide regulation, operation and planning of the Jawaharlal Nehru Port and to vest the administration, control and management of the Port upon the board of the JNPA. The Act detailed out the key provisions on, i) Constitution and Composition of board of JNPA, ii) Filling up of casual vacancies, iii) meetings of board, iv) Powers of Board in respect of Planning and development, v) Scale of rates for assets and services available at the Port, vi) Offences by companies, vii) Power of Board to make regulations. The Act is applicable to the project, as JNPCT is an integral part of the JNPA and the authority of JNPA's board is applicable on JNPCT
17.	The Indian Port Act, 1908	√	√	√	Jawaharlal Nehru Port Authority	The Act to consolidate the enactments relating to the port and port-charges
18.	The Dock Workers (Regulation of Employment) Act, 1948	×	×	√	Jawaharlal Nehru Port Authority	The Act to provide regulations on employment of dock workers[26]. The key provision of the Act, include: • Scheme for ensuring regular employment of workers—Provision may be made by a scheme for the registration of dock workers 5 [and employers] with a view to ensuring greater regularity of employment and for regulating the employment of dock workers, whether registered or not, in a port • In particular, a scheme may provide— o regulating the recruitment and entry into the scheme of dock workers, [and the registration of dock workers and employers], including the maintenance of registers, the removal either temporarily or permanently, of names from the registers and the imposition of fees for registration o regulating the employment of dock workers, whether registered or not, and the terms and conditions of such employment, including rates of remuneration, hours of work and

[26] "dock worker" means a person employed or to be employed in, or in the vicinity of, any port on work in connection with the loading, unloading, movement or storage of cargoes, or work in connection with the preparation of ships or other vessels for the receipt or discharge of cargoes or leaving port

Sr. No.	Applicable Regulation/Permit	Pre-Construction	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
						conditions as to holidays and pay in respect thereof o securing that, in respect of periods during which employment, or full employment, is not available for dock workers to whom the scheme applies and who are available for work, such workers will, subject to the conditions of the scheme, receive a minimum pay o prohibiting, restricting, or otherwise controlling the employment of dock workers to whom the scheme does not apply and the employment of dock workers by employers to whom the scheme does not apply
19.	Contract Labour (Regulation & Abolition) Central Act 1970 and Rules, 1971	×	√	√	Labour Department	The Act applies to: • To every establishment in which twenty or more workmen are employed or were employed on any day of the preceding twelve months as contract labour • To every contractor who employees or who employed on any day of the preceding twelve months twenty or more workmen The Act details out conditions of licensing of contractors[27] and ensure basic welfare measures to be made available to the contract workers by the employer, which includes: • Canteens • Restrooms • First aid facilities • Liability of principal employer • Responsibility for payment of wages • Penalties and procedure • Registers and other records to be maintained[28]
20.	Minimum Wages Act 1948	×	√	√	Labour Department	The act ensures minimum wages for each category of workers. Per the provision of the Act, the employer shall pay to every employee engaged in a schedule employment under them, wages at a rate not less than the minimum wages fixed by such notification of by the state government for that class of employees in that employment without any deductions except as may be authorised within such time and subject to such conditions as may be prescribed. Further, the Act also detailed out provisions on key aspects, such as: • fix the working hours for a normal working day • overtime payment • wages of worker who works for less than normal working days • Minimum time rate wages for piecework • Maintenance of registers and records • Penalties on offences to the Act • General provision for punishment of offences • Payment of undisbursed amounts due to employees **Overtime Payment** The employer shall pay to every employee engaged in a scheduled employment under him wages at a rate not less than the minimum rate of wages fixed by the appropriate

[27] No contractor to whom this Act applies, shall undertake or execute any work through contract labour except under and in accordance with a license issued in that behalf by the licensing officer

[28] Every principal employer and every contractor shall maintain such registers and records giving such particulars of contract labour employed, the nature of work performed by the contract labour, the rates of wages paid to the contract labour and such other particulars in such form as may be prescribed

Sr. No.	Applicable Regulation/Permit	Pre-Construction	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
						Government Authority for that class of employees in that employment without any deductions except as may be authorized within such time and subject to such conditions as may be prescribed
21.	Equal Remuneration Act 1976	×	√	√	Labour Department	Puts in place rules and regulations governing the remuneration payable to workers and employees
22.	The Payment of Wages Act, 1936, amended in 2005 and 2017	×	√	√	Labour Department	• This Act was passed with the aim of regulating the payment of wages but excluding bonus/pension/PF/gratuity etc. to persons employed in any factory, either directly or indirectly through a sub-contractor. • The Act holds the employer solely responsible for the payment of wages to the employees. • The Act also specifies the need for a timeline for the wage payment, and the provisions for fines and deductions amongst other details pertaining to wages • No wage period shall exceed one month
23.	Maternity Benefit Act, 1961 & The Maternity Benefit (Amendment) Act, 2017	×	√	√	Labour Department	• Every woman shall be entitled to, and her employer shall be liable for, the payment of maternity benefit at the rate of the average daily wage for the period of her actual absence the period immediately preceding the day of her delivery, the actual day of her delivery and any period immediately following that day. • Increases the duration of the maternity leave from 12 to 26 weeks which can be availed prior to 8 weeks from the date of expected delivery (earlier it was 6 weeks prior). • From third child onwards, maternity leave to be for 12 weeks which can be availed 6 weeks prior. • Employer to permit a woman to work from home, if the nature of work permits her to do so and the same can be availed after the completion of her maternity leave for a duration mutually decided. Woman to be informed at the time of appointment, of the maternity benefits available, either in writing or electronically.
24.	The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013	×	√	√	Labour Department	• No woman shall be subjected to sexual harassment at any workplace • The following circumstances, among other circumstances, if it occurs or is present in relation to or connected with any act or behaviour of sexual harassment may amount to sexual harassment: - o Implied or explicit promise of preferential treatment in her employment: or o Implied or explicit threat of detrimental treatment in her employment; or o Implied or explicit threat about her present or future employment status: or o Interference with her work or creating an intimidating or offensive or hostile work environment for her; or • Humiliating treatment likely to affect her health or safety.
25.	The E.P.F. and Miscellaneous Provisions act, 1952	×	√	√	Labour Department	• This Act is applicable to every factory or establishment employing 20 or more persons. • This Act requires the employer to provide for provident fund as under the scheme to the general public • The contribution which shall be paid by the employer to the Fund shall be ten percent. Of the basic wages, dearness allowance and retaining allowance, if any, for

Sr. No.	Applicable Regulation/Permit	Pre-Construction	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
						the time being payable to each of the employees whether employed by him directly or by or through a contractor, and the employee's contribution shall be equal to the contribution payable by the employer in respect of him and may, if any employee so desires, be an amount exceeding ten percent of his basic wages, dearness allowance and retaining allowance if any,
26.	Payment of Bonus Act, 1965 and rules and subsequent amendment	×	√	√	Labour Department	Every employee shall be entitled to be paid by his employer in an accounting year, bonus, in accordance with the provisions of this Act, provided he has worked in the establishment for not less than thirty working days in that year. Further, every employer shall be bound to pay to every employee in respect of the accounting year commencing on any day in the year 1979 and in respect of every subsequent accounting year, a minimum bonus which shall be 8.33 per cent. of the salary or wage earned by the employee during the accounting year or one hundred rupees, whichever is higher, whether the employer has any allocable surplus in the accounting year. An employee shall be disqualified from receiving bonus under this Act, if he is dismissed from service for • fraud; or • riotous or violent behaviour while on the premises of the establishment; or • theft, misappropriation, or sabotage of any property of the establishment
27.	Payment of Gratuity Act, 1972	×	√	√	Labour Department	Gratuity shall be payable to an employee on the termination of his employment after he has rendered continuous service for not less than five years, • on employee's superannuation, or • on his retirement or resignation, • on his death or disablement due to accident or disease Provided that the completion of continuous service of five years shall not be necessary where the termination of the employment of any employee is due to death or disablement. The gratuity amount will be calculated as follows: • Employees are entitled to get the salary of 15 days for every completed year as gratuity. • Only the basic pay and DA (if any) are considered while accounting for the salary. It means any bonus, special allowance and HRA are not taken for the gratuity calculation. **Note** Gratuity calculation: Gratuity = (Salary / 26) x 15 x Number of years in service Where; Salary is "Last drawn basic pay + DA" 26 is the average working days in a month (As per Gratuity rules – 26 days not 30 days calculated) 15 is the actual days considered for gratuity in a year
28.	ESI Act, 1948 (Employees State Insurance Act, 1948)	×	√	√	Labour Department	• It applies to all non-seasonal factories • To provide benefits in case of sickness, maternity and employment injury' and to make provision for certain other matters in relation thereto.

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						• all employees in factories or establishments to which this Act applies shall be insured in the manner provided by this Act. • The contribution payable under this Act in respect of an employee shall comprise contribution payable by the employer (hereinafter referred to as the employer's contribution) and contribution payable by the employee (hereinafter referred to as the employee's contribution) and shall be paid to the Corporation.
29.	Workmen's Compensation Act, 1923	×	√	√	Labour Department	Payment of compensation amount as applicable at the time of the accident resulting in a temporary or a permanent disablement such that it reduces the earning potential of workman in any employment. Or contracts an occupational disease peculiar to that employment
30.	Child Labour (Prohibition and Regulation) Act, 1986 and subsequent amendments	×	√	√	Labour Department	The Act intends to: • Ban the employment of children, i.e., those who have not completed their fourteenth year, in specified occupations and processes • Lay down a procedure to decide modifications to the schedule of banned occupations or processes • Regulate the conditions of work of children in employments where they are not prohibited from working • Lay down enhanced penalties for employment of children in violation of the provisions of this Act and other Acts which forbid the employment of children
31.	The Bonded Labour System (Abolition) Act 1976;	×	√	√	Labour Department	Abolition of Bonded Labour System: (i) The bonded labour system is abolished and every bonded labourer stands free and is discharged from any obligation to render any bonded labour; (ii) (a) No person is to make any advance of bonded labour, (b) No person is to compel any person to render any bonded labour or other form of forced labour.
32.	The Protection of Civil Rights Act, 1955	×	√	√	Labour Department	A person shall be deemed to boycott another person who - (a) refuses to let to such other person or refuses to permit such other person, to use or occupy any house or land or refuses to deal with, work for hire for, or do business with, such other person or to render to him or receive from him any customary service, or refuses to do any of the said things on the terms on which such things would be commonly done in the ordinary course of business; or (b) abstains from such social, professional, or business relations as he would ordinarily maintain with such other person.
33.	Inter-state Migrant Workmen Act 1979.	×	√	√	Labour Department	The Key provisions of the Act, include: • Responsibility of payment of wages: 1) A contractor shall be responsible for payment of wages to each inter-state migrant workman employed by him and such wages shall be paid before expiry of such period as may be prescribed; 2) Every principal employer shall nominate a representative duly authorised by him to be present at the time of disbursement of wages by the contractor and it shall be the duty of such representative to certify the amounts paid as wages in such manner and may be prescribed; 3) It shall be the duty of the contractor to ensure the disbursement of wages in the presence of the authorize representative of the principal employer; 4) In case the contractor fails to make payment within

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						the prescribed period or make short payment, then the principal employer shall be liable to make payment of the wages in full or the unpaid balance due, as the case maybe, to the inter-State migrant workman employed by the contractor and recover the amount so paid from the contractor either by deduction from any amount payable to the contractor under any contract or as a debt payable by the contractor • The wage rate of an interstate migrant worker shall in no case be paid less than the wages fixed under the Minimum Wages Act, 1948, 2. Wages payable to an interstate migrant workman shall be paid in cash • There shall be paid by the contractor to every interstate migrant worker at the time of recruitment, a displacement allowance equal to fifty per cent of the monthly wages payable to him or seventy-five rupees whichever is higher • The amount paid to a worker as displacement allowance shall not be refundable and shall be in addition to the wages or other amount payable to him
34.	The building and other Construction Workers Act, 1996	×	√	√	Labour Department	Ensure safety measures at construction work site and other welfare measures such as canteens, first-aid facilities, ambulance, housing accommodation for Workers near the Workplace etc. **Overtime Payment** Wages for overtime work: 1) Where any building worker is required to work on any day in excess of the number of hours constituting a normal working day, he shall be entitled to wages at the rate of twice his ordinary rate of wages; 2) The ordinary rate of wages means the basic wages plus such allowances as the worker is for the time being entitled to but does not include any bonus. **Workers' Accommodation** (1) The employer shall provide, free of charges and within the work site or as near to it as may be possible, temporary living accommodation to all building workers employed by him for such period as the building or other construction work is in progress. (2) The temporary accommodation provided under sub-section (1) shall have separate cooking place, bathing, washing and lavatory facilities. (3) As soon as may be, after the building or other construction work is over, the employer shall, at his own cost, cause removal or demolition of the temporary structures erected by him for the purpose of providing living accommodation, cooking place or other facilities to the building workers as required under sub-section (1) and restore the ground in good level and clean condition. **Creches** (1) In every place wherein, more than fifty female building workers are ordinarily employed, there shall be provided and maintained a suitable room or rooms for the use of children under the age of six years of such female workers. (2) Such rooms shall— (a) provide adequate accommodation; (b) be adequately lighted and ventilated; (c) be maintained in a clean

Sr. No.	Applicable Regulation/Permit	Pre-Construction	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
						and sanitary condition; (d) be under the charge of women trained in the care of children and infants.
35.	The Industries Disputes (Amendment) Act, 2010	×	√	√	Labour Department	• Every industrial establishment employing twenty or more workmen shall have one or more Grievance Redressal Committee for the resolution of disputes arising out of individual grievances. • The Grievance Redressal Committee shall consist of equal number of members from the employer and the workmen. • The chairperson of the Grievance Redressal Committee shall be selected from the employer and from among the workmen alternatively on rotation basis every year. • The total number of members of the Grievance Redressal Committee shall not exceed more than six: Provided that there shall be, as far as practicable, one-woman member if the Grievance Redressal Committee has two members and in case the number of members is more than two, the number of women members may be increased proportionately. • Notwithstanding anything contained in this section, the setting up of Grievance Redressal Committee shall not affect the right of the workman to raise industrial dispute on the same matter under the provisions of this Act. • The Grievance Redressal Committee may complete its proceedings within forty-five days on receipt of a written application by or on behalf of the aggrieved party. • The workman who is aggrieved of the decision of the Grievance Redressal Committee may prefer an appeal to the employer against the decision of Grievance Redressal Committee and the employer shall, within one month from the date of receipt of such appeal, dispose of the same and send a copy of his decision to the workman concerned. • Nothing contained in this section shall apply to the workmen for whom there is an established Grievance Redressal Mechanism in the establishment concerned.
36.	Trade Union Act, 1926	×	√	√	Labour Department	Any seven or more members of a Trade Union may, by subscribing their names to the rules of the Trade Union and by otherwise complying with the provisions of this Act with respect to registration, apply for registration of the Trade Union under this Act. The admission of ordinary members who shall be persons actually engaged or employed in an industry with which the Trade Union is connected, and also the admission of the number of honorary or temporary members to form the executive of the Trade Union
37.	Persons with Disabilities Act, 1995 and Persons with Disability Rules 1996	×	√	√	Labour Department	• Give effect to the proclamation on the full participation and equality (equal opportunities) of people with disabilities and protection of rights • The employer in every establishment shall furnish such information or return as may be prescribed in relation to vacancies appointed for person, with disability that have occurred or are about to occur in that establishment to such Special Employment Exchange as may be prescribed and the establishment shall thereupon comply with such requisition.

Sr. No.	Applicable Regulation/Permit	Pre-Construction	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
						• Every employer shall maintain such record in relation to the person. With disability employed in his establishment in such form and in such manner as may be prescribed by the appropriate Government • Every appropriate Government shall appoint in every establishment such percentage of vacancies not less than three per cent. for persons or class of persons with disability of which one per cent. Each shall be reserved for persons suffering from- o Blindness or low vision; o Bearing impairment; o Loco motor disability or cerebral palsy, in the posts identified for each disability: • Provided that the appropriate Government may, having regard to the type of work carried on in any department or establishment, by notification subject to such conditions, if any, as may be specified in such notification, exempt any establishment from the provisions of this section.
38.	Motor Vehicles Act, 1988	×	√	√	Labour Department	The Motor Vehicles Act, 1988 is an Act of the Parliament of India which regulates all aspects of road transport vehicles. The Act came into force from 1 July 1989. It replaced Motor Vehicles Act, 1939 which earlier replaced the first such enactment Motor Vehicles Act, 1914.[1] The Act provides in detail the legislative provisions regarding licensing of drivers/conductors, registration of motor vehicles, control of motor vehicles through permits, special provisions relating to state transport undertakings, traffic regulation, insurance, liability, offences and penalties, etc. For exercising the legislative provisions of the Act, the Government of India made the Central Motor Vehicles Rules 1989
39.	Shops and Establishment Act 1953	×	×	√	Labour Department	• This is a state legislation act and each state has framed its own rules for the Act. • The act lays down rules regarding working hours, guidelines for national holidays and rules of leave etc. • The employer must send a statement in prescribed form along with prescribed fee to inspector of local area within 30 days of the commencement of the establishment, containing: o Name of employer or manager o The postal address of the establishment o Category of the establishment o Any other particulars as may be prescribed • Any change in the statement submitted to the Inspector must be notified in prescribed form ,form, including closing of establishment • No employee is allowed to work more than 9 hours in a day or 48 hours in a week • An employee may be allowed to work up to 3 hours a week over this limit and up to 26 hours of 6 days in a year for purposes of making of accounts, stock taking settlements • No employee is allowed to work for more than 5 hours at a stretch unless he is given rest for half an hour in case the establishment is engaged in manufacturing process and 1 hour in any other cases • Every establishment shall remain close on any one day of the week • No child may be allowed to work in any establishment

Sr. No.	Applicable Regulation/Permit	Pre-Construction	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
						• No young person is allowed to work in any establishment for more than 3 hours in a day unless he has an interval of rest of at least 30 mins • No young person or women is allowed to work before 1.00am and after 7.00 pm in any establishment and to perform any such work as may be declared by the State Govt. to be involving danger of life, health or morale. • Premises should be clean and free from effluvia arising from any drain or privy or other nuisance and shall be cleaned at such times and by such methods as may be described which may include, lime washing, colour washing, painting, varnishing, disinfecting and deodorizing. • Every establishment should be well lighted and 'd also provide prescribed precautions against fire. • A first aid box should be maintained at every establishment where manufacturing process is carried out. • An employee who has worked for not less than 3 months in a year is allowed for leave not less than 5 days for every 60 days on which he has worked and for a period of not less than 21 days for every 240 days on which he works during ana year. Such leave may be accumulated for a maximum of 63 days. • In addition, every employee is entitled to: o casual leave for 7 days a year; o medical leave for 7 days a year; o leave for not more than 4 days a year on any of national or o festival holidays as specified by State Govt. These leaves are with wages. • If an employee has been in continuous employment for not less than one year, employer can dispense his services only by giving minimum of 30 days' notice in writing or wages in lieu of such notice.
40.	The Companies Act 2013 and Rules 2014	√	√	√	Labour Department	• This Act aims to protect and empower investors and other stakeholders while bringing in greater transparency in corporate governance. • This section is applicable on companies having a: o net worth of Rs 500 crore or more during any financial year, or o turnover of Rs 1000 crore or more, or o net profit of Rs 5 crore or more. • the companies meeting the threshold criteria specified should spend in every financial year, at least 2% of the average net profits of the company made during the three immediately preceding financial years, in pursuance of CSR Policy.
41.	Ancient Monuments and Archaeological Sites and Remains Act 1958	×	√	×	Labour Department	• This Act places restrictions on the destruction, alteration, defacement or removal of monuments and on construction on or near the site of any protected monument. • No person, including the owner or occupier of a protected area, shall construct any building within the protected area or carry on any mining, quarrying, excavating, blasting or any operation of a like nature in such area, or utilise such area or any part thereof in any other manner without the permission of the Central Government

Sr. No.	Applicable Regulation/Permit	Pre-Construction	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
42.	Private Security Agencies (Regulation) Act, 2005	×	√	√	Private Security Agency, Maharashtra	An Act to provide for regulations of private security agencies and for matters connected therewith or incidental thereto. Per the provision of the Act – No person shall carry on or commence the business of private security agency, unless he/she holds a license issued under this Act
Ecology						
43.	Wildlife (Protection) Act, 1972	√	√	√	Wildlife Warden, Maharashtra Forest Department	Due to the presence of protected floral and/or faunal species (listed in Schedules of Wildlife (Protection) Act, 1972) are recorded from the project area, the proponent should implement conservation measures for their protection.
International Regulations, Treaties and Conventions						
44.	The International Convention for the Prevention of Pollution from Ships (MARPOL)	×	×	√	International Maritime Organization	The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. The Convention includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six technical Annexes. Special Areas with strict controls on operational discharges are included in most Annexes. The annexes include the following: • Annex I: Regulations for the Prevention of Pollution by Oil,1983 • Annex II: Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk, 1983 • Annex III: Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form, 1992 • Annex IV: Prevention of Pollution by Sewage from Ships, 2003 • Annex V: Prevention of Pollution by Garbage from Ships, 1988 • Annex VI: Prevention of Air Pollution from Ships, 2005
45.	The Protocol on Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances	×	×	√	International Maritime Organization	Protocol aims to establish national systems for preparedness and response and to provide a global framework for international co-operation in combating major incidents or threats of marine pollution. Parties to the OPRC-HNS Protocol are required to establish measures for dealing with pollution incidents, either nationally or in co-operation with other countries.
46.	International Maritime Dangerous Goods (IMDG) Code	×	×	√	International Maritime Organization	The IMDG Code was developed as an international code for the maritime transport of dangerous goods in packaged form, in order to enhance and harmonize the safe carriage of dangerous goods and to prevent pollution to the environment. The Code sets out in detail the requirements applicable to each individual substance, material or article, covering matters such as packing, container traffic and stowage, with particular reference to the segregation of incompatible substances.
47.	International Convention for the Safety of Life at Sea (SOLAS), 1974	×	×	√	International Maritime Organization	The main objective of the SOLAS Convention is to specify minimum standards for the construction, equipment and operation of ships, compatible with their safety. Control provisions allow Contracting Governments to inspect ships of other Contracting States if there are clear grounds for believing that the ship and its equipment do not substantially comply with the requirements of the Convention - this procedure is known as port State control. The current SOLAS Convention includes Articles setting out general obligations,

Sr. No.	Applicable Regulation/Permit	Pre-Construction	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
						amendment procedure and so on, followed by an Annex divided into 14 Chapters.
48.	The International Ship and Port Facility (ISPS) Code	×	×	√	International Maritime Organization	The main objectives of the ISPS Code include: • Establishment of an international framework that fosters cooperation between Contracting Governments, Government agencies, local administrations and the shipping and port industries, in assessing and detecting potential security threats to ships or port facilities used for international trade, so as to implement preventive security measures against such threats • Determining the respective roles and responsibilities of all parties concerned with safeguarding maritime security in ports and on-board ships, at the national, regional and international levels • To ensure that there is early and efficient collation and exchange of maritime security-related information, at national, regional and international levels • To provide a methodology for ship and port security assessments, which facilitates the development of ship, company and port facility security plans and procedures, which must be utilised to respond to ships' or ports' varying security levels • To ensure that adequate and proportionate maritime security measures are in place on board ships and in ports.
49.	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matte	×	√	√	International Maritime Organization	The "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972", the "London Convention" for short, is one of the first global conventions to protect the marine environment from human activities and has been in force since 1975. Its objective is to promote the effective control of all sources of marine pollution and to take all practicable steps to prevent pollution of the sea by dumping of wastes and other matter.
50.	United Nations Convention on Law of the Sea	×	×	√	The Division for Ocean Affairs and the Law of the Sea (DOALOS) of the Office of Legal Affairs of the United Nations	The United Nations Convention on the Law of the Sea was adopted in 1982. It lays down a comprehensive regime of law and order in the world's oceans and seas establishing rules governing all uses of the oceans and their resources.
51.	Kyoto Protocol: The 3rd Conference of the Parties to the Framework Convention on Climate Change (FCCC) in Kyoto in December 1997 introduced the Clean Development Mechanism (CDM) as a new concept for voluntary greenhouse-gas emission reduction agreements.	√	√	√	MoEFCC, Government of India United Nations Framework Convention on Climate Change	The Kyoto Protocol operationalizes the United Nations Framework Convention on Climate Change by committing industrialized countries and economies in transition to limit and reduce greenhouse gases (GHG) emissions in accordance with agreed individual targets
52.	Montreal Protocol	×	√	√	MoEFCC, Government of India United Nation Environment Programme (UNEP)	The Montreal Protocol on Substances that Deplete the Ozone Layer is the landmark multilateral environmental agreement that regulates the production and consumption of nearly 100 man-made chemicals referred to as ozone depleting substances (ODS). The Montreal Protocol phases down the consumption and production of the different ODS in a stepwise manner, with different timetables for developed and developing countries.

3.4 ADB's Requirement

In July 2009, ADB's Board of Directors approved the Safety Policy statement (SPS) governing the environmental and social safeguards of ADB's operations. The SPS builds upon ADB's previous safeguard policies on the Environment, Involuntary Resettlement, and Indigenous Peoples, and brings them into one consolidated policy framework with enhanced consistency and coherence, and more comprehensively addresses environmental and social impacts and risks. The SPS applies to all ADB-supported projects reviewed by ADB's management after 20 January 2010. ADB works with borrowers to put policy principles and requirements into practice through project review and supervision, and capacity development support. .

ADB adopts a set of specific safeguard requirements that are required to address environmental and social impacts and risks:

- Safeguard Requirements 1: Environment – The Environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts. The projects are initially screened to determine the level of assessment that is required. ADB categorizes the projects into three project categories based on the severity, sensitivity, and the magnitude of its potential environmental impacts: Category A (if the project likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. An environmental impact assessment (EIA), including an environmental management plan (EMP), is required); Category B (if the project likely to have potential impacts are less adverse than category A and minor impacts expected can be mitigated. An initial environmental examination (IEE), including an EMP, is required); and Category C (if the projects likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required).
- Requirements for Existing Facilities: For projects involving facilities and/or business activities that already exist or are under construction, the projects will undertake an environment and/or social compliance audit, including on-site assessment, to identify past or present concerns related to impacts on the environment, involuntary resettlement, and Indigenous Peoples. The objective of the compliance audit is to determine whether actions were in accordance with ADB's safeguard principles and requirements for projects and to identify and plan appropriate measures to address outstanding compliance issues. Where noncompliance is identified, a corrective action plan agreed on by ADB and the borrower will be prepared. The plan will define necessary remedial actions, the budget for such actions and the time frame for resolution of noncompliance. The audit report (including corrective action plan, if any) will be made available to the public in accordance with the information disclosure requirements of the Safeguard Requirements 1–3. If a project involves an upgrade or expansion of existing facilities that has potential impacts on the environment, involuntary resettlement, and/or Indigenous Peoples, the requirements for environmental and social impact assessments and planning specified in Safeguard Requirements 1-3 will apply in addition to compliance audit.
- Safeguard Requirements 2: Involuntary Resettlement – The policy is designed to avoid the risk of impoverishment among those displaced as a direct result of ADB investment. The policy recognizes that restoring the incomes and living standards of the affected people is complex, and requires a development strategy that encompasses compensation, resettlement and rehabilitation packages to improve, or at least restore, their social and economic base. The ADB's Policy on Involuntary Resettlement stipulates three important elements in involuntary resettlement: (i) compensation for lost assets and loss of livelihood and income, (ii) assistance in relocation including provision of relocation sites with appropriate facilities and services, and (iii) assistance with rehabilitation to achieve at least the same level of well-being with the project as before.
- Safeguard Requirements 3: Indigenous Peoples[29] – The Policy on Indigenous Peoples is triggered if a project directly or indirectly affects the dignity, human rights, livelihood systems, or culture of indigenous peoples or affects the territories or natural or cultural resources that indigenous peoples own, use, occupy, or claim as an ancestral domain or asset. The policy on states that the borrower/ client will ensure (i) that affected indigenous peoples receive culturally appropriate social and economic benefits; and (ii) that when potential adverse impacts on indigenous peoples are identified, these will be avoided to the maximum extent possible. Where this avoidance is not feasible, based on meaningful consultation with indigenous communities, the Indigenous Peoples Plan (IPP) will be prepared which outlines measures to minimize, mitigate, and compensate for the adverse impacts.
- Social Project Strategy (2001): The key in ADB's Social Protection Strategy is that it requires compliance with the ILO's core labor standards. The four internationally recognized core labor standards (CLS) represent the eight ILO conventions which are covered in ADB's social protection strategy is governed by. These CLS include: 1. Freedom from child labour (No. 138,

[29] Indigenous Peoples may be referred to in different countries by such terms as indigenous ethnic minorities, indigenous cultural communities, aboriginals, hill tribes, minority nationalities, scheduled tribes, or tribal groups. Such groups can be considered Indigenous Peoples

182), 2. Freedom from forced labour (No.29, 105), 3. Freedom from discrimination at work (No. 100, 111)4. Freedom to form and join a union, and to bargain collectively (No.87, 98).

- Gender Development (1998): ADB aims to operationalize its policy on gender and development (GAD) primarily through mainstreaming gender considerations into all ADB operations. However, ADB will continue to develop and finance stand-alone projects directed at correcting gender disparities and promoting the empowerment of women, especially in developing member countries (DMCs) with glaring gender inequalities.
- Access to Information Policy (2018): The policy reflects ADB's commitment to transparency, accountability, and participation by stakeholders in ADB-supported development activities in Asia and the Pacific. It also recognizes the right of people to seek, receive, and impart information about ADB's operations.

3.5 IFC's General Environmental, Health & Safety (EHS) guidelines, 2007

General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are taken into account.

3.6 IFC's Environmental, Health, and Safety Guidelines for Ports, Harbours, and Terminals.

IFC's Environment, Health and Safety Guidelines for Ports, Harbours and Terminals includes the following:

- As part of the design and siting of port facilities, surveys, assessment and modeling of metocean,
- hydrological, sedimentological and coastal geomorphological conditions should be carried out together with an identification of potential adverse impacts on coastal processes such as erosion and accretion, from the placement of new physical structures. Design, siting considerations and coastal protection measures (e.g., beach nourishment, sand bypassing, groynes, seawalls, coastal revegetation, etc.) should be considered to minimize adverse impacts from these structures.
- As part of a coastal processes monitoring and management plan, projects should conduct a risk assessment of littoral sediment transport, shoreline
- morphology and erosion patterns and trends, and coastal inundation profiles; define monitoring requirements (e.g., beach profiling, satellite imagery/remote sensing); and identify action triggers.
- Ports should implement systems for the proper screening, acceptance, and transport of dangerous cargo based on local and international standards and regulations.

3.7 IFC Environmental, Health, and Safety Guidelines for Shipping

The EHS Guidelines for Shipping include information relevant to the operation and maintenance of ships used for the transport of bulk cargo, and goods. The EHS Guidelines for Shipping apply to vessels operated with fossil fuels and do not address issues specific to nuclear powered vessels. The guidelines cover the following:

- Industry specific Environmental, Occupational Health (OHS) and Safety and Community Health and Safety (CHS) Impacts and Management
- Environmental, OHS and CHS Performance Indicator and Monitoring

3.7.1 Applicability of ADB Safeguards

The applicability of ADB safeguards to the Project has been summarized in ***Table 3-3***.

Table 3-3: Applicability of ADB Safeguards to the Project

Sr. No.	ADB Safeguard	Applicability/ Compliance
1.	Safeguard Requirements 1: Environment	Applicable The Environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts. An Initial Environmental & Social Examination (IESE) for the proposed project has been

Sr. No.	ADB Safeguard	Applicability/ Compliance
		undertaken to identify and assess any potentially adverse environmental and social impacts associated with the proposed Project, assess compliance with applicable laws and the applicable reference framework, determine the measures needed to prevent or minimize and mitigate the adverse impacts, and identify potential environmental and social opportunities, including those that would improve the environmental and social sustainability of the Project. The proposed project is likely to have environmental impacts during construction and operation phase including air emissions due to operation of D.G. sets, machinery & equipment and vehicular movement; wastewater and waste (hazardous and non-hazardous) generation; contamination due to leakage and accidental spill of hazardous material; and occupational health & safety issues due to handling of dangerous goods.
2.	Safeguard Requirements 2: Involuntary Resettlement	Not Appliable As the project does not require additional land acquisition and there is no potential adverse social impact related to involuntary resettlement due to the proposed project. Further, proposed project shall be developed on existing land of JNPT which will be given to NSFPTL for 30 years concession period, as well as there are no close by communities and only authorized perrons can enter the terminal/port therefore proposed project does not have potential negative impacts and such adverse social impacts on Involuntary Resettlement related due to project is not anticipated. For more details refer to ***section 2.4***
3.	Safeguard Requirements 3: Indigenous Peoples	Not Applicable As the project does not require additional land acquisition and there is no potential adverse social impact on Ips due to the proposed project. Further, proposed project shall be developed on existing land of JNPT which will be given to NSFPTL for 30 years concession period, as well as there are no close by communities and only authorized perrons can enter the terminal/port therefore proposed project does not have potential negative impacts and such adverse social impacts on IPs/IR related due to project is not anticipated. Additionally, during the construction and operation phase of the Project, the project will not have direct interaction or project's induced impact towards the local community. However, there will be limited impacted related to the community health and safety (refer to ***section 7.6.1.7*** and ***7.6.2.7***)

4 Environmental and Social Baseline Conditions

This section describes the existing environmental and social sensitivities of the study area (as described below). The sensitivities include the relevant components of the physical, biological, and socio-economic environment. The purpose of describing the environmental and social sensitivities of the study area is to:

- To describe the environmental characteristics of the Project site and surrounding areas to identify key resources and receptors that will be affected by the Project during the scoping process.
- To determine if any nearby communities or structures will be affected by the Project establishment; and
- To understand the significance of the different habitats within the study area and its importance for sustaining species of conservation importance, in terms of providing habitat contiguity to the surrounding region and dependency of surrounding communities

4.1 Study Area

The area of up to 5 km radius from the Project boundary (JNPCT) has been demarcated as the study area considering the direct activities of the Port and the JNPCT. The study area has also been demarcated considering the extent of the JNPCT (direct or indirect) past impacts. The past impacts of the JNPCT may include:

- Land acquisition
- Rehabilitation of the resettled household due to development of the JNPCT
- Impact on the socio-economic condition of villages falling within 5 km radius of the JNPCT's location
- Impact of air quality in the area
- Increase of noise pollution in the area
- Changes in the physical structures in the area such as construction of access roads, new settlement area, and other physical structure.
- Significant direct and indirect impacts on biological environment in the area

Thus, considering these past impacts, the study area has been demarcated as of 5 km – to understand the physical, biological, and socio-economic condition of the settlements (villages) in the 5 km radius from the JNPCT location. Further, the socio-economic baseline has also considered two (2) villages named Hanuman Koliwada and Sheva which are falling outside the 5 km radius. The reason of selecting these two villages is because these villages were selected to resettle the households impacted due to land acquisitions for the port.

For ecological assessment, the study area was considered as 5 km for the primary observation and consultations. At the same time, the secondary data available in the form of previous reports / studies within the range of 10-20 km were also considered[30, 31, 32, 33, 34]. Thus, the baseline data presented in the current report covers a buffer of at least 10 km (in general); and 20 km for marine fauna. For details refer Section 4.3.Details of the villages falling under the study area are provided below:

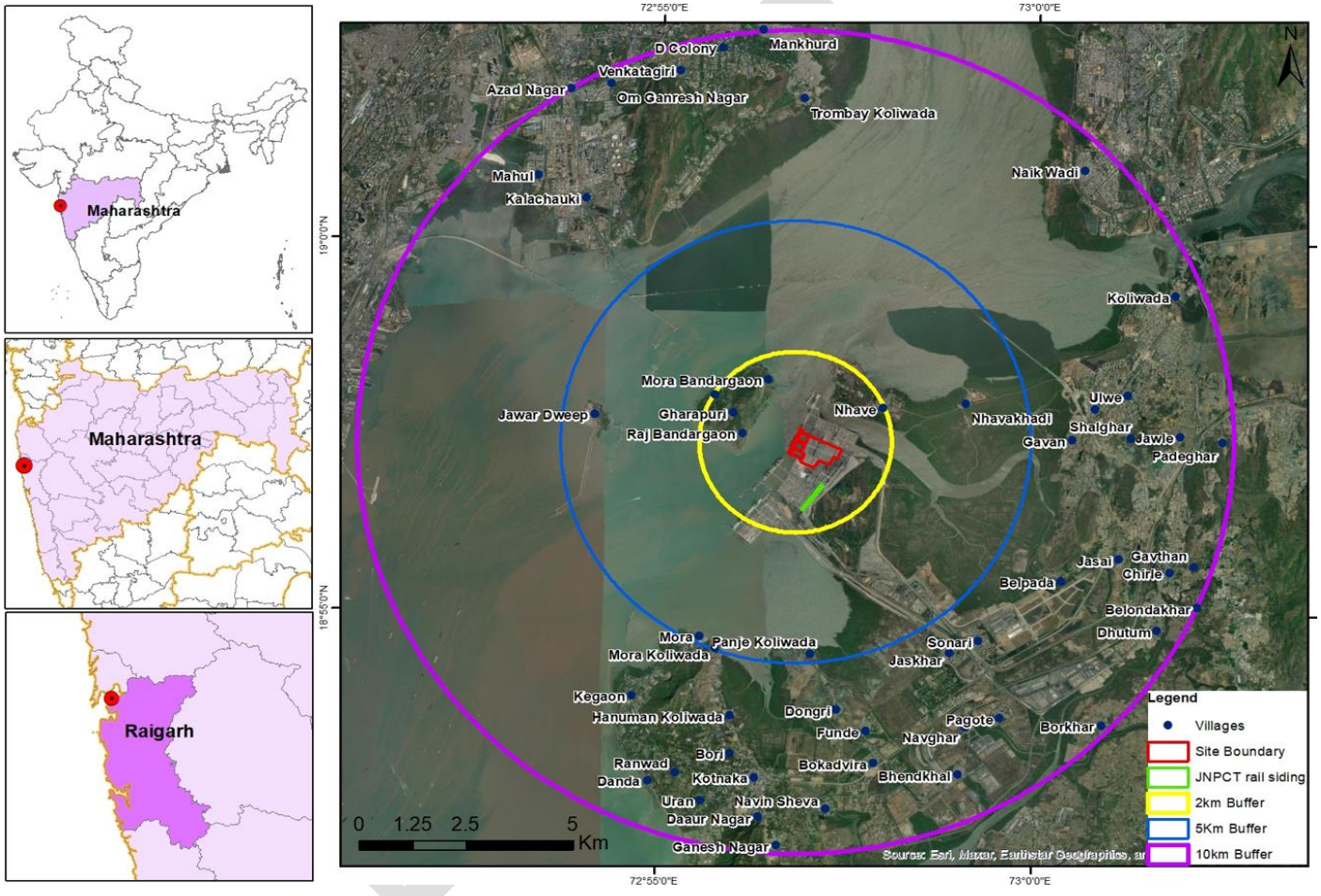
Table 4-1: Villages falling under the study area

Sr. No.	Villages falling under study area
1.	Gharapuri
2.	Raj Badargaon
3.	Mora Bandargaon
4.	Nhave

[30] Studies on the impact of dredging on marine ecology at Jawaharlal Nehru Port, Navi Mumbai. CSIR-National Institute of Oceanography, Mumbai, India.
[31] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.
[32] Narwade, S.S., Prabhu, M.V., Shaikh, P.A., Ambavane, P.A. and Rahmani, A.R. (2014) Baseline survey of birds at the proposed NMIA area. Annual Report - III, January-December, 2014. Submitted to CIDCO, Navi Mumbai, Maharashtra by BNHS, India, pp 63.
[33] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.
[34] Mumbai Trans Harbor Link Project - Supplemental Environmental Impact Assessment (2015). Mumbai Metropolitan Region Development Authority.

Sr. No.	Villages falling under study area
5.	Sheva
6.	Panje
7.	Mora Koliwada
8.	Mora
9.	Hanuman Koliwada
10.	Bokadvira

Figure 4-1: Map depicting villages in the study area



Source: ArcGIS Imagery Mapping

4.2 Physical Environmental Sensitivities

4.2.1 Land use

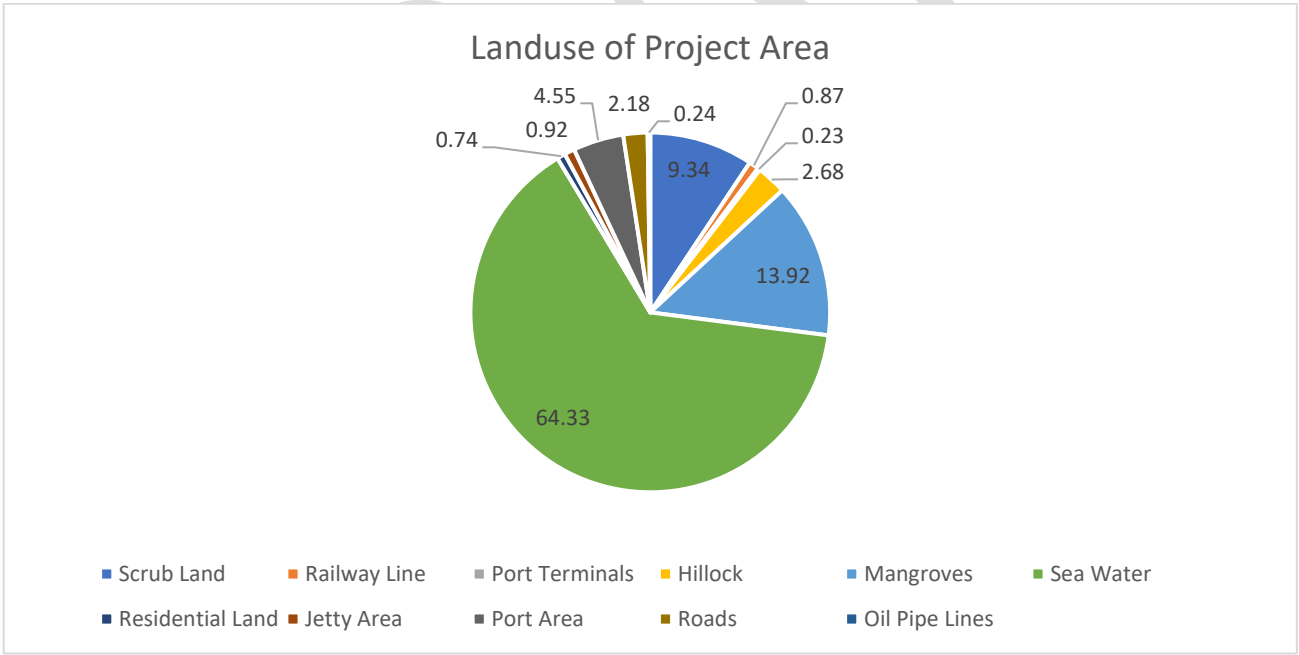
With changing nature of land use patterns in the study area, land use/cover inventories are an essential component in land resource evaluation and environmental studies. As observed during site visit and as per satellite imagery, majority of the study area is surrounded by sea water (64.3%) followed by mangroves (~14%). A detailed analysis of the landuse of the study area has been presented in ***Table 4-2*** and map showing land use of the study area has been presented in ***Figure 4-3.***

Table 4-2: Landuse Break up of the Study Area

S.No.	LU Category	Area (Ha)	%
1.	Scrub Land	851.16	9.34
2.	Railway Line	79.76	0.87
3.	Port Terminal	20.71	0.23
4.	Hillock	244.78	2.68
5.	Mangroves	1269.20	13.92
6.	Sea Water	5864.82	64.33
7.	Residential Land	67.51	0.74
8.	Jetty Area	83.97	0.92
9.	Port Area	414.72	4.55
10.	Roads	198.52	2.18
11.	Oil Pipe Lines	21.54	0.24
	Total Area (Ha)	**9116.69**	**100**

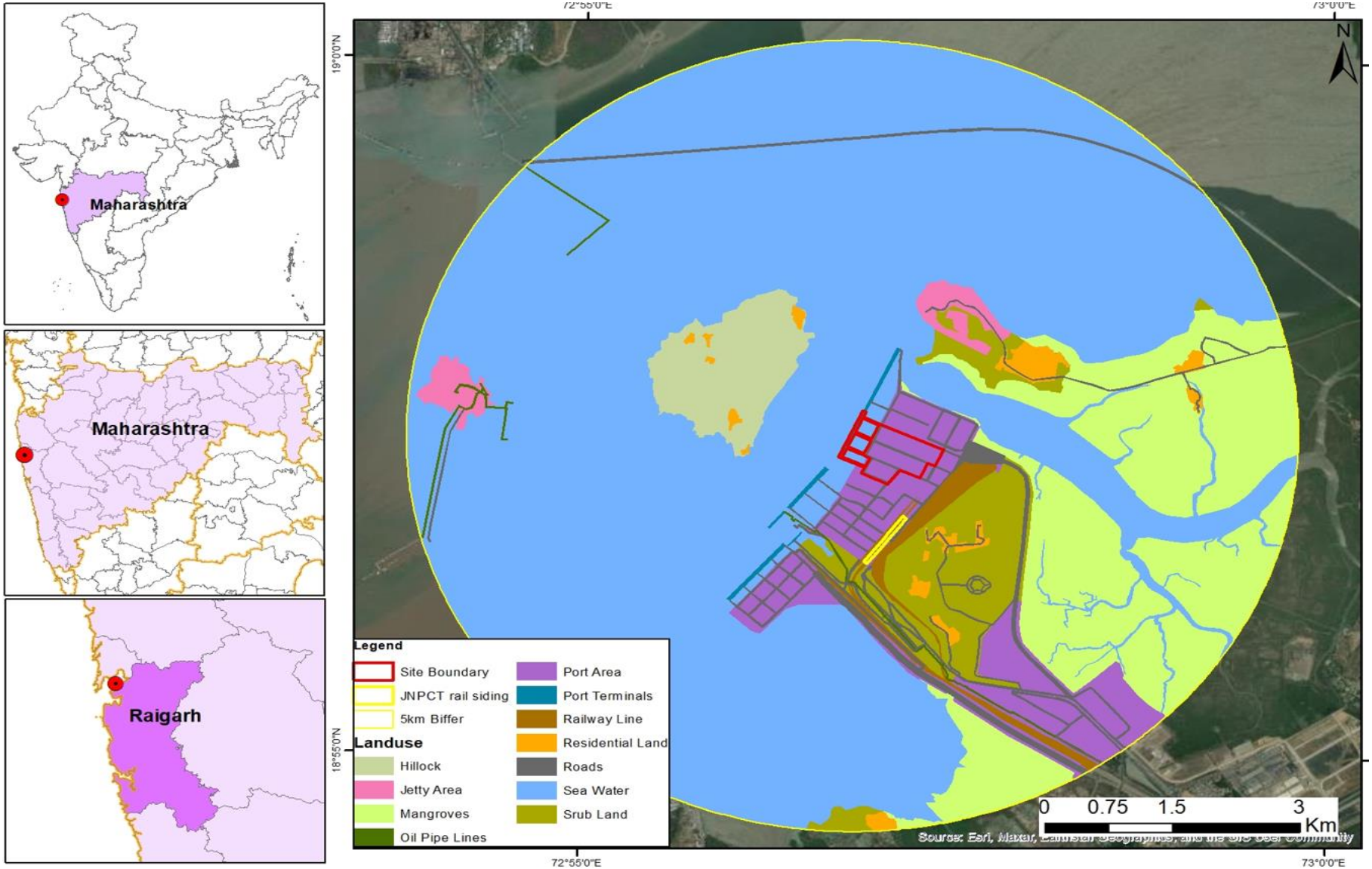
Source: ArcGIS Imagery Mapping

Figure 4-2: Land use break up of Study Area



Source: ArcGIS Imagery Mapping

Figure 4-3: Land use of the Study Area



Source: ArcGIS imagery Mapping

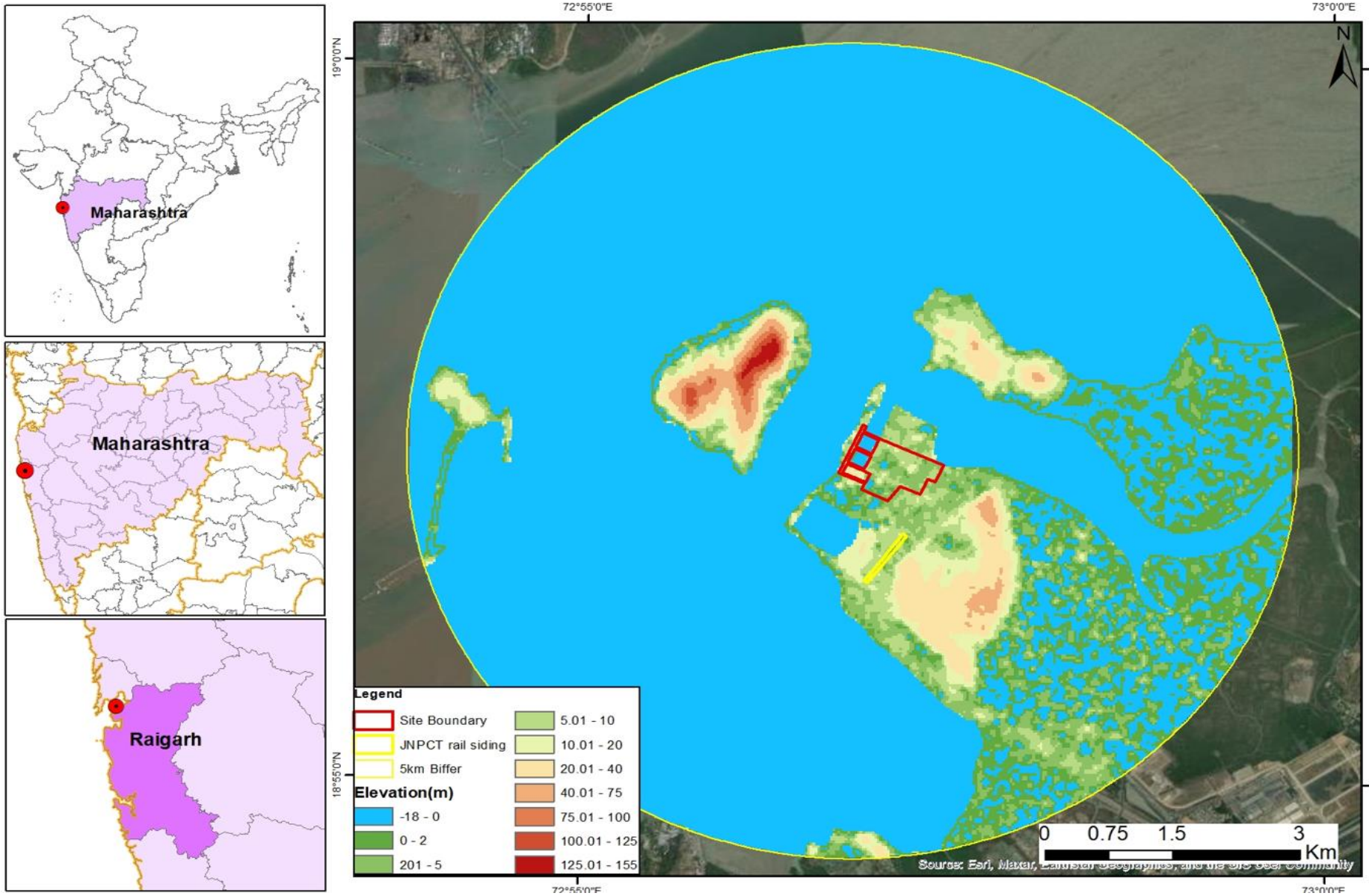
4.2.2 Topography

Jawaharlal Nehru Port is located at 18° 56' 43" N (latitude) and 72° 56' 24" E (longitude) along the eastern shore of Mumbai harbour of Elephanta Island.[35] According to report on landuse plan under JNPA jurisdiction dated August 2022[36], the highest level of the JN Port is at 45m above the sea level, on Sheva hill. Overall, the port is predominantly located on flat land with natural drainage towards north west and north east.

As observed during site visit and as per satellite imagery, the elevation of the proposed project (JNPCT) was observed with to be ranging between -18m to 10 m above mean sea level. The topographical map showing elevation of the study area has been presented in ***Figure 4-4***.

[35] https://www.jnport.gov.in/location
[36] https://www.jnport.gov.in/filedata/Report_on_land_Use_Plan_for_JNPA___August_2022__23_2022_10_06_17_04_09.pdf

Figure 4-4: Topography map of the Study Area



Source: ArcGIS Imagery Mapping

4.2.3 Geology and Soil

According to CGWB[37] study for Raigarh District (where the proposed project fall), there are three physiographic divisions within the district i.e. (i) Coastal zone in west covers about 20% percent of the district (ii) Central zone covers about 1/3 rd. of the district, consisting of fertile land in low lying area (iii) Hilly zone in the eastern part highly uneven in altitude and covered with forest. This hill range is characterized by ruggedness and uneven topography, with crestline of peaks and saddles forming the eastern horizon. Ulhas, Panvel and Patalganga are the three main rivers in northern part. Kundalika River is the main river in central part whereas in the southern part Savitri River is the main river. The soils in the district are formed from the Deccan Trap which is predominating rock formation with small out crops of Laterite at a few places in the Poladpur taluka and Matheran hill. The soils are grouped as Forest, Varkas, Rice, Khar or Saline, Coastal Alluvium and Laterite as per the location and topographical situation.

According to report on landuse plan under JNPA jurisdiction dated August 2022, the typical soil characteristics at the JN Port are silty clay or marine clay overlaying basalt rock. However, the thickness of silty/marine clay varies at different locations. While at the Nhava creek area in shallow waters, the silty clay has thickness varying from 2 m to 7 m. However, in the Uran mudflat area it is much higher at about 15 to 20 m.

4.2.4 Oceanographic Information

4.2.4.1 Temperature

JNPA conducts monthly marine water quality assessment at the JNP Harbour. Based on the marine water quality assessment for the month of August 2022, the temperature of marine water was recorded to be between 28.14^0 C -31.16^0 C. Furthermore, as per the annual environmental monitoring report for FY 2021-22 for JNPA, the annual mean temperature of marine water ranged between 25.10^0 C and 32.80^0 C. According to sea temperature.org[38], the maximum sea water temperature during summers reach upto 31.6°C in the month of June and minimum remains at 28°C in March. Similarly, the maximum temperature in winters (December to February) goes upto 28.9 °C in December and minimum remains at 24.3°C in the month of January. During Monsoon (mid-June to September), the maximum temperature remains between 29 °C -31 °C and minimum remains between at 26 °C and 27 °C.

4.2.4.2 Current

According to JNPA[39], the currents in the Mumbai Harbour and the near shore zone are tide induced with reversal at high and low waters. The current strength ranges from 1.5 to 3 knots. Current speeds and directions within the bay and associated tributaries are largely due to tidal movements and show little variations from non-monsoon to monsoon. The maximum current speed in the outer Bay exceeds 1m/s. The maximum current speed decrease in the inner Nhava creek and are typically around 0.8 m/s, decreasing during neap tide. According to Central Water and Power Research Station (CWPRS) report dated February 2000, CWPRS studied current direction at JNP harbour. The general flow direction was recorded to be around 360 degrees North during flood and 180 degree North during ebb.

The excursion lengths and average current speed of the Bay on available drogue trajectories are presented in Table below.

Table 4-3: Tide Excursion at Mumbai Harbour

Tide	Excursion Length (km)		Average Current Speed (m/s)	
	Flood	Ebb	Flood	Ebb
Spring	11.5	11.5	0.5	0.55
Neap	5.5	6.0	0.25	0.3

Source: https://www.jnport.gov.in/

[38] https://www.seatemperature.org/asia/india/navi-mumbai.htm
[39] https://www.jnport.gov.in/

4.2.4.3 Tides

The dominant tide in the Harbour side over Mumbai is the semi-diurnal tide with a period of 12 hours and 40 minutes. The below *Table 4-4* represents the particulars of tidal level related to Chart Datum.

Table 4-4: Tidal Information on Harbour area over Mumbai

Tide	Above(+) or Below(-) Chart Datum
Highest High Water recorded	+ 5.38 m
Mean High Water Spring Tides.	+ 4.42 m
Mean High Water Neap Tides.	+ 3.30 m
Mean Sea Level.	+ 2.51 m
Mean Low Water Neap Tides.	+ 1.86 m
Mean Low Water Spring Tides.	+ 0.76 m
Lowest Low Water recorded.	- 0.46 m
Highest Low Water	+ 2.74 m

Source: Mumbaiport.gov.in

According to statistical studies conducted by Mumbai Port Authority, the studies indicated that :-

- All high tides exceed + 2.70 m.
- About 5% of all high tides would be less than + 3.20 m.

4.2.4.4 Waves

According to the Mumbai Port Authority, the predominant waves are the swell waves generated by deep sea storms. These mainly arise just before and during the South West monsoon. The statistical analysis indicates that most wave periods fall between 6 seconds and 10 seconds.

During the continuance of the North-East monsoon, North-Easterly winds known as "Elephantas" blow for short durations during the months of October-November. As the fetch and duration of these winds are limited, the "significant height" of the resulting waves is not likely to exceed 1 meter with period ranging from 3 to 5 seconds.

Offshore wind

According to the Offshore wind data compiled by Indian Meteorological Department (IMD) based on ship observations in the area enclosed by Latitude 15° N to 20° N and longitude 70° E to 75° E for the period 1986 to 2001the wind blows from the SW to N sector for 83% of the time and the predominant wind direction is north (45.7%). The wind speed is less than 15 m/s (54 km/hr) for 75% of the time and 20 m/s (72 km/hr) for 90% of the time. The percentage of occurrence of wind speeds is as follows:

- 0 to 18 kmph - 14.6 %
- 18 to 36 kmph - 32.4 %
- 36 to 54 kmph - 27.5%
- 54 to 72 kmph - 15.0%
- 72 to 90 kmph - 7.0%
- 90 to 108 kmph - 3.5%

4.2.4.5 Cyclones

Based on the weather details on Mumbai Port Authority, the cyclones may occur in the period of May/June or October/November. The last severe cyclone off the coast of Mumbai was experienced in June 1996. Prior to this the earlier cyclone occurred in 1992. Occasionally, sudden high winds also occur during the fine weather period from north east.[40]

4.2.5 Meteorological Conditions

The meteorology of the study area is based on the climatological data (1981-2010) for India Meteorological Department (IMD) station at Mumbai (Colaba) located ~40 km from site is given in ***Table 4-5.***

Table 4-5: Climatological Data (1981-2010)

Month	Mean Temperature (°C)		Humidity		Rainfall in mm	Wind Speed in Kmph
	Maximum	Minimum	% Relative Humidity	Vapour Pressure (hPa)		
January	34.4	16	78	19.5	0.9	4.6
February	34.9	17.1	76	20.3	0.2	5.4
March	35.8	20	78	24.6	0.4	5.7
April	35.1	22.9	77	28.8	0.5	5.7
May	35.4	25	76	31.5	20.2	6
June	35	23.3	83	32.9	530.2	7.4
July	32.1	23.3	89	32.5	711.6	9
August	31.7	23.3	89	31.6	493.8	8.5
September	32.7	23.2	89	31.3	330.4	5.1
October	36.4	22.8	84	29.7	78.4	4.3
November	36.3	20.7	78	25.1	14.9	4.2
December	35.3	17.7	77	21.2	2.6	4.2
Mean	**37.6**	**15.6**	**81**	**27.4**	***2184.1***	**5.8**

Source: Climatological Table 1981-2010, India Meteorological Department

4.2.5.1 Temperature

As per the data recorded at meteorological station, the maximum and minimum temperature in the study area remains constant throughout the year. October has been recorded as the hottest month with highest temperature of 36.4°C. The lowest temperature of 16°C was recorded in month of January. The daily mean minimum temperature was 15.6°C in whereas the daily mean maximum temperature 37.6°C.

According to CGWB study for Raigarh district, 2013, the climate of the district is typical of west coast and characterized with plentiful and regular seasonal rainfall, oppressive weather in summer and high humidity throughout the year. The mean minimum temperature is 17.7°C and mean maximum temperature is 31.8°C.

4.2.5.2 Rainfall

The total annual rainfall in the study area as per IMD (1981-2010) is about 2184.1 mm with a mean wind speed of 5.8 Kmph. The monsoon sets in May and attains high intensity in month of July. The monsoon withdraws towards the end of the October.

[40] https://www.mumbaiport.gov.in/index3_n.asp?sslid=693&subsublinkid=749&langid=1

Sporadic rainfall is also experienced in the month of November and December of the year. The maximum rainfall was observed during month of July (711.6 mm) and minimum during the month of February (0.2 mm).

According to CGWB study for Raigarh district, 2013, the analysis of long term rainfall data indicated that normal annual rainfall over the district ranges from 2200 mm to more than 3000 mm in the plains and it is above 5000 mm in the hills. The minimum rainfall is in the northwest around Uran (where the project site falls) i.e., 2197 mm and maximum around Mahad i.e.,3360 mm. The annual average rainfall for 10 years for (2003-2012) for Uran and Panvel tehsil, where the project site falls have been presented in ***Table 4-6*** The latest annual rainfall data trend for the Project tehsil is not available on public domain. Therefore, the rainfall data for 2003-2012 has been considered for baseline.

Table 4-6: Annual Rainfall Data for 10 years (2003-2012)

Project Tehsil	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average
Uran	2006.80	2108.30	2205.50	2433.40	2602.00	2890.00	3084.00	1800.00	2328.00	1072.00	2253.00
Panvel	3021.90	2702.00	2778.50	3878.60	3300.00	3393.00	3635.00	2367.00	2991.00	2102.00	3016.90

Source: CGWB study for Raigad district, Maharashtra, 2013

4.2.5.3 Wind

As per IMD (1981-2010) data presented above, the maximum wind speed of 9 kmph was observed during the month of July and minimum wind speed of 4.2 kmph was observed during the month of November and December. As per the annual environmental monitoring report for FY 2021-22 for JNPA, the predominant wind direction at JN Port is West North West (WNW).

4.2.5.4 Humidity

As per IMD (1981-2010) data presented above, the relative humidity is constant throughout the year. However, a slight increase in humidity was observed during the period of peak monsoon from July to October. Maximum vapour pressure of 32.9 hPa (hectopascal) is experienced in the month of June and minimum of 19.5 hPa is experienced in the month of January.

According to CGWB study for Raigarh district, 2013, Raigarh district have high humidity throughout the year. The mean relative humidity during the non-monsoon season varies from 70-73% in the morning and 62-68% in the evening. With the onset of the southwest monsoon, there is a marked increase in the humidity which remains around 80-85% till October. The humidity is less during December to February which is about 70% in the morning and 62% in the evening.

4.2.6 Environmental Monitoring

Environmental monitoring data presented as part of the IESE study is based on secondary data obtained from JNPA website, covering the study area. JNPA has appointed IIT Madras for conducting monthly environmental monitoring (air, noise, water) at various locations within the port. According to the conditions of the environmental clearance obtained for JN Port dated 16.09.1988, six air pollution monitoring stations and six water pollution monitoring stations are required to be installed at the port area and neighboring areas which are susceptible to pollution arising due to port activities. The locations for air, noise and marine water quality monitoring have been identified based on weather conditions and proximity of sensitive receptors. IIT Madras share monthly monitoring data and combined annual data with JNPA on monthly and annual basis which is uploaded on JNPA website. The annual environmental monitoring data for FY 2021-22 has been considered for the IESE study and the same is presented in subsequent sections. Primary environmental monitoring was therefore not conducted as part of the IESE study.

Map showing locations of the environmental monitoring conducted by JNPA have been presented in the ***Figure 4-5.***

4.2.6.1 Air Environment

As per the annual monitoring report, the annual ambient air monitoring was conducted at 9 locations (A2-A10) and a continuous air monitoring station was installed at 1 location (A1) for 24-hr average concentration monitoring of PM10, PM2.5, SO2 and NO2 and CO in FY 2021-22. The locations were selected based on proximity to receptors from port industrial activities, traffic movement, development activities and proximity to residential and archaeological sites. The monitoring parameters considered as part of the monitoring included Respirable Particulate Matter (RPM) i.e. PM_{10} (particulate matter of particle size less than 10

micrometers) and $PM_{2.5}$ (particulate matter of particle size less than 2.5 micrometers), Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_x) and Carbon Monoxide (CO). PM_{10}, $PM_{2.5}$, SO_2 and NO_x, were monitored on 24 hourly basis twice a week and CO was monitored for 8 hourly basis for twice a week at IMC, NG, SEZ, APM, BMCT, CB, DP World, RC. However, the samples were monitored only twice in a month for the same hours (as mentioned above) at EC station. The samples collected as part of the monitoring was analyzed against National Ambient Air Quality Standards (NAAQS) by CPCB. The monthly data was combined, and annual average values were estimated from mean values. The locations of the ambient air quality monitoring have been presented in ***Table 4-7*** and the annual average air monitoring data has been presented in ***Table 4-8.*** Map showing monitoring locations has been presented in ***Figure 4-5.***

Table 4-7: Description of Ambient Air Quality Monitoring locations within JNPA.

Location Code	Station	Location
A1	POC	Port Operational Centre (Continuous air quality monitoring station) *Located within Project Boundary*
A2	IMC	At IMC compound in Liquid Chemical Terminal Area
A3	RC	At JNP residential township
A4	EC	At Elephanta Caves
A5	NGC	Near North Gate Complex *Nearest to proposed project, located at an aerial distance of 300 m towards north east direction*
A6	APM	APM terminal near to BPCL Jetty
A7	BMCT	Near BMCT Admin Building
A8	SEZ	Special Economic Zone
A9	CB	Coastal Berth
A10	DP world	DP World Nhava Sheva

Source: IIT Madras – JNPA Annual Environmental Monitoring Report 2021-2022

Table 4-8: Annual Average values of air pollutants compared with applicable standards

Parameter	Particulate matter (PM 10)	Particulate matter (PM 2.5)	Sulphur dioxide (SO_2)	Nitrogen dioxide (NO2)	Carbon monoxide (CO)	Air Quality Index
Units	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**mg/m³**	-
NAAQS Permissible Limits (µg/m³) (Annual)	**60**	**40**	**50**	**40**	**2**	**0-50- Good 51-100-Satisfactory 101-200- moderate 201-300- poor 301-400-Very poor 401-500-Severe**
IFC/WB EHS Guidelines	**70 (Interim target[41]-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)**	**35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)**	-	**40 (guideline)**	-	-
IMC	186.86	68.48	18.54	36.65	0.87	**157.91**
NG	150.05	59.65	15.77	29.08	0.83	**133.37**
SEZ	135.69	55.29	11.42	20.97	0.81	**123.79**

[41] Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines

Parameter	Particulate matter (PM 10)	Particulate matter (PM 2.5)	Sulphur dioxide (SO_2)	Nitrogen dioxide (NO2)	Carbon monoxide (CO)	Air Quality Index
APM	102.47	51.88	16.07	25.93	0.83	**101.65**
BMCT	102.40	56.31	13.13	21.52	0.82	**101.60**
CB	103.12	50.92	12.28	21.14	0.73	**102.08**
DP World	144.88	70.04	23.04	43.23	0.45	**133.47**
RC	94.84	40.98	8.60	16.75	0.35	**94.84**
EC	76.42	26.85	12.26	24.16	0.28	**76.42**

Source: IIT Madras – JNPA Annual Environmental Monitoring Report 2021-2022

As per the Annual monitoring report by IIT Madras shared with JNPA, during monsoon season, decreased concentration of PM10 was observed as compared to other seasons due to precipitation by rain. Overall Ambient Air Quality of JNPA was well within the prescribed standards of CPCB except PM values at some locations. The higher concentrations of particulate matter may be due to increased dust particles in ambient air contributed from construction activities that took place during the period. PM10 contributed up to 1.70 to 3.11 times more and PM2.5 contributed up to 1.27 to 1.75 times more when compared with the Annual NAAQS of airborne particulate matter. Furthermore, the PM 10 levels were observed to be exceeding both guidelines as well as interim targets as per IFC/WB EHS guidelines. The PM2.5 levels at all the locations were also observed to be exceeding the guideline and interim targets as per IFC/WB EHS guidelines, except for EC location, where the PM 2.5 value was observed to be within Interim target-1. It is concluded from the above results that the airshed for PM 10 and PM2.5 is degraded at the project area.

A continuous air quality monitoring station has been installed at Port Operation Centre Location (POC) to monitor 24-hr average concentration of PM10, PM2.5, SO2 and NO2 and CO were measured using high volume samplers (APM 460 NL and APM 550 MFC) by IIT Madras for JNPA from June 2021-March 2022. The results of the month wise real time air quality monitoring have been presented in ***Table 4-9***.

Table 4-9: Ambient Air quality monitoring station at Port Operation Centre.

Parameter	Particulate matter (PM 10)	Particulate matter (PM 2.5)	Sulphur dioxide (SO_2)	Nitrogen dioxide (NO_2)	Carbon monoxide (CO)	AQI
Units	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**mg/m³**	-
NAAQS Permissible Limits (µg/m³)	**100**	**60**	**80**	**80**	**2**	**0-50- Good 51-100-Satisfactory 101-200- moderate 201-300- poor 301-400-Very poor 401-500-Severe**
IFC/WB EHS Guidelines	**150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)**	**75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)**	**125 (Interim target-1) 50 (Interim target-2) 20 (guideline)**	-	-	
Apr 21	98.13	40.81	3.54	20.14	0.61	98.13
May 21	62.34	27.59	2.75	18.45	0.55	62.34
June 21	46.22	21.01	2.95	22.53	0.57	50.97
July 21	40.05	19.54	2.08	9.05	1.23	40.59
Aug 21	45.36	20.66	1.57	8.48	0.6	46
Sep 21	35.26	18.44	2.7	6.66	0.3	32

Parameter	Particulate matter (PM 10)	Particulate matter (PM 2.5)	Sulphur dioxide (SO_2)	Nitrogen dioxide (NO_2)	Carbon monoxide (CO)	AQI
Oct 21	119.1	53.16	2.38	8.2	0.52	112.73
Nov 21	147.1	72.12	3.05	15.03	0.77	135
Dec 21	162	95.51	4.54	15.84	0.84	218.37
Jan 22	181.2	109.89	5.51	39.35	0.77	266.30
Feb 22	165	90.43	5.87	67.69	0.79	201.43
Mar 22	156.7	94.05	6.62	80.92	0.87	213.50
Average Apr 21-Mar 22	**104.9**	**55.27**	**3.63**	**26.03**	**0.7**	**103.25**

Source: IIT Madras – JNPA Annual Environmental Monitoring Report 2021-2022

The above ***Table 4-9*** shows the ambient air quality of the POC which indicates that the particulate matter were observed to be increasing after October. This can be attributed to multiple reasons including, increase in vehicle movements and rebound of pollution post lockdown in 2020, festivals celebrated during October in India and onset of winter resulting higher pollution trap at ground level. The average Air Quality Index of POC was observed to be 103.25 which is categorized as moderate as per Air Quality Index standards by CPCB. The PM 10 level was observed to be within guideline (as per IFC/WB EHS guidelines) of 50 µg/m^3 from June 2021 to September 2021. However, the PM 10 levels exceeded the guidelines as well as interim targets from October 2021 to March 2022, however, it was observed to be within Interim Target-3. Similarly, PM 2.5 levels were observed to be within guideline (as per IFC/WB EHS guidelines) of 25 µg/m^3 from June 2021 to September 2021. The level exceeded the guideline but was observed to be within the Interim target-1 for the month of October 2021-November 2021. The PM 2.5 level exceeded the interim targets from December 2021- March 2022. Based on review of monthly environmental monitoring reports for FY 2020-21, similar results were observed, wherein the particulate matter (PM 10 and PM 2.5) was observed to be increasing from October 2020 till March 2021.

4.2.6.1.1 Stack Emission Monitoring

In addition to the above, JNPA also conducts stack emission monitoring of DG sets installed within JNPCT through third party named M/s Mahabal Enviro Engineers Private Limited. JNPA conducted stack emission monitoring of DG sets at JNPCT in October 2021. The results of the stack emission monitoring of the 04 DG sets (two (02) DG sets of 1000 kVA of stack height 10 m above ground level and two (02) DG sets of 1500 kVA of stack height 30 m above ground level) installed within substation[42] of JNPCT has been presented in ***Table 4-10***.

Table 4-10: Results of DG sets Stack Emission Monitoring

S.N	Parameters	Unit	1000 kVA		1500 kVA		CPCB Limit
			DG 1	DG 2	DG 1	DG 2	
1.	Particulate Matter (PM)	mg/Nm^3	32	25	35	32	150
2.	Sulphur Dioxide (SO_2)	mg/Nm^3	33	27	33	22	40
3.	Oxides of Nitrogen (NOx)	mg/Nm^3	93	100	105	97.8	25
4.	Acid Mist	mg/Nm^3	Not Detected	3.34	<2.5	Not Detected	35
5.	Ash Content	mg/Nm^3	<10	<10	<10	<10	-

Source: Stack Emission Report dated October 2021 shared by JM Baxi

Based on the stack emission monitoring results presented above for 4 DG sets, two (02) DG sets of 1000 kVA and two (02) DG sets of 1500 kVA) installed within substation of JNPCT, it was observed that all the parameters for all the DG sets were within CPCB

[42] The exact locations of the DG sets are not available

Limit except for NOx levels. The concentration of NOx in the stacks of all the DG sets were observed to be exceeding the CPCB limit of 25 mg/Nm^3. The higher NOx level in the stacks can be attributed to the unregulated temperature within the stacks.

4.2.6.1.2 Sources of Air Emission

The sources of air emissions at the port and terminal typically include exhaust emission from diesel engines used for propulsion of ships, exhaust emission due to movement of vehicles, cargo handling equipment and diesel generators (two (02) DG sets of 1000 kVA and two (02) DG sets of 1500 kVA). The Stack height of existing D.G. set of capacity 1000kVA and 1500 kVA was 10 m and 30 m respectively, which is in line with CPCB guidelines (national) and meet GIIP requirement. Currently, the vehicles being used at JNPCT are Pollution Under Control (PUC) certified.

Other sources of emission at the port and terminals of JNPA include Volatile Organic Compound (VOCs) emissions due to manoeuvring of ship at the terminal during arrival and departure, and diesel based vehicles. Sensitive receptors exposed to air emissions within vicinity of the port and terminal are primarily workers working at JNPCT and other adjoining terminals and the terrestrial species. Impact and management measures due to air emissions has been presented in ***Chapter 7.***

4.2.6.1.3 Sources of GHG Emission

The current Scope 1 and Scope 2 sources of GHG emission at JNPCT terminal are as follows:

Scope 1 GHG Emissions

- Combustion of Diesel in DG sets within substation and RTGCs
- Diesel Consumption in vehicles and equipment including trucks, RTGC, container etc.
- Fuel consumption in JNPA vehicles

Scope 2 GHG Emissions

- High Mast
- Electric Substation
- Consumption of purchased electricity at Store rooms
- Consumption of purchased electricity at Administrative Buildings

As understood, JNPA is currently not monitoring GHG emissions at JNPCT.

4.2.6.2 Noise Environment

JNPA has also conducted noise monitoring once in 6 months through IIT Madras. The noise monitoring was undertaken at 12 locations. The locations[43] were selected based on proximity to receptors from port industrial activities, traffic movement, development activities and proximity to residential area. The frequency of monitoring was once in 6 months on an hourly basis at 24-hour interval in line with JNPA's Environmental Management and Monitoring Plan (EMMP). The monitoring was conducted while the port operations were carried out in full capacity. The half yearly data was combined, and annual average values were estimated from mean values. The locations of the study area along with the results have been presented in ***Table 4-11***. Map showing monitoring locations has been presented in ***Figure 4-5***.

Table 4-11: Annual Average Ambient Noise Quality Monitoring Results of JN Port for FY 2021-22

S.No.	Sampling ID	Location Name	Results Leq dB(A)	
			Leq Day	Leq Night
1.	N1	GTICT Berth (Gateway Terminal of India Container Terminal Berth)	73.08	64.54
2.	N2	JNP Container Berth (Jawaharlal Nehru port Container Berth) *(within JNPCT-Proposed Project boundary)*	68.70	60.06
3.	N3	NSICT Berth (Nhava Sheva International Container Terminal Berth)	69.63	66.16
4.	N4	BMCT (Bharat Mumbai Container Terminals)	69.69	66.48

[43] No specific monitoring location was mentioned in the Port environmental clearance dated 16.09.1988.

S.No.	Sampling ID	Location Name	Results Leq dB(A)	
			Leq Day	Leq Night
5.	N5	Container yard opposite to C. T. canteen *(within JNPCT- Proposed Project boundary)*	66.40	65.22
6.	N6	J. M. Bakshi EOTC container yard *(within JNPCT- Proposed Project boundary)*	66.86	67.61
7.	N7	ICD 1- 5 (Internal Container Depot 1- 5)	70.31	68.07
8.	N8	BPCL (Bharat Petroleum Corporation Ltd)	70.22	70.03
9.	N9	Port Craft Jetty	65.59	63.70
10.	N10	North Gate Complex (*nearest to proposed project, located at* an *aerial distance of 300 m towards northeast direction)*	65.09	63.20
11.	N11	SEZ (Special Economic Zone)	65.89	61.47
12.	N12	CFS Gate	69.28	65.91
Limit As per CPCB (Environment Protection Rules, 1986)				
Industrial Area Leq dB(A)			75	70
Limit as per IFC/WB EHS Guidelines				
Industrial Area Leq dB(A)			70	70

Source: IIT Madras – JNPA Annual Environmental Monitoring Report 2021-2022

From the above ***Table 4-11***, it is observed that the noise levels are within the permissible limit as per CPCB guidelines. However, the Leq day levels exceeded at BPCL, GTICT and ICD 1-5 as per IFC/WB EHS guidelines for industrial areas. The noise levels at JNPCT and within 500 m of JNPCT i.e., (N2, N5, N6 and N10) were observed to be within CPCB as well as IFC/ WB EHS guidelines' permissible limit. The major contribution to noise in the port is due to heavy vehicular traffic transporting containers.

Note: Locations N2, N5, N6 and N10 can be considered for monitoring noise locations for JNPCT, since N2, N5, N6 locations are within JNPCT and N10 is located 300 m from the terminal.

4.2.6.2.1 Sources of Noise Emission

The typical sources of noise emissions at the port and terminal include cargo handling, vehicular traffic, loading and unloading of containers at container yard and at the ship, operation of diesel generators (two (02) DG sets of 1000 kVA and two (02) DG sets of 1500 kVA), movement of vessel[44] for import and export etc.

The sources of land based noise & vibrations include movement of trucks on internal roads and at the berth areas, operation cranes for container loading and unloading. Similarly, underwater noise & vibration at the port include movement of vessels and dredging activities. As understood, the vessels and shipping line follow IMO guidelines for reduction of underwater noise from commercial shipping to address adverse impact on marine life.

Sensitive receptors exposed to noise emissions are primarily workers working at JNPCT and other adjoining terminals and the terrestrial and aquatic species. Impact and management measures due to noise emissions has been presented in ***Chapter 7.***

4.2.6.3 Marine Water Quality

Marine water quality assessment was carried out at the port by IIT Madras at ten selected harbour locations on monthly basis for FY 2021-22. All the physico-chemical, biological, ecological and sediment analysis parameters were analyzed by adopting the "Standard Methods for the Examination of Water and Wastewater", 22nd Ed. (APHA, 2012) and Coastal Water Quality Measurements Protocol for COMAPS Programme, Ministry of Earth Sciences (MOES), Government of India (GOI). The monthly data was combined, and annual average values were estimated from mean values. The locations of the marine water quality along

[44] In FY 2021-22, JNPCT handled 220 vessels for container loading and unloading

with criteria for location selection has been presented in ***Table 4-12***. Summary of annual results for marine water quality parameters in JNP Harbour for period of April, 2021 to March, 2022 have been presented in ***Table 4-13*** and the map showing monitoring locations has been presented in ***Figure 4-5.***

Table 4-12: Locations for Marine Water Quality Monitoring

S.no.	Location ID	Description
1.	W1	Between Elephanta and Nhava Islands and can be identified at the last green buoy no. F1Green of JNP approach channel and just opposite to ONGC Depot at the Nhava Island.
2.	W2	Denoted by buoy no.FG2 RED of JNP channel. It is near the Elephanta Island, and opposite to Port Craft Jetty
3.	W3	Identified by the green buoy no. FG2 Green of JNP approach channel and lies near the landing jetty.
4.	W4	Located at Uran Patch Beacon (lighthouse on concrete platform) near the Butcher Island filling platform.
5.	W5	W5 is near to the guide bund and others are along Nhava creek up to Belpada. These are selected to examine the impact of neighboring Nhava Villages and Belpada to the creek water quality.
6.	W6	This is a mobile station and hence its location is changed during every visit. This sampling station was selected in order to examine the variation of water quality in the area not represented by the fixed stations. *(Nearest to proposed project, located at an aerial distance of 250 m towards south west direction during monitoring period)*
7.	W7	This station is located near landing jetty. This station was selected in order to examine the water quality due to liquid cargo jetty
8.	W8	Located near proposed chemical berth. Selected to examine the impact of proposed chemical terminal and IVth Container terminal activities on water quality
9.	W9	Located in between GTI and Liquid Cargo Jetty. This station is selected to examine the impact of terminal activities on water qualities
10.	W10	Located near proposed chemical berth. Selected to examine the impact of proposed chemical terminal and IVth Container terminal activities on water quality.

Table 4-13: Results of Marine Water Quality Monitoring of JN Port harbour

S.No.	Parameters	Unit	Samples'		Standard[45]	Mean
			Min	Max		
1.	Temperature	(°C)	25.1	32.8	-	29±1.93
2.	pH	None	6.9	8.7	6.5-9.0	7.8±0.5
3.	Salinity	ppt	13.4	35.8	-	29.8±6.3
4.	Turbidity	NTU	18.2	92.5	-	39.6±19.4
5.	Total Dissolved Solid (TDS)	mg/l	19546	45752	-	34327±5555.3
6.	TSS	mg/l	84	416	-	257±62
7.	TS	mg/l	19689	46047	-	34584±5592
8.	DO	mg/l	4.1	6.7	3.0mg/L or 40% of saturation value	5.6±0.7
9.	COD	mg/l	27.3	104.9	-	73.8±21
10.	BOD	mg/l	0.8	2.9	5	1.8±0.5

[45] As per CPCB Primary Water Quality Criteria for Class SW-IV Waters (for harbour waters)

S.No.	Parameters	Unit	Samples'		Standard[45]	Mean
			Min	Max		
11.	NH_3-N	mg/l	0.0041	0.2096	-	0.0243±0.0.025
12.	Phenol	mg/l	0.0007	0.0170	-	0.0062±0.0034
13.	Oil and Grease	mg/l	0.0020	1.1940	10	0.2949±0.2280
14.	TPC	CFU/ml	30	384	-	128±59.9
15.	Fecal Coliforms	MPN/100ml	48	665	500(max)	133±96
			Marine Sediments			
16.	Organic Matter	%	2.8	63.8	-	39.7±15.6
17.	Total Carbon	%	1.6	37.1	-	22.6±9.2
18.	Inorganic Phosphate		12	439.7	-	149.3±104.5

Source: IIT Madras – JNPA Annual Environmental Monitoring Report 2021-2022

The above table indicates that all the parameters are well within the prescribed standard limits for Primary Water Quality Criteria for Class IV Waters (for Harbour Waters) by CPCB for Physico-Chemical parameters and Bio-Chemical parameters. The characteristic parameters for sediments are showing normal variations in concentrations for JNPA harbour area. The results obtained for marine water quality parameters show no adverse effect of these activities on water quality. As per the National Sanitation Foundation Water Quality Index (NSFWQI)[46] estimation, the overall quality of port's water is in good category.

As per the results of the Annual monitoring report by IIT Madras shared to JNPA, the characteristic parameters for sediments show normal variations in concentrations for JNPA harbour area. JNPA is mainly handling container and liquid cargo whereas, dry cargo like fertilizers, food grains, raw materials etc. are not being handled at JNPA.

4.2.6.4 Marine Ecological and Sediment Quality

The results of marine ecological and sediment quality has been presented in ***Table 4-14***. As per the results discussed in the Annual Monitoring report to JNPA, all the parameters were observed to be within the recommended ranges of the ecological parameters for Arabian Sea except Phosphate, Nitrates, and Nitrite. The undesirable levels of these parameters are the result of untreated discharges of sewage and industrial waste from the towns and villages around the area. Net Primary Productivity and Chlorophyll-a were well within prescribed standards for ecological parameters for Arabian Sea. The characteristic parameters for sediments showed normal variation in concentrations for JNP Harbour.

Table 4-14: Results of Marine Ecology and Sediment Monitoring

S.No.	Parameters	Unit	Samples'		Standard	Mean
			Min	Max		
1.	Gross Primary Productivity	mgC/m^3/day	24.91	52.75		35.55±6.13
2.	Net Primary Productivity	mgC/m^3/day	0.35	22.58	<1500 at surface	6.79±4.56
3.	Phytoplankton	No/L	58910	150509		101902
4.	Zooplankton	No/L	21357	50457		31918
5.	Chlorophyll -a	mg/m^3	0.01	3.90	<4[Oligotropic class]; 4-10[Mesotropic	0.64

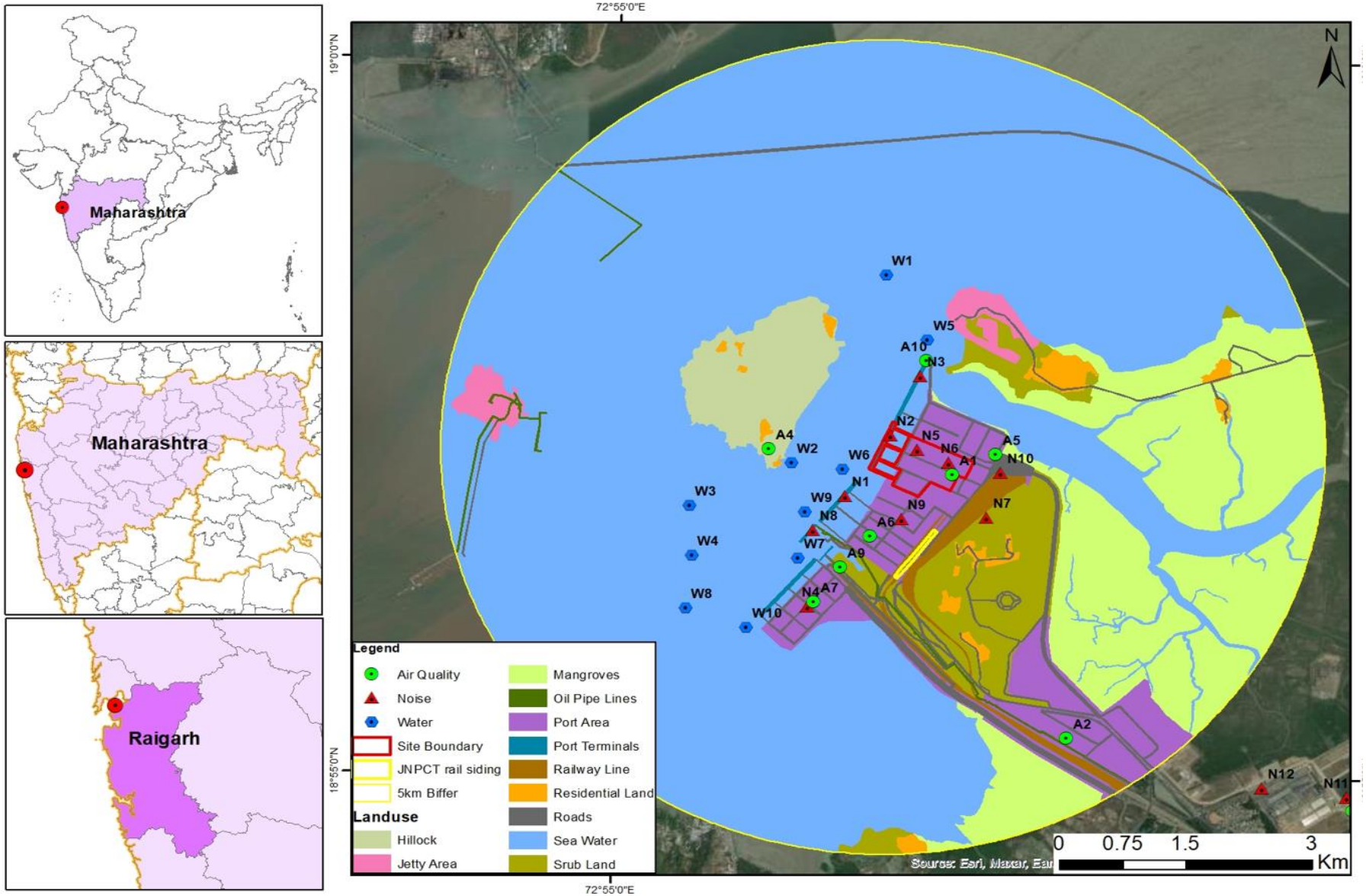
[46] A commonly used water quality index (WQI) was developed by the National Sanitation Foundation (NSF) in 1970. The NSFWQI was developed to provide a standardized method for comparing the water quality of various bodies of water.

S.No.	Parameters	Unit	Samples'		Standard	Mean
			Min	Max		
					class]; >10 [Eutropicclass]	
6.	Algal Biomass	mg/m^3	0.98	261.21		42.76
7.	Particulate Organic Carbon	mg/m^3	3.87	55.51	10-100	15.38±8.46
8.	Macrobenthos	No/m^2	100	803		415
9.	Phosphate	µg/L	24.9	140	10-100	63.3±23.7
10.	Nitrate	µg/L	39.4	2924.9	1.0-500	970.7±763.6
11.	Nitrite	µg/L	28.4	365.7	<125	148.1±92.8
12.	Silicate	µg/L	17.0	72.7	10—5000	42.9±7.9
13.	Sulphates	µg/L	246.3	384.4		316.0±38.1
	Permissible limits and Recommended ranges of the Ecological Parameters for Arabian Sea Sediment Characteristics					
14.	Phosphate	mg/kg		12.0	439.7	144.8±104.0
15.	Nitrate	mg/kg		13.2	2511.6	469
16.	Nitrite	mg/kg		2.1	333.0	70.2
17.	Silicate	mg/kg		31.5	195.9	94.3±40.4
18.	Sulphates	mg/kg		12.5	178.4	99.8±49.6

Source: IIT Madras – JNPA Annual Environmental Monitoring Report FY 2021-2022

The parameters considered for marine water quality, marine ecological and sediment quality monitoring are adequate in line with the national standards (CPCB guidelines).

Figure 4-5: Map showing JNPA Environmental Monitoring Locations



Source: ArcGIS Imagery Mapping

4.2.7 Natural Hazards

4.2.7.1 Depressions and Cyclonic Storms

India Meteorological Department has classified the storm systems as follows:

- Depressions: Winds from 18-33 knots (33-61 kmph)
- Cyclonic storms: Winds from 34-47 knots (62-87 kmph)
- Severe cyclonic storms: Winds above 48 knots (88 kmph)

Based on the records of IMD from 1891 to 1994 (104 years), it is observed that a few storms have crossed close enough to the study area affecting the area with strong winds, heavy rains and moderate to high sea wave conditions. There have been 47 such storms during this period with 32 depressions, 6 cyclonic storms and 9 severe cyclonic storms. The below ***Table 4-15*** shows Season-wise distribution of cyclonic storms.

Table 4-15: Season-Wise Distribution of Cyclonic Storms

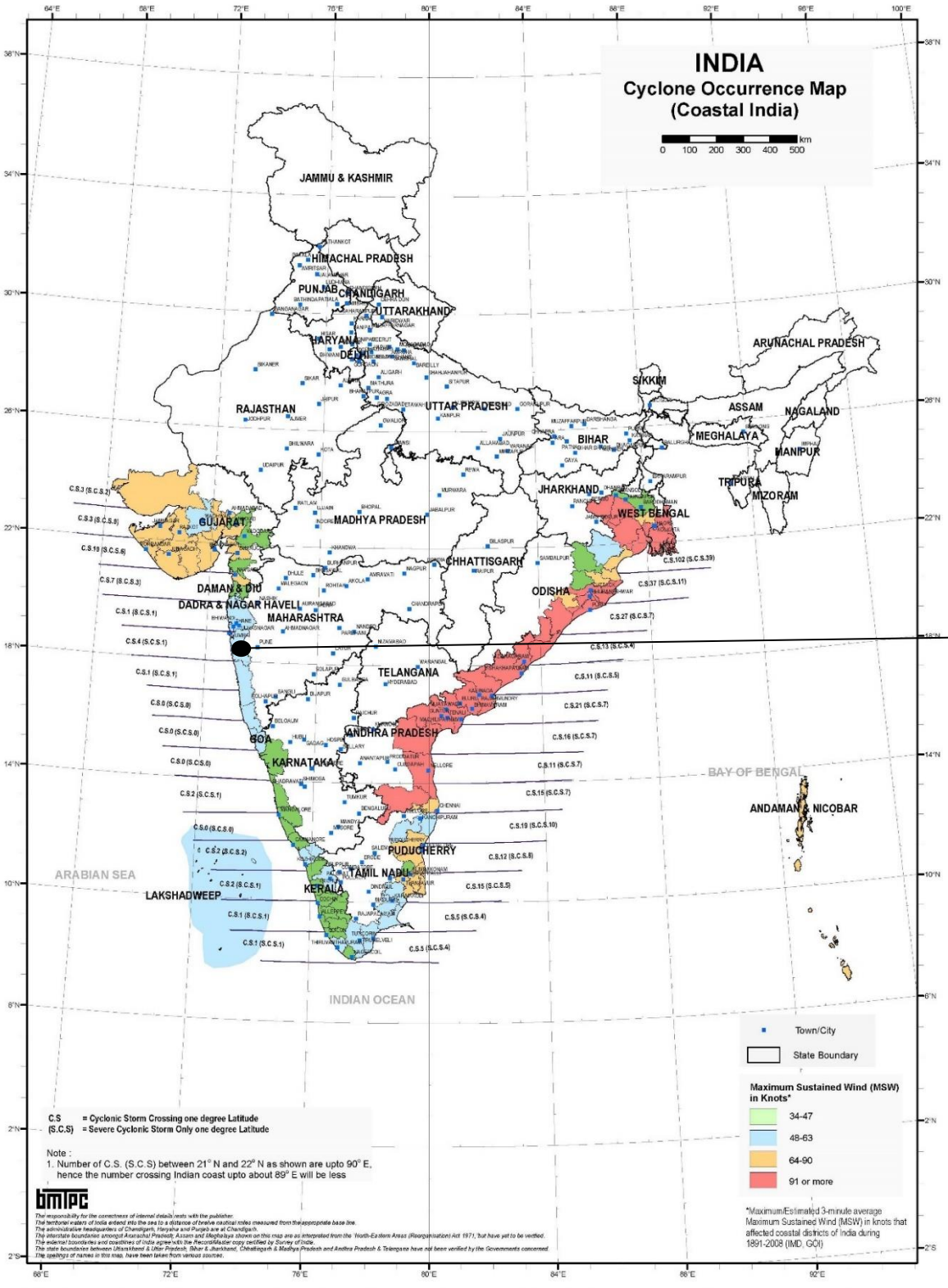
Season	Months of Occurrence	No. of Cyclones	Cyclonic system
Pre-monsoon	April & May	6	3 depressions and 3 severe cyclonic storms
SW monsoon	June & September	18	13 depressions, 2 cyclonic storms and 3 severe cyclonic storms
Post-monsoon	October & November	23	16 depressions, 3 cyclonic storms and 4 severe cyclonic storms

Source: IMD from 1891 to 1994

Wind speeds usually reach speeds of 30 - 40 knots (55-75 kmph) and during severe storms wind speeds reach up to 60 knots (110 kmph).

The below ***Figure 4-6*** shows the project area lies in the cyclone zone of Maximum Sustained Wind (MSW) of 48 – 63 knots and the below ***Figure 4-7*** shows the wind hazard map which indicates the project area lies in the moderate damage risk zone of 44m/s.

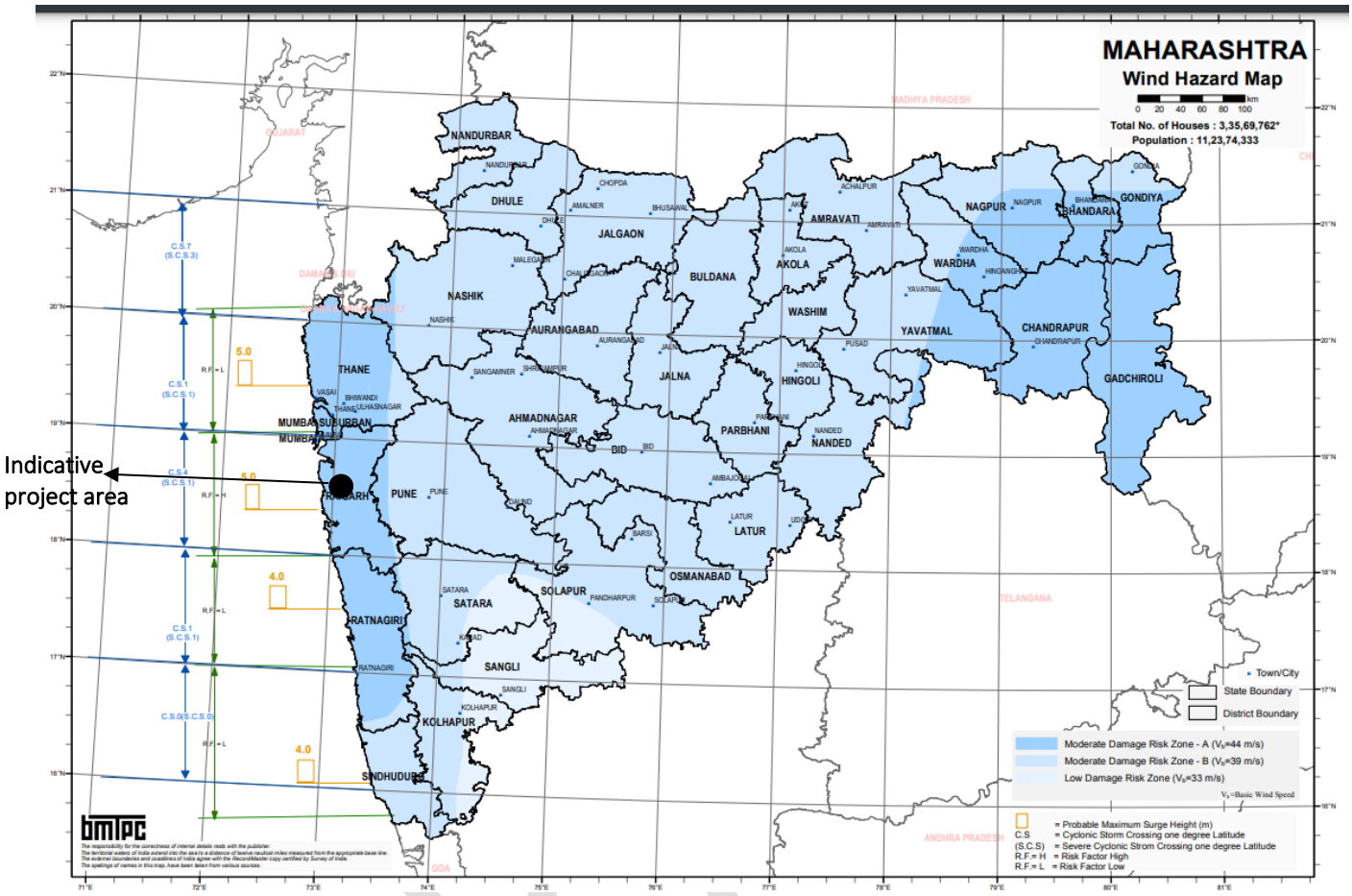
Figure 4-6: Map showing Cyclone occurrence of the Project Location



BMTPC : Vulnerability Atlas- 3rd Edition; Peer Group, MoHUA; Map is Based on digitised data of SOI, GOI; Maximum Sustained Wind (MSW) Data from IMD, GOI. Disclaimer: The maps are solely for thematic presentation.

Source: https://bmtpc.org/topics.aspx?mid=56&Mid1=178

Figure 4-7: Map showing Wind Hazards of project area



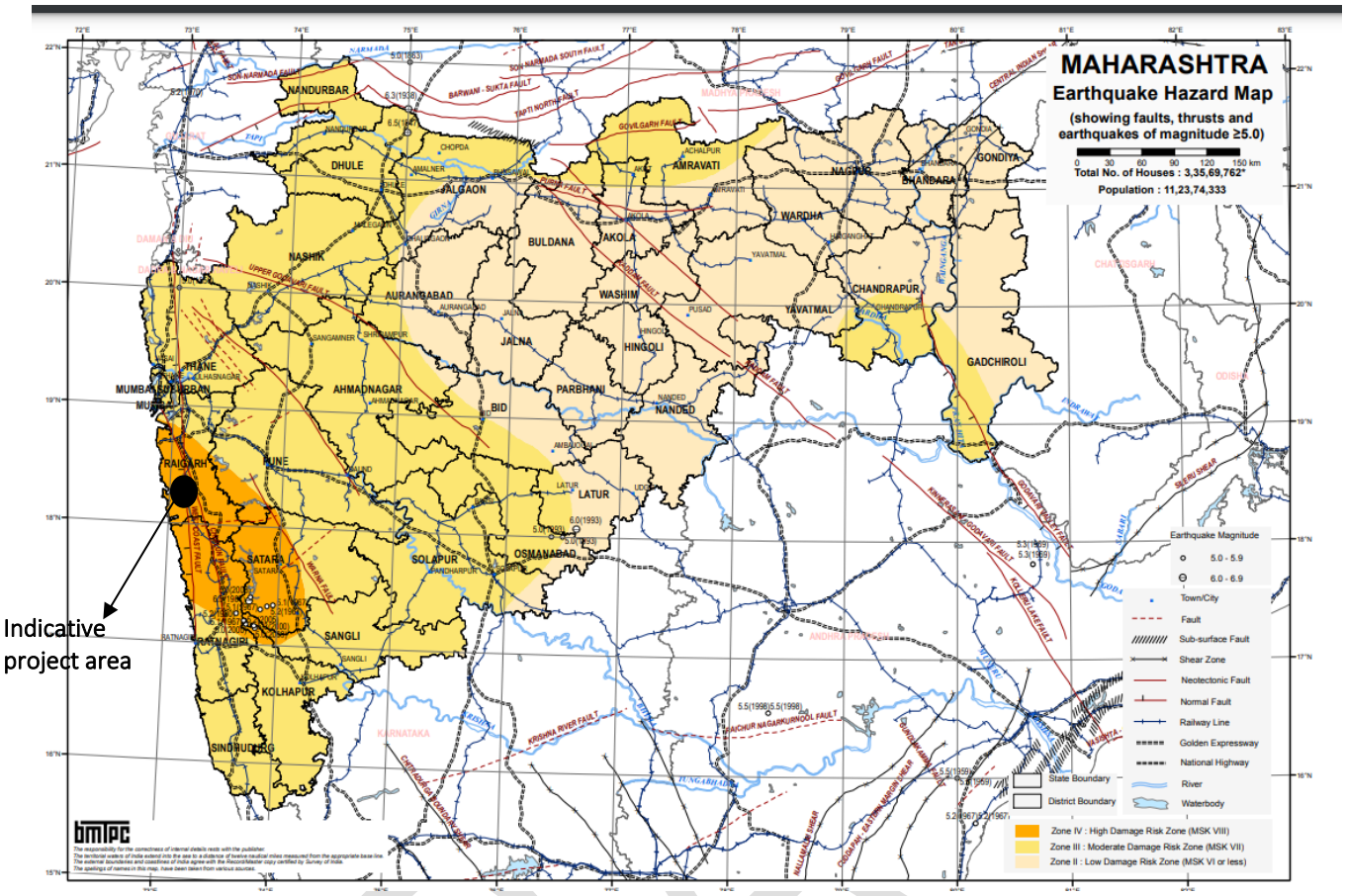
Source: https://bmtpc.org/topics.aspx?mid=56&Mid1=178

4.2.7.2 Seismicity

According to Vulnerability Atlas 3rd Edition by Building Materials and Technology Promotion Council (BMTPC), the project area is classified in Zone IV having high seismic activity. The project area is within IS 1893 seismic zone IV (High risk earthquakes)

The ***Figure 4-8*** shows the earthquake affected zone where the project area lies in the high damage risk zone IV of MSK VIII.

Figure 4-8: Map showing Earthquake Hazard at Proposed Project

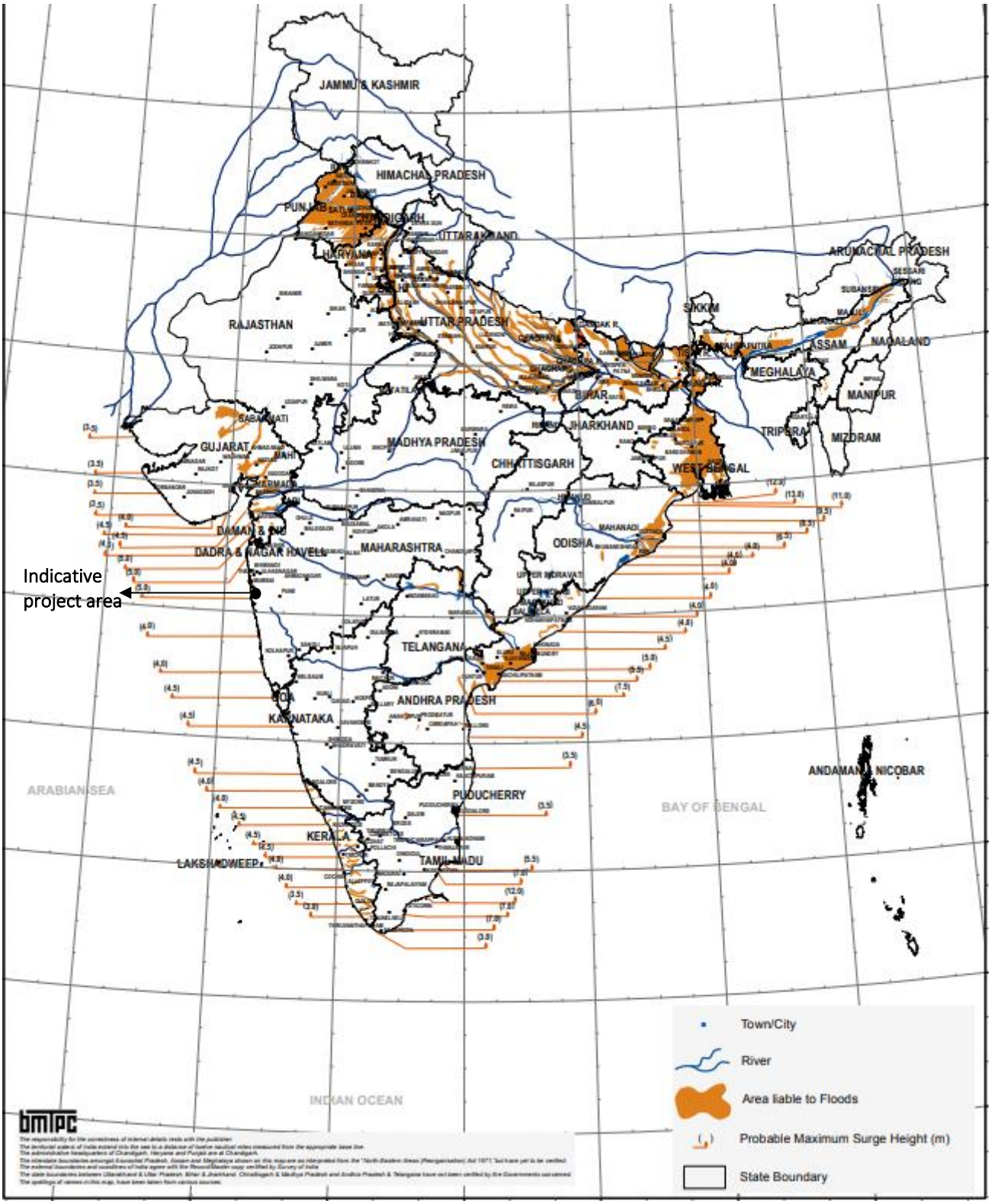


Source: https://bmtpc.org/topics.aspx?mid=56&Mid1=178

4.2.7.3 Flood

According to Vulnerability Atlas of India, 3rd Edition by Building Materials and Technology Promotion Council (BMTPC), the proposed Project is not located in an area vulnerable to floods as shown in ***Figure 4-9***. However, refer ***Section 6.2.3*** and ***Section 6.2.4*** for details on projection of flood and sea level rise respectively at the proposed project area.

Figure 4-9: Map showing Flood Hazard at proposed Project



Source: BMTPC

4.2.8 Cultural Heritage

As per the Archaeological Survey of India, no centrally protected monuments/sites[47] and state protected monuments/sites[48] is present in the vicinity of the project location. However, approximately 2 km on the western side of the project across the ship channel, there is a World Heritage Site named Elephanta caves. The Elephanta , locally known as Gharapuri, comprises of three (3) villages namely Rajbandar, Morabander and Shetbandar.

Further based on the consultation with the local community at the Gharipura island (where the Elephanta Cave is located). During the consultation with the community, it was reported that there is no impact on the heritage site due to construction and operation of the port. Further, the JNPA is in the process of construction of protection wall of ~3.2 km at the island, so that the world heritage site shall be protected from any unforeseen event (such as flooding and increasing of sea level) in future. JNPA is complying with the conditions of the environmental clearance (EC) for protection of Elephanta Caves. Monthly air quality is being conducted by JNPA as per the conditions of the EC. Furthermore, presence of no other cultural heritage is reported by the local community in the vicinity of the project

Note: As a safeguard, chance find procedure has been developed as part of this assignment which will be applicable on project and implemented during construction activity (refer to ***Annexure K***)

4.3 Ecological Baseline

Summary of the surroundings: The different type of habitats in the study area has been listed in ***Table 4-16***. Among the natural habitats, sea and mangroves are the dominating ones by their coverage. A small portion of Panje wetland is also present about 4.5 km from the terminal in south direction, while the mangroves are majorly present towards the east.

The ecological baseline was prepared for the upgradation of the container terminal of JN port- JNPCT. Efficiency enhancement in its existing capacity from 0.4 million TEUs to 1.4 million TEUs in FY 2027 and further up to 1.8 million TEUs by 2029[49] to reduce the waiting time for vessels is the main moto of this upgradation. The activities involved in this upgradation have already been explained under section 2.3.2 Proposed Expansion/ Upgradation Plan and the traffic under section 2.3.6 Proposed Internal Cargo Conveyance.

The JN port is directly connected to SH-54 and NH-4B for transportation of containers and maintained by state and national authorities (Sections 2.2.1 and 2.2.8.1). JN Port is also connected with rail network of Indian Railways through a lead line connecting the port with Jasai station, which is operated and maintained by the Indian Railways (Section 2.3.6.3).

This efficiency enhancement will decrease the vessel waiting time, while the number of vessels arriving at the terminal will remain mostly the same and they will utilize the same channel; container transportation by road will decrease from ~ 84 % to 70% (Section 2.3.6.2); and the dependency on the rail will increase from 15 to 17 trains per day to 25 trains per day (Section 2.3.6.3). It is also expected that currently deployed vessels of 6500 to 8000 TEU will be replaced with vessels of 9000 to 11500 TEU capacity (Section 2.2.8.3). Overall, the project activities will not cause any significant increase in the total port's vessel traffic or terrestrial traffic (as mentioned under section 2.3.6.1 Estimated Container Traffic and 2.3.6.2 Estimated Road Traffic; 2.3.6.3 Estimated Rail Traffic).

As JN Port is an operational port, marine survey in immediate surroundings of the port was not conducted. Such information has been supplemented with data from secondary sources. National Institute of Oceanography (NIO), a government research institute working in the field of marine sciences was engaged by JN port to understand the water quality, sediments and biological characteristics in the marine environment of the port surroundings as well as channel. To achieve the above-mentioned objectives, NIO conducted several studies between 1996-2016 and submitted its report in March, 2018[50]. The findings of this report were also utilized in this IESE study.

47 https://asi.nic.in/wp-content/uploads/2021/08/Maharashtra-Aurangabad-Circle-Mumbai-Circle-and-Nagpur-Circle.pdf (Accessed on October 31, 2022)

48 https://asi.nic.in/protected-monuments-in-maharashtra/ (Accessed on October 31, 2022)

[49] Draft Report on Conatiner Traffic at NSFTPL dated 31st October 2022

[50] Studies on the impact of dredging on marine ecology at Jawaharlal Nehru Port, Navi Mumbai. CSIR-National Institute of Oceanography, Mumbai, India.

As per the available secondary information[51,52,53,54], at least eight (08) species with conservation significance have been identified (***Table 4-26***). Limited secondary information regarding the foraging/feeding and breeding area of these species, within the study area was reported. Most of the migratory birds' activities were reported from the Thane Creek Flamingo Sanctuary (present ~12.5 km from the terminal)[55]. Eight individuals of Fourfinger Threadfin (*Eleutheronema tetradactylum*) were reported from the Sewri and Mahul area in 2008[56]; two more observations were reported near the Thane creek area in this year (2022)[57]. Only one observation of Khaire's Black Shieldtail (*Melanophidium khairei*) was reported from the Vikhroli area towards the Thane creek[58]. The consultation with the fishermen indicates the movement of the Indian Humpback Dolphin (*Sousa plumbea*) in the 5 km buffer of the study area for foraging/feeding, secondary data also supports the same[59] but due to the absence of any significant nesting (breeding) site in the study area, it is unlikely to have a chance of critical habitat within the study area[60,61,62,63]. Indian Skimmer (*Rynchops albicollis*) was reported Thane Creek Flamingo Sanctuary [19.1410937, 72.9609883][64], and only one observation near Panje wetland in 2018[65]; 30 - 278 Black-tailed Godwit (*Limosa limosa*) were also reported from the same location[66]; 15 - 1500 Greater Flamingo (*Phoenicopterus roseus*) & 1 - 432 Lesser Flamingo (*Phoeniconaias minor*) were also reported from the Panje wetland in 2018[67], but no roosting site was confirmed within the study area[68]; while the Steppe Eagle (*Aquila nipalensis*) was reported away from the study area[69].

A primary ecological survey was conducted between 15th – 16th September 2022, to understand the marine, coastal and terrestrial ecology and to establish an ecological baseline of the study area. The entire Mumbai and Navi Mumbai area already have huge anthropogenic activities, due to the human settlement and industry on the land, and oil & natural gas extraction as well as regular vessel activities in the sea. Besides this terminal- JNPCT, four other terminals are also operational in the same port and contributing to the vessel movements as well as road and rail transportation since long time (>30 yrs). Mumbai Trans Harbor Link

[51] https://www.inaturalist.org/observations?iconic_taxa=Actinopterygii&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

[52] https://www.inaturalist.org/observations?iconic_taxa=Reptilia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

[53] https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L2745852; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L14891370; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L17955762; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L10982777; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L7931230; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L4007948; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L15476519; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L2919598; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L14861634; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L4008281; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L18148588; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L3148420

[54] https://www.inaturalist.org/observations?iconic_taxa=Mammalia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

[55] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.

[56] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.

[57] https://www.inaturalist.org/observations/132250784; https://www.inaturalist.org/observations/122764488

[58] https://www.inaturalist.org/observations/32106533

[59] https://www.inaturalist.org/observations/124927845; https://www.inaturalist.org/observations/120857383

[60] https://macaulaylibrary.org/asset/48009701

[61] https://ebird.org/species/steeag1/IN-MH-MS

[62] https://openjicareport.jica.go.jp/pdf/12270369_04.pdf

[63] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.

[64] https://macaulaylibrary.org/asset/48009701

[65] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.

[66] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.

[67] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.

[68] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.

[69] https://ebird.org/species/steeag1/IN-MH-MS

Project is also under construction towards the north of the JNPCT within a 5 km radius. Thus, for the primary ecological survey and consultations, the study area was defined as 5 km surrounding the terminal, considering that, the project activities may impact the surrounding environment up to 5 km. On the other hand, the secondary information was extracted from the several previously performed studies / reports / surveys within the range of 10-20 km in the region. Thus, the overall data presented and assessed for this report covers an area of at least 10 km (in general); and for marine fauna it covers an area of upto 20 km[70]. The data presented under section 4.3.3.2 Aquatic (Marine) Ecology was extracted from the available database[71, 72] and previous reports[73, 74, 75] covering 20 km length of existing JNPA approach channel i.e. sea routes (the channel is presented in ***Figure 2-8***). The main objective behind this exercise is to identify the possible impacts on the species and habitats (present in the vicinity) due to the project-related activities - including transportation, which ultimately help to select the mitigation and management strategy.

4.3.1 Objectives

Ecological survey for Initial Environment and Social Examination (IESE) was conducted with the following objectives,

- to generate a baseline for aquatic ecology (focusing marine system);
- to produce a baseline for terrestrial ecology (focusing coastal system);
- to check the proximity of ecological sensitive areas and recognize the major habitat types;
- to enlist the potential species which may trigger critical habitat (if any); and
- to identify the potential impacts from increased traffic volumes along land and sea routes to and from the terminal

4.3.2 Ecological Baseline - Methodology

To understand the existing ecology of the study area, an ecological baseline was prepared with the help of information gathered under, i. Literature Review and ii. Field Data Collection.

4.3.2.1 Literature Review

A literature review was performed to screen out the presence of internationally and/or nationally recognized areas of high biodiversity value e.g., Protected Areas (PAs), Alliance for Zero Extinction (AZE) sites, etc.; and habitat of IUCN Threatened and Restricted-range species; and Key Biodiversity Areas (KBAs), which include Important Bird and Biodiversity Areas (IBAs) in and around the proposed project location. The following databases were majorly assessed to achieve the objectives,

- https://ebird.org/home
- https://www.inaturalist.org/
- https://indiabiodiversity.org/
- https://avibase.bsc-eoc.org/avibase.jsp?lang=EN
- http://wiienvis.nic.in/Database/Maps_PAs_1267.aspx
- http://www.wiienvis.nic.in/Database/IBA_8463.aspx
- http://www.wiienvis.nic.in/Database/ramsar_wetland_sites_8224.aspx

[70] Studies on the impact of dredging on marine ecology at Jawaharlal Nehru Port, Navi Mumbai. CSIR-National Institute of Oceanography, Mumbai, India.

[71] https://www.inaturalist.org/observations?iconic_taxa=Actinopterygii&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

[72] https://www.inaturalist.org/observations?iconic_taxa=Mammalia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

[73] Studies on the impact of dredging on marine ecology at Jawaharlal Nehru Port, Navi Mumbai. CSIR-National Institute of Oceanography, Mumbai, India.

[74] JNPA Annual progress report for Water Quality Monitoring. Department of Civil Engineering, IIT Madras, Chennai, India.

[75] Mumbai Trans Harbor Link Project - Supplemental Environmental Impact Assessment (2015). Mumbai Metropolitan Region Development Authority.

Besides these databases, the data was extracted from several reports[76,77,78, 79, 80, 81,], articles, etc. available in the public domain. Based on all the accumulated information, lists of floral and faunal species from different habitats (exclusively for Marine, and Coastal areas) were prepared along with their conservation status (as per IUCN Red List) and their status in the list of scheduled species [as per Wildlife (Protection) Act, 1972]. The dominant habitats in and around the project location was also identified with the help of google earth imagery and other available secondary data.

4.3.2.2 Field Data Collection

A field survey was conducted to determine the existing ecological conditions (habitats, flora and fauna) within the study area[82]. This baseline facilitates an adequate assessment of the project's impacts upon ecology as well as it helps the development of appropriate mitigation measures. Habitats, which may support good biodiversity i.e., forest patches, scrubs, water bodies, etc. was focused during the survey.

4.3.2.2.1 Habitat Survey

Different habitats (natural, modified and critical) available within the study area identified by the desktop review were verified through site visit and consultation with locals. Data regarding the type and quality of habitat with reference to flora and fauna supported were collected.

4.3.2.2.2 Floral Survey

The floral diversity of the study area was recorded by visual observation during the site visit and identified using published manuals. The information (reports and scientific publications) dealing with the floristic diversity of the related area available in the public domain were also considered in the survey (specifically for phytoplankton).

4.3.2.2.3 Faunal Survey

I. Faunal species (specifically reptiles, birds, and mammals) from the study areas were recorded based on direct sightings, indirect evidence such as dung, droppings, scats, pugmarks, scratch signs, burrows, nests, etc.;
II. Consultations with local communities were carried out by displaying photographs of species anticipated in the area to confirm whether there have been any recent sightings (specifically fishes, reptiles, birds, and mammals);
III. For zooplanktons and benthos, the lists were prepared based on site-specific secondary information[83,84,85];
IV. Identification and classification of any species recognized as Threatened (in accordance with International Union for the Conservation of Nature [IUCN] Red List Online Version 2022-1) and according to the schedules of the Wildlife (Protection) Act, 1972; and
V. Identification of areas which are important or sensitive for ecological reasons including their breeding, nesting, foraging, resting, overwintering areas including wildlife migratory corridors/avian migratory routes.

Survey efforts:

The ecological survey was conducted between 15th to 16th September 2022. Different aspects covered during this survey are given as,

Date	Activities
15.09.2022	Consultation with the Environment Manager of JNPA Site walk and survey at the terminal Consultation with the truck drivers near container yard

[76] Studies on the impact of dredging on marine ecology at Jawaharlal Nehru Port, Navi Mumbai. CSIR-National Institute of Oceanography, Mumbai, India.
[77] JNPA Annual progress report for Water Quality Monitoring. Department of Civil Engineering, IIT Madras, Chennai, India.
[78] Mumbai Trans Harbor Link Project - Supplemental Environmental Impact Assessment (2015). Mumbai Metropolitan Region Development Authority.
[79] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.
[80] Narwade, S.S., Prabhu, M.V., Shaikh, P.A., Ambavane, P.A. and Rahmani, A.R. (2014) Baseline survey of birds at the proposed NMIA area. Annual Report - III, January-December, 2014. Submitted to CIDCO, Navi Mumbai, Maharashtra by BNHS, India, pp 63.
[81] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.
[82] As JN Port is an operational port and presence of several restricted areas by the Indian Navy, no detailed avifaunal survey and marine survey was conducted. Such information has been supplemented with data from secondary sources (cited as footnotes in the relevant sections).
[83] Studies on the impact of dredging on marine ecology at Jawaharlal Nehru Port, Navi Mumbai. CSIR-National Institute of Oceanography, Mumbai, India.
[84] JNPA Annual progress report for Water Quality Monitoring. Department of Civil Engineering, IIT Madras, Chennai, India.
[85] Mumbai Trans Harbor Link Project - Supplemental Environmental Impact Assessment (2015). Mumbai Metropolitan Region Development Authority.

Date	Activities
	Drive through and walk-through survey along the road
16.09.2022	Site survey and consultation around the JNPA administrative building Site survey and consultation near Panje Site survey and consultation (exclusively with fishermen) in Mora Koliwada Drive through and walk-through survey along the road
04.11.2022	Telephonic consultation with fishermen community of Gharapuri Village (Elephanta island)

4.3.3 Ecological Baseline - Results

4.3.3.1 Habitat Types

In the literature review, different habitats were identified within the study area, with the help of google earth satellite imagery. These habitats were verified during the reconnaissance survey in site visit. The study area consists of natural habitats (sea, wetlands, mangroves, and hillocks), and modified habitats (port area, and jetty area). The distribution of identified habitats within the study area can be seen in ***Figure 4-10***.

The area covered by different habitats in the study area has been listed in ***Table 4-16***. Among the natural habitats, sea and mangroves are the dominating ones by their cover area. A small portion of Panje wetland is also present about 4.5 km from the terminal in south direction, while the mangroves are majorly present towards the east. There will no significant direct impact on the natural habitats present in the study area (here we are considering the JNPA approach channel as modified habitat due to the continues vessels movement since long time). Five Endangered [Fourfinger Threadfin (*Eleutheronema tetradactylum*), Khaire's Black Shieldtail (*Melanophidium khairei*), Indian Humpback Dolphin (*Sousa plumbea*), Indian Skimmer (*Rynchops albicollis*), Steppe Eagle (*Aquila nipalensis*)] and three migratory/congregatory [Black-tailed Godwit (*Limosa limosa*), Greater Flamingo (*Phoenicopterus roseus*), Lesser Flamingo (*Phoeniconaias minor*)] species have been reported from the study area (***Table 4-26***). All the above-mentioned species were opportunistically seen/recorded in the study area, no site-specific detailed survey for the targeted species is available[86,87,88,89]. Most of the migratory birds' activities were reported from the Thane Creek Flamingo Sanctuary (present ~12.5 km from the terminal)[90,91]. Eight individuals of Fourfinger Threadfin (*Eleutheronema tetradactylum*) were reported from the Sewri and Mahul area in 2008[92]; two more observations were reported near the Thane creek area in this year (2022)[93]. Only one observation of Khaire's Black Shieldtail (*Melanophidium khairei*) was reported from the Vikhroli area towards the Thane creek[94]. The consultation with the fishermen indicates the movement of the Indian Humpback Dolphin (*Sousa plumbea*)

[86] https://www.inaturalist.org/observations?iconic_taxa=Actinopterygii&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

[87] https://www.inaturalist.org/observations?iconic_taxa=Reptilia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

[88] https://www.inaturalist.org/observations?iconic_taxa=Mammalia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

[89] eBird Database [https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L2745852; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L14891370; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L17955762; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L10982777; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L7931230; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L4007948; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L15476519; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L2919598; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L14861634; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L4008281; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L18148588; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L3148420]

[90] https://macaulaylibrary.org/asset/48009701

[91] https://openjicareport.jica.go.jp/pdf/12270369_04.pdf

[92] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.

[93] https://www.inaturalist.org/observations/132250784; https://www.inaturalist.org/observations/122764488

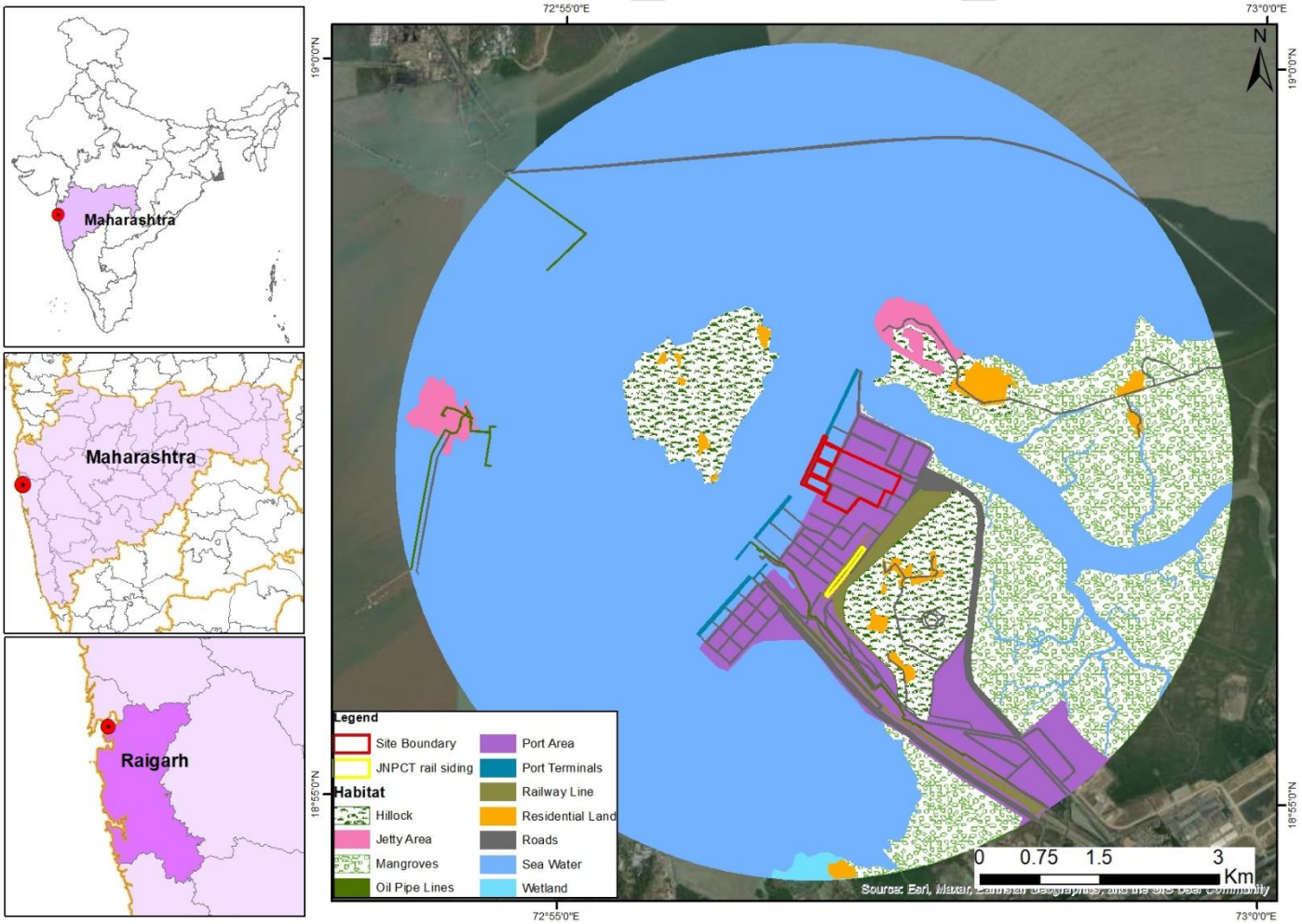
[94] https://www.inaturalist.org/observations/32106533

in the 5 km buffer of the study area for foraging/feeding, secondary data also supports the same[95]. but due to the absence of any significant nesting (breeding) site in the study area, it is unlikely to have a chance of critical habitat within the study area[96,97,98,99].

Table 4-16: Area covered by different habitats in the study area

Natural Habitats	Area covered		Modified Habitats	Area covered	
	Ha	%		Ha	%
Sea	5864.82	67.54	Port Area	469.00	5.40
Wetlands	18.74	0.22	Jetty Area	83.97	0.97
Mangroves	1271.66	14.65			
Hillocks	591.99	6.82			

Figure 4-10: Habitat map



[95] https://www.inaturalist.org/observations/124927845; https://www.inaturalist.org/observations/120857383
[96] https://macaulaylibrary.org/asset/48009701
[97] https://ebird.org/species/steeag1/IN-MH-MS
[98] https://openjicareport.jica.go.jp/pdf/12270369_04.pdf
[99] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.

4.3.3.2 Aquatic (Marine) Ecology

This section considers the marine environment present in the study area including sea transport routes.

4.3.3.2.1 Phytoplankton

Phytoplanktons are free-floating, microscopic autotrophs and contribute as a primary producer in the aquatic system. Their diversity, growth and multiplication depend on solar illuminations, temperature, silicates, trace elements etc. As they are open and sensitive to the surrounding environment (i.e. water), they are used as an indicator of water quality. The diversity of phytoplankton is variable and varies from one season to another. The variation of phytoplanktonic diversity and productivity is responsible for the diversity and growth of zooplanktons and finally the larger aquatic fauna. Based on previous site-specific reports[100,101,102] a list of 41 phytoplanktons from the study area is presented in the table below,

Table 4-17: Phytoplankton diversity of the study area

Sr. No.	Phytoplanktons	Family	Group
1	*Asterionella* sp.	Fragilariaceae	Diatom
2	*Biddulphia* sp.	Biddulphiaceae	Diatom
3	*Ceratium furca* (Ehrenberg) Claparéde & Lachmann	Ceratiaceae	Dinoflagellate
4	*Ceratium inflatum* (Kofoid) E.G. Jørgensen	Ceratiaceae	Dinoflagellate
5	*Ceratium macroceros* (Ehrenberg) Vanhöffen	Ceratiaceae	Dinoflagellate
6	*Ceratium tripos* (O.F. Müller) Nitzsch	Ceratiaceae	Dinoflagellate
7	*Chaetoceros* sp.	Chaetocerotaceae	Diatom
8	*Corethron* sp.	Corethraceae	Diatom
9	*Coscinodiscus* sp.	Coscinodiscaceae	Diatom
10	*Cyclotella* sp.	Stephanodiscaceae	Diatom
11	*Cylindrotheca closterium* (Ehrenberg) Reimann & J.C. Lewin	Bacillariaceae	Diatom
12	*Dactyliosolen* sp.	Rhizosoleniaceae	Diatom
13	*Dinophysis miles* Cleve	Dinophysaceae	Dinoflagellate
14	*Ditylum* sp.	Lithodesmiaceae	Diatom
15	*Eucampia* sp.	Hemiaulaceae	Diatom
16	*Euglena* sp.	Euglenaceae	Single cell flagellate eukaryote
17	*Guinardia* sp.	Rhizosoleniaceae	Diatom
18	*Gyrodinium* sp.	Gymnodiniaceae	Dinoflagellate
19	*Gyrosigma* sp.	Pleurosigmataceae	Diatom
20	*Hemidiscus* sp.	Hemidiscaceae	Diatom
21	*Leptocylindrus* sp.	Leptocylindraceae	Diatom
22	*Melosira* sp.	Melosiraceae	Diatom
23	*Navicula* sp.	Naviculaceae	Diatom

[100] Studies on the impact of dredging on marine ecology at Jawaharlal Nehru Port, Navi Mumbai. CSIR-National Institute of Oceanography, Mumbai, India.
[101] JNPA Annual progress report for Water Quality Monitoring. Department of Civil Engineering, IIT Madras, Chennai, India.
[102] Mumbai Trans Harbor Link Project - Supplemental Environmental Impact Assessment (2015). Mumbai Metropolitan Region Development Authority.

Sr. No.	Phytoplanktons	Family	Group
24	*Nitzschia* sp.	Bacillariaceae	Diatom
25	*Noctiluca* sp.	Noctilucaceae	Dinoflagellate
26	*Pediastrum* sp.	Hydrodictyaceae	Green Algae
27	*Peridinium* sp.	Peridiniaceae	Dinoflagellate
28	*Plagioselmis* sp.	Cryptomonadaceae	Cryptophyte
29	*Pleurosigma* sp.	Pleurosigmataceae	Diatom
30	*Protoperidinium depressum* (Bailey) Balech	Protoperidiniaceae	Dinoflagellate
31	*Pseudo-nitzschia* sp.	Bacillariaceae	Diatom
32	*Pyramimonas* sp.	Pyramimonadaceae	Green Algae
33	*Rhizosolenia* sp.	Rhizosoleniaceae	Diatom
34	*Skeletonema* sp.	Skeletonemataceae	Diatom
35	*Spirulina* sp.	Spirulinaceae	Blue-green Algae
36	*Surirella* sp.	Surirellaceae	Diatom
37	*Thalassionema* sp.	Thalassionemataceae	Diatom
38	*Thalassiosira* sp.	Thalassiosiraceae	Diatom
39	*Triceratium favus* var. *pentagona* Tempère & Peragallo	Triceratiaceae	Diatom
40	*Triceratium* sp.	Triceratiaceae	Diatom
41	*Trichodesmium* sp.	Microcoleaceae	Blue-green Algae

4.3.3.2.2 Zooplankton

Zooplanktons are small floating but sometime weakly swimming organisms, that drift with water currents. They are dependent on phytoplankton for their food and nutrition. Based on previous site-specific reports[103,104,105] a list of 39 zooplanktons from the study area is presented in the table below,

Table 4-18: Zooplankton diversity of the study area

Sr. No.	Zooplanktons	Class	Order	Family	Group
1	*Acetes indicus*	Malacostraca	Decapoda	Sergestidae	Shrimp
2	*Acetes* sp.	Malacostraca	Decapoda	Sergestidae	Shrimp
3	Amphipods	Malacostraca	Members of Amphipoda Order		-
4	Appendicularians	Members of Appendicularia Class			-
5	Barnacles (Nauplius larvae)	Thecostraca	Members of Cirripedia Subclass		-
6	Chaetognatha	Members of Chaetognatha Phylum			Marine Worm

[103] Studies on the impact of dredging on marine ecology at Jawaharlal Nehru Port, Navi Mumbai. CSIR-National Institute of Oceanography, Mumbai, India.
[104] JNPA Annual progress report for Water Quality Monitoring. Department of Civil Engineering, IIT Madras, Chennai, India.
[105] Mumbai Trans Harbor Link Project - Supplemental Environmental Impact Assessment (2015). Mumbai Metropolitan Region Development Authority.

Sr. No.	Zooplanktons	Class	Order	Family	Group
7	*Codonellopsis* sp.	Oligotrichea	Choreotrichida	Codonellopsidae	-
8	Copepods	Hexanauplia	Members of Copepoda Subclass		-
9	Ctenophores	Members of Ctenophora Phylum			-
10	Decapod larvae	Malacostraca	Members of Decapoda Order		-
11	Doliolids	Thaliacea	Members of Doliolida Order		-
12	Echinoderm larvae	Members of Echinodermata Phylum			-
13	*Eutintinnus* sp.	Oligotrichea	Choreotrichida	Tintinnidae	-
14	*Favella* sp.	Oligotrichea	Choreotrichida	Ptychocylididae	-
15	Fish eggs	-	-	-	-
16	Fish larvae	-	-	-	-
17	Foraminiferans	Members of Foraminifera Subphylum			Forams
18	Gastropod	Members of Gastropoda Class			-
19	Insect larvae	-	-	-	-
20	Invertebrate egg	-	-	-	-
21	Isopods	Malacostraca	Members of Isopoda Order		-
22	Lamellibranchs	Members of Bivalvia Class			-
23	*Lucifer hanseni*	Malacostraca	Decapoda	Luciferidae	Shrimp
24	*Lucifer* sp.	Malacostraca	Decapoda	Luciferidae	Shrimp
25	Medusae	Members of Medusozoa Subphylum			-
26	Mysids	Malacostraca	Members of Mysida Order		Shrimp-like Crustaceans
27	Ostracods	Members of Ostracoda Class			-
28	*Paracalanus indicus*	Maxillopoda	Calanoida	Paracalanidae	-
29	Penaeids	Malacostraca	Decapoda	Members of Penaeidae Family	-
30	Polychaetes	Members of Polychaeta Class			-
31	Pteropods	Gastropoda	Members of Pteropoda Order		-
32	Rotifer	Members of Rotifera Phylum			Wheel animal
33	*Sagitta* sp.	Sagittoidea	Aphragmophora	Sagittidae	Arrow worm
34	Siphonophores	Hydrozoa	Members of Siphonophorae Order		-
35	Stomatopods	Malacostraca	Members of Stomatopoda Order		Mantis shrimp
36	Tanaids	Malacostraca	Members of Tanaidacea Order		Shrimp-like Crustaceans
37	*Tintinnopsis orientalis*	Oligotrichea	Choreotrichida	Codonellidae	-
38	*Tintinnopsis* sp.	Oligotrichea	Choreotrichida	Codonellidae	-

Sr. No.	Zooplanktons	Class	Order	Family	Group
39	*Tintinnopsis tocantinensis*	Oligotrichea	Choreotrichida	Codonellidae	-

4.3.3.2.3 Benthos

Benthos are the organisms living in the benthic zone of an aquatic ecosystem i.e. on the bottom or associated with substrata. Based on previous site-specific reports[106,107,108] a list of 31 benthos from the study area is presented in the table below,

Table 4-19: Benthos diversity of the study area

S.N.	Benthos	Class	Order	Family	Group
1	Amphipods	Malacostraca	Members of Amphipoda Order		-
2	Anthozoa	Members of Anthozoa Subphylum			Corals
3	Barnacles	Thecostraca	Members of Cirripedia Subclass		-
4	Brachyuran (Crab)	Malacostraca	Decapoda	Members of Brachyura Infraorder	True crab
5	Carideans	Malacostraca	Decapoda	Members of Caridea Infraorder	Caridean shrimp
6	Chaetognatha	Members of Chaetognatha Phylum			Marine Worm
7	*Clypeomorus bifasciata*	Gastropoda	Unranked	Cerithiidae	Sea snail
8	Cumaceans	Malacostraca	Members of Cumacea Order		Hooded or Comma shrimp
9	Decapod larvae	Malacostraca	Members of Decapoda Order		-
10	Fish larvae	-	-	-	-
11	Gastropods	Members of Gastropoda Class			-
12	*Glycera longipinnis*	Polychaeta	Phyllodocida	Glyceridae	-
13	Glyceridae	Polychaeta	Phyllodocida	Members of Glyceridae Family	Blood worm
14	Isopods	Malacostraca	Members of Isopoda Order		-
15	Magelonidae	Polychaeta	Spionida	Members of Magelonidae Family	-
16	Mudskippers	Actinopterygii	Gobiiformes	Members of Oxudercidae Family	-
17	Nephtyidae	Polychaeta	Phyllodocida	Members of Nephtyidae Family	Cat worm
18	Nereidae	Polychaeta	Phyllodocida	Members of Nereididae Family	Rag or clam worm
19	*Neripteron violaceum*	Gastropoda	Cycloneritida	Neritidae	-
20	Ophiuroids	Members of Ophiuroidea Class			Brittle or serpent star
21	Ostracods	Members of Ostracoda Class			-
22	Pelecypods	Members of Bivalvia Class			-
23	Polychaetes	Members of Polychaeta Class			-
24	Pycnogonids	Pycnogonida	Members of Pantopoda Order		Sea spiders

[106] Studies on the impact of dredging on marine ecology at Jawaharlal Nehru Port, Navi Mumbai. CSIR-National Institute of Oceanography, Mumbai, India.
[107] JNPA Annual progress report for Water Quality Monitoring. Department of Civil Engineering, IIT Madras, Chennai, India.
[108] Mumbai Trans Harbor Link Project - Supplemental Environmental Impact Assessment (2015). Mumbai Metropolitan Region Development Authority.

S.N.	Benthos	Class	Order	Family	Group
25	Sea Urchin	Members of Echinoidea Class			-
26	Sergestids	Malacostraca	Decapoda	Members of Sergestidae Family	Prawns
27	Sipunculids	Members of Sipuncula Class			Peanut worms
28	Slugs	Gastropoda	Members of Heterobranchia Subclass		Sea Slugs
29	Spionidae	Polychaeta	Spionida	Members of Spionidae Family	-
30	Tanaids	Malacostraca	Members of Tanaidacea Order		Shrimp-like Crustaceans
31	*Telescopium telescopium*	Gastropoda	Unranked	Potamididae	Telescope snail

4.3.3.2.4 Fish and other aquatic fauna

As per the literature review[109,110,111,112], local consultation with fishermen, and field survey, 28 fishes, 01 Mollusca and 01 Mammal (total 30) species were recorded (reported / observed) from the study area. Out of these, two species were categorized under Endangered category of the IUCN Red List (Online Version 2022-1) - Indian Humpback Dolphin (*Sousa plumbea*) & Fourfinger Threadfin (*Eleutheronema tetradactylum*); and one species [Indian Humpback Dolphin (*Sousa plumbea*)] was listed under the Schedule I category as per the Wildlife (Protection) Act, 1972. A list of all the recorded species along with their IUCN status and schedule category from the study area is presented in ***Table 4-20***. As JN Port is an operational port, primary marine survey in immediate surroundings of the port was not conducted. Such information has been supplemented with data from secondary sources. National Institute of Oceanography (NIO) a government research institute working in the field of marine sciences was engaged by JN port to understand the water quality, sediments and biological characteristics in the marine environment of the port surroundings as well as channel. To achieve the above-mentioned objectives, NIO conducted several studies between 1996-2016 and submitted its report in March 2018. The findings of this report were also utilized in the baseline preparation. More information about the records and activities of ecological significant marine species have been separately provided under section 4.3.3.6 Species with Conservation Significance.

Table 4-20: Fishes and other aquatic fauna from the study area

S.N.	Common English Name	Binomial Scientific Name	IUCN Red List - Categories	Wild Life (Protection) Act - Schedules
1	Atlantic Tripletail	*Lobotes surinamensis*	Least Concern	Not listed
2	Bombay Duck Lizardfish	*Harpadon nehereus*	Near Threatened	Not listed
3	Burrowing Goby	*Trypauchen vagina*	Least Concern	Not listed
4	Common Dolphinfish	*Coryphaena hippurus*	Least Concern	Not listed
5	Fourfinger Threadfin	*Eleutheronema tetradactylum*	Endangered	Not listed
6	Goldspotted Rockcod	*Epinephelus coioides*	Least Concern	Not listed
7	Indo-Pacific Tarpon	*Megalops cyprinoides*	Data Deficient	Not listed
8	John's Snapper	*Lutjanus johnii*	Least Concern	Not listed
9	Largehead Hairtail	*Trichiurus lepturus*	Least Concern	Not listed
10	Lattice Blaasop	*Takifugu oblongus*	Least Concern	Not listed

[109] iNaturalist Database [https://www.inaturalist.org/observations?iconic_taxa=Actinopterygii&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species]

[110] Studies on the impact of dredging on marine ecology at Jawaharlal Nehru Port, Navi Mumbai. CSIR-National Institute of Oceanography, Mumbai, India.

[111] JNPA Annual progress report for Water Quality Monitoring. Department of Civil Engineering, IIT Madras, Chennai, India.

[112] Mumbai Trans Harbor Link Project - Supplemental Environmental Impact Assessment (2015). Mumbai Metropolitan Region Development Authority.

S.N.	Common English Name	Binomial Scientific Name	IUCN Red List - Categories	Wild Life (Protection) Act - Schedules
11	Lunartail Puffer	*Lagocephalus lunaris*	Least Concern	Not listed
12	Mangrove Red Snapper	*Lutjanus argentimaculatus*	Least Concern	Not listed
13	Miniature Indian Ricefish	*Oryzias setnai*	Least Concern	Not listed
14	Mud Skipper	*Boleophthalmus dussumieri*	Least Concern	Not listed
15	Pickhandle Barracuda	*Sphyraena jello*	Least Concern	Not listed
16	Razorbelly Scad	*Alepes kleinii*	Least Concern	Not listed
17	Short-nosed Tripodfish	*Triacanthus biaculeatus*	Least Concern	Not listed
18	Silver Pomfret	*Pampus argenteus*	Vulnerable	Not listed
19	Silver Sillago	*Sillago sihama*	Least Concern	Not listed
20	Small Spotted Dart	*Trachinotus baillonii*	Least Concern	Not listed
21	Small-scaled Terapon	*Terapon puta*	Least Concern	Not listed
22	Spinycheek Grouper	*Epinephelus diacanthus*	Least Concern	Not listed
23	Spotted Codlet	*Bregmaceros mcclellandi*	Not assessed	Not listed
24	Spotted Scat	*Scatophagus argus*	Least Concern	Not listed
25	Spotted Sicklefish	*Drepane punctata*	Least Concern	Not listed
26	Tiger Perch	*Terapon jarbua*	Least Concern	Not listed
27	White Sardine	*Escualosa thoracata*	Least Concern	Not listed
28	-	*Coilia dussumieri*	Least Concern	Not listed
Mollusca				
29	Indian Squid	*Uroteuthis duvauceli*	Data Deficient	Not listed
Mammal				
30	Indian Humpback Dolphin	*Sousa plumbea*	Endangered	Schedule I

4.3.3.2.5 Invasive Species

No invasive species was reported / observed from the aquatic (marine) system in the study area.

4.3.3.3 Terrestrial Ecology

This section considers the terrestrial environment present in the study area including road transport routes.

4.3.3.3.1 Flora

The floral diversity present within the project boundary and 5 km buffer areas was assessed during the site survey. A total of fifty-five (55) floral species belonging to twenty-seven (27) families were observed from the 5 km radius of the project area. Fabaceae was the most dominating family in the area with 12 species. None of the species identified in the region is threatened and/or restricted range species. A list of encountered as well as reported[113] floral species with their families and life forms has been given in ***Table 4-21***.

[113] https://www.academia.edu/6749035/FLORAL_DIVERSITY_OF_MANGROVE_ECOSYSTEM_FROM_COASTAL_ENVIRONMENT_OF_URAN_RAIGAD_NAVI_MUMBAI_MAHARASHTRA

Table 4-21: Floral diversity of the study area

S.N.	Binomial Scientific Name	Family	Life form
1	*Abelmoschus manihot* (L.) Medik.	Malvaceae	Shrub
2	*Acacia auriculiformis* A.Cunn. ex Benth.	Fabaceae	Tree
3	*Acanthus ilicifolius* L.	Acanthaceae	Shrub
4	*Achyranthes aspera* L.	Amaranthaceae	Herb
5	*Aegiceras corniculatum* (L.) Blanco	Primulaceae	Shrub
6	*Alternanthera paronychioides* A.St.-Hil.	Amaranthaceae	Herb
7	*Apluda mutica* L.	Poaceae	Grass
8	*Avicennia marina* (Forssk.) Vierh.	Acanthaceae	Tree
9	*Avicennia officinalis* L.	Acanthaceae	Tree
10	*Azadirachta indica* A.Juss.	Meliaceae	Tree
11	*Barleria cristata* L.	Acanthaceae	Shrub
12	*Basella alba* L.	Basellaceae	Climber
13	*Blumea lacera* (Burm.f.) DC.	Asteraceae	Herb
14	*Bombax ceiba* L.	Malvaceae	Tree
15	*Bridelia retusa* (L.) A.Juss.	Phyllanthaceae	Tree
16	*Caesalpinia bonduc* (L.) Roxb.	Fabaceae	Climber
17	*Cajanus scarabaeoides* (L.) Thouars	Fabaceae	Climber
18	*Calotropis gigantea* (L.) Dryand.	Apocynaceae	Tree
19	*Ceriops tagal* (Perr.) C.B. Robinson	Rhizophoraceae	Tree
20	*Clerodendrum inerme* L.	Verbenaceae	Shrub
21	*Cordia dichotoma* G.Forst.	Boraginaceae	Tree
22	*Cressa cretica* L.	Convolvulaceae	Herb
23	*Cynodon dactylon* (L.) Pers.	Poaceae	Grass
24	*Delonix regia* (Hook.) Raf.	Fabaceae	Tree
25	*Derris scandens* (Roxb.) Benth.	Fabaceae	Climber
26	*Derris trifoliata* Lour.	Fabaceae	Climber
27	*Erythrina stricta* Roxb.	Fabaceae	Tree
28	*Ficus benghalensis* L.	Moraceae	Tree
29	*Ficus hispida* L.f.	Moraceae	Tree
30	*Ficus religiosa* L.	Moraceae	Tree
31	*Fimbristylis ferruginea* (L.) Vahl	Cyperaceae	Grass
32	*Grewia asiatica* L.	Malvaceae	Tree

S.N.	Binomial Scientific Name	Family	Life form
33	*Ipomoea imperati* (Vahl) Griseb.	Convolvulaceae	Herb
34	*Ipomoea pes-caprae* (L.) R.Br.	Convolvulaceae	Climber
35	*Lantana camara* L.	Verbenaceae	Shrub
36	*Leucaena leucocephala* (Lam.) de Wit	Fabaceae	Tree
37	*Lumnitzera racemosa* Willd.	Combretaceae	Tree
38	*Mesosphaerum suaveolens* (L.) Kuntze	Lamiaceae	Herb
39	*Mucuna pruriens* (L.) DC.	Fabaceae	Climber
40	*Parkinsonia aculeata* L.	Fabaceae	Tree
41	*Peltophorum pterocarpum* (DC.) K.Heyne	Fabaceae	Tree
42	*Plumeria obtusa* L.	Apocynaceae	Tree
43	*Polyalthia longifolia* Sonn.	Annonaceae	Tree
44	*Pongamia pinnata* (L.) Pierre	Fabaceae	Tree
45	*Psidium guajava* L.	Myrtaceae	Tree
46	*Ricinus communis* L.	Euphorbiaceae	Small Tree
47	*Salvadora persica* L.	Salvadoraceae	Tree
48	*Scoparia dulcis* L.	Plantaginaceae	Herb
49	*Sesuvium portulacastrum* (L.) L.	Aizoaceae	Herb
50	*Sonneratia apetala* Buch.-Ham.	Lythraceae	Tree
51	*Sonneratia caseolaris* (L.) Engl.	Lythraceae	Tree
52	*Streblus asper* Lour.	Moraceae	Tree
53	*Suaeda maritima* (L.) Dumort.	Amaranthaceae	Herb
54	*Tectona grandis* L.f.	Lamiaceae	Tree
55	*Ziziphus mauritiana* Lamk.	Rhamnaceae	Tree

4.3.3.3.2 Herpatofauna

As per the literature review[114], local consultation, and field survey, thirteen (13) herpetofauna (reptiles + amphibians) species were recorded (reported / observed) from the study area. Out of these, one species - Khaire's Black Shieldtail (*Melanophidium khairei*) was categorized under any Endangered category of the IUCN Red List (Online Version 2022-1); and one species [Bengal Monitor Lizard (*Varanus bengalensis*)] was listed under the Schedule I category as per the Wild Life (Protection) Act, 1972. A list of all the recorded species along with their IUCN status and schedule category from the study area is presented in ***Table 4-22***. The presence and activities of ecological significant avifaunal species have been separately discussed under section 4.3.3.6 Species with Conservation Significance.

[114] iNaturalist Database [https://www.inaturalist.org/observations?iconic_taxa=Reptilia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species]

Table 4-22: Herpetofauna diversity of the study area

S.N.	Common English Name	Binomial Scientific Name	IUCN Red List - Categories	Wild Life (Protection) Act - Schedules
1	Asiatic Water Snake	*Fowlea piscator*	Not assessed	Schedule II
2	Beaked Sea Snake	*Hydrophis schistosus*	Least Concern	Not listed
3	Bengal Monitor Lizard	*Varanus bengalensis*	Least Concern	Schedule I
4	Buff-striped Keelback	*Amphiesma stolatum*	Not assessed	Schedule IV
5	Daudin's Bronzeback	*Dendrelaphis tristis*	Least Concern	Not listed
6	Gerard's Water Snake	*Gerarda prevostiana*	Least Concern	Not listed
7	Indian Cobra	*Naja naja*	Least Concern	Schedule II
8	Khaire's Black Shieldtail	*Melanophidium khairei*	Endangered	Not listed
9	Montane Trinket Snake	*Coelognathus helena* ssp. *monticollaris*	Least Concern	Not listed
10	Oriental Garden Lizard	*Calotes versicolor*	Not assessed	Not listed
11	Oriental Ratsnake	*Ptyas mucosa*	Not assessed	Schedule II
12	Skink	*Mabuya sp.*	Not assessed	Not listed
13	Wart Snake	*Acrochordus granulatus*	Least Concern	Not listed

4.3.3.3.3 Mammals

As per the literature review[115], local consultation and field survey, nine (09) terrestrial mammals were recorded (reported / observed) from the study area. Out of these, one species - Bonnet Macaque (*Macaca radiata*) was categorized under any Vulnerable category of the IUCN Red List (Online Version 2022-1); while no species was listed under the Schedule I category as per the Wild Life (Protection) Act, 1972. A list of all the recorded species along with their IUCN status and schedule category from the study area is presented in ***Table 4-23***.

Table 4-23: Mammals from the study area

S.N.	Common English Name	Binomial Scientific Name	IUCN Red List - Categories	Wild Life (Protection) Act. 1972 - Schedules
1	Black-footed Gray Langur	*Semnopithecus hypoleucos*	Least Concern	Schedule II
2	Bonnet Macaque	*Macaca radiata*	Vulnerable	Schedule II
3	Five-striped Palm Squirrel	*Funambulus pennanti*	Least Concern	Schedule IV
4	Golden Jackal	*Canis aureus*	Least Concern	Schedule II
5	Greater False Vampire	*Lyroderma lyra*	Least Concern	Not listed
6	Indian Grey Mongoose	*Herpestes edwardsii*	Least Concern	Schedule II
7	Jungle Cat	*Felis chaus*	Least Concern	Schedule II
8	Rhesus Monkey	*Macaca mulatta*	Least Concern	Schedule II
9	Schneider's Roundleaf Bat	*Hipposideros speoris*	Least Concern	Not listed

[115] iNaturalist Database [https://www.inaturalist.org/observations?iconic_taxa=Mammalia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species]

4.3.3.3.4 Mangroves

Mangroves are a group of plants from different life forms (mostly trees and shrubs) that grows in the coastal intertidal zone. Mangrove forests are essential for the coasts because they reduce erosion from storm surges, currents, waves, and tides. Now a days with the increasing threat of climate change with rising sea levels, the mangroves become vital for shoreline communities. The mangroves have a complex underwater root system, which attracts several marine organisms for their food and shelter. Due to the increasing anthropogenic activities the global mangrove cover is continuously depleting, thus, it is important to conserve these natural coastguards.

In the study area, a good mangrove cover is present (see ***Figure 4-10***), which is dominated with several true mangrove species such as, *Acanthus ilicifolius* L., *Aegiceras corniculatum* (L.) Blanco, *Avicennia marina* (Forssk.) Vierh., *Avicennia officinalis* L., *Ceriops tagal* (Perr.) C.B. Robinson, *Lumnitzera racemosa* Willd., *Sonneratia apetala* Buch.-Ham., and *Sonneratia caseolaris* (L.) Engl. Some common associated species are, *Caesalpinia bonduc* (L.) Roxb., *Clerodendrum inerme* L., *Cressa cretica* L., *Derris scandens* (Roxb.) Benth., *Derris trifoliata* Lour., *Fimbristylis ferruginea* (L.) Vahl, *Ipomoea imperati* (Vahl) Griseb., *Ipomoea pes-caprae* (L.) R.Br., *Salvadora persica* L., *Sesuvium portulacastrum* (L.) L., and *Suaeda maritima* (L.) Dumort. A compiled list of mangrove species along with their life forms and IUCN status from the study area is presented in ***Table 4-24***.

Table 4-24: Floral diversity in the mangroves of the study area

S.N.	Binomial Scientific Name	Family	Life form	IUCN Red List - Categories
1	*Acanthus ilicifolius* L.	Acanthaceae	Shrub	Least Concern
2	*Aegiceras corniculatum* (L.) Blanco	Primulaceae	Shrub	Least Concern
3	*Alternanthera paronychioides* A.St.-Hil.	Amaranthaceae	Herb	Not assessed
4	*Apluda mutica* L.	Poaceae	Grass	Not assessed
5	*Avicennia marina* (Forssk.) Vierh.	Acanthaceae	Tree	Least Concern
6	*Avicennia officinalis* L.	Acanthaceae	Tree	Least Concern
7	*Barleria cristata* L.	Acanthaceae	Shrub	Not assessed
8	*Basella alba* L.	Basellaceae	Climber	Not assessed
9	*Blumea lacera* (Burm.f.) DC.	Asteraceae	Herb	Least Concern
10	*Caesalpinia bonduc* (L.) Roxb.	Fabaceae	Climber	Least Concern
11	*Cajanus scarabaeoides* (L.) Thouars	Fabaceae	Climber	Least Concern
12	*Ceriops tagal* (Perr.) C.B. Robinson	Rhizophoraceae	Tree	Least Concern
13	*Clerodendrum inerme* L.	Verbenaceae	Shrub	Not assessed
14	*Cressa cretica* L.	Convolvulaceae	Herb	Least Concern
15	*Derris scandens* (Roxb.) Benth.	Fabaceae	Climber	Least Concern
16	*Derris trifoliata* Lour.	Fabaceae	Climber	Not assessed
17	*Ficus hispida* L.f.	Moraceae	Tree	Least Concern
18	*Fimbristylis ferruginea* (L.) Vahl	Cyperaceae	Grass	Least Concern
19	*Ipomoea imperati* (Vahl) Griseb.	Convolvulaceae	Herb	Not assessed
20	*Ipomoea pes-caprae* (L.) R.Br.	Convolvulaceae	Climber	Least Concern
21	*Lumnitzera racemosa* Willd.	Combretaceae	Tree	Least Concern

S.N.	Binomial Scientific Name	Family	Life form	IUCN Red List - Categories
22	*Mesosphaerum suaveolens* (L.) Kuntze	Lamiaceae	Herb	Not assessed
23	*Salvadora persica* L.	Salvadoraceae	Tree	Least Concern
24	*Scoparia dulcis* L.	Plantaginaceae	Herb	Not assessed
25	*Sesuvium portulacastrum* (L.) L.	Aizoaceae	Herb	Least Concern
26	*Sonneratia apetala* Buch.-Ham.	Lythraceae	Tree	Least Concern
27	*Sonneratia caseolaris* (L.) Engl.	Lythraceae	Tree	Least Concern
28	*Streblus asper* Lour.	Moraceae	Tree	Least Concern
29	*Suaeda maritima* (L.) Dumort.	Amaranthaceae	Herb	Not assessed

4.3.3.3.5 Invasive Species

No invasive species was reported / observed from the terrestrial system in the study area.

4.3.3.4 Avifauna

As per the literature review[116, 117, 118, 119, 120,121], local consultation and field survey, 272 avifaunal species were recorded from the region, which include four species Endemic to Western Ghats [Crimson-backed Sunbird (*Leptocoma minima*), Malabar Lark (*Galerida malabarica*), Malabar Starling (*Sturnia blythii*), Sahyadri Sunbird (*Aethopyga vigorsii*)]; two Endangered (as per IUCN Red Lis) [Indian Skimmer (*Rynchops albicollis*), Steppe Eagle (*Aquila nipalensis*)]; and five Vulnerable (as per IUCN Red Lis) [Bristled Grassbird (*Schoenicola striatus*), Common Pochard (*Aythya ferina*), Greater Spotted Eagle (*Clanga clanga*), Indian Spotted Eagle (*Clanga hastata*), River Tern (*Sterna aurantia*)]. Twenty-one (21) Schedule I species - Black Eagle, Black Kite, Black-winged Kite, Bonelli's Eagle, Booted Eagle, Brahminy Kite, Eurasian Buzzard, Eurasian Sparrowhawk, Eurasian Spoonbill, Greater Spotted Eagle, Indian Grey Hornbill, Indian Peafowl, Laggar Falcon, Montagu's Harrier, Oriental Honey-buzzard, Osprey, Pallid Harrier, Shikra, Short-toed Snake-Eagle, Steppe Eagle, Western Marsh-Harrier were also recorded from the region as per the Wild Life (Protection) Act, 1972. The area also supports 118 Migratory, and 22 Raptor species ***Table 4-25***. The maximum counts of some of the species observed during the avifaunal survey in the same region by Bombay Natural History Society (BNHS)[122] have also been provided in the table. The presence and activities of ecological significant avifaunal species have been separately discussed under section 4.3.3.6 Species with Conservation Significance.

[116] eBird Database [https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L2745852; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L14891370; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L17955762; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L10982777; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L7931230; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L4007948; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L15476519; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L2919598; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L14861634; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L4008281; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L18148588; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L3148420]

[117] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.

[118] Narwade, S.S., Prabhu, M.V., Shaikh, P.A., Ambavane, P.A. and Rahmani, A.R. (2014) Baseline survey of birds at the proposed NMIA area. Annual Report - III, January-December, 2014. Submitted to CIDCO, Navi Mumbai, Maharashtra by BNHS, India, pp 63.

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Table 4-25: Avifaunal diversity from the study area

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wild Life (Protection) Act. 1972 - Schedules	Max. Number of individuals[1]
1	African Comb Duck	*Sarkidiornis melanotos*	R	Least Concern	Schedule IV	-
2	Alexandrine Parakeet	*Palaeornis eupatria*	R	Near Threatened	Schedule IV	-
3	Alpine Swift	*Tachymarptis melba*	R	Least Concern	Not Listed	-
4	Amur Falcon	*Falco amurensis*	M	Least Concern	Schedule IV	-
5	Ashy Drongo	*Dicrurus leucophaeus*	M	Least Concern	Schedule IV	-
6	Ashy Prinia	*Prinia socialis*	R	Least Concern	Schedule IV	-
7	Ashy-crowned Sparrow-lark	*Eremopterix griseus*	R	Least Concern	Schedule IV	-
8	Asian Desert Warbler	*Sylvia nana*	M	Least Concern	Schedule IV	-
9	Asian Koel	*Eudynamys scolopaceus*	R	Least Concern	Schedule IV	-
10	Asian Openbill	*Anastomus oscitans*	R	Least Concern	Schedule IV	-
11	Asian Palm-swift	*Cypsiurus balasiensis*	R	Least Concern	Schedule IV	-
12	Asian Pied Starling	*Gracupica contra*	R	Least Concern	Schedule IV	-
13	Asian Plain Martin	*Riparia chinensis*	R	Least Concern	Not Listed	-
14	Asian Woollyneck	*Ciconia episcopus*	R	Near Threatened	Schedule IV	-
15	Baillon's Crake	*Zapornia pusilla*	M	Least Concern	Schedule IV	-
16	Bank Myna	*Acridotheres ginginianus*	R	Least Concern	Schedule IV	-
17	Barn Owl	*Tyto alba*	R	Least Concern	Schedule IV	-
18	Barn Swallow	*Hirundo rustica*	M	Least Concern	Not Listed	-
19	Barred Buttonquail	*Turnix suscitator*	R	Least Concern	Schedule IV	-
20	Bar-tailed Godwit	Limosa lapponica	M	Near Threatened	Schedule IV	-
21	Baya Weaver	*Ploceus philippinus*	R	Least Concern	Schedule IV	-
22	Bay-backed Shrike	*Lanius vittatus*	R	Least Concern	Not Listed	-
23	Black Bittern	*Ixobrychus flavicollis*	R	Least Concern	Schedule IV	-
24	Black Drongo	*Dicrurus macrocercus*	R	Least Concern	Schedule IV	-
25	Black Eagle	*Ictinaetus malaiensis*	R	Least Concern	Schedule I	-
26	Black Kite	*Milvus migrans*	R	Least Concern	Schedule I	-
27	Black-breasted Weaver	*Ploceus benghalensis*	R	Least Concern	Schedule IV	-
28	Black-capped Kingfisher	*Halcyon pileata*	R	Least Concern	Schedule IV	-
29	Black-headed Bunting	*Emberiza melanocephala*	M	Least Concern	Schedule IV	-
30	Black-headed Gull	*Chroicocephalus ridibundus*	M	Least Concern	Schedule IV	26
31	Black-headed Ibis	*Threskiornis melanocephalus*	R	Near Threatened	Schedule IV	6
32	Black-tailed Godwit	*Limosa limosa*	M	Near Threatened	Schedule IV	278
33	Black-winged Kite	*Elanus caeruleus*	R	Least Concern	Schedule I	23

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wild Life (Protection) Act. 1972 - Schedules	Max. Number of individuals[1]
34	Black-winged Stilt	*Himantopus himantopus*	R	Least Concern	Schedule IV	200
35	Blue-cheeked Bee-eater	*Merops persicus*	R	Least Concern	Not Listed	-
36	Blue-tailed Bee-eater	*Merops philippinus*	M	Least Concern	Schedule IV	-
37	Bluethroat	*Cyanecula svecica*	M	Least Concern	Schedule IV	-
38	Blyth's Pipit	*Anthus godlewskii*	M	Least Concern	Schedule IV	-
39	Blyth's Reed Warbler	*Acrocephalus dumetorum*	M	Least Concern	Schedule IV	-
40	Bonelli's Eagle	*Aquila fasciata*	R	Least Concern	Schedule I	-
41	Booted Eagle	*Hieraaetus pennatus*	M	Least Concern	Schedule I	-
42	Booted Warbler	*Iduna caligata*	M	Least Concern	Schedule IV	-
43	Brahminy Kite	*Haliastur indus*	R	Least Concern	Schedule I	2
44	Brahminy Starling	*Sturnia pagodarum*	R	Least Concern	Schedule IV	-
45	Bristled Grassbird	Schoenicola striatus	R	Vulnerable	Schedule IV	-
46	Broad-billed Sandpiper	*Calidris falcinellus*	M	Least Concern	Schedule IV	900
47	Bronze-winged Jacana	*Metopidius indicus*	R	Least Concern	Schedule IV	-
48	Brown Shrike	*Lanius cristatus*	M	Least Concern	Not Listed	-
49	Brown-headed Gull	*Larus brunnicephalus*	M	Least Concern	Schedule IV	4
50	Caspian Tern	*Hydroprogne caspia*	M	Least Concern	Schedule IV	59
51	Cattle Egret	*Bubulcus ibis*	R	Least Concern	Schedule IV	5
52	Chestnut-shouldered Bush-sparrow	*Gymnoris xanthocollis*	R	Least Concern	Schedule IV	-
53	Chestnut-tailed Starling	*Sturnia malabarica*	M	Least Concern	Schedule IV	-
54	Cinnamon Bittern	*Ixobrychus cinnamomeus*	R	Least Concern	Schedule IV	-
55	Citrine Wagtail	*Motacilla citreola*	M	Least Concern	Schedule IV	-
56	Clamorous Reed Warbler	*Acrocephalus stentoreus*	R	Least Concern	Schedule IV	-
57	Collared Sand Martin	*Riparia riparia*	M	Least Concern	Not Listed	-
58	Common Babbler	*Argya caudata*	R	Least Concern	Schedule IV	-
59	Common Chiffchaff	*Phylloscopus collybita*	M	Least Concern	Schedule IV	-
60	Common Coot	*Fulica atra*	M	Least Concern	Schedule IV	69
61	Common Cuckoo	*Cuculus canorus*	M	Least Concern	Schedule IV	-
62	Common Grasshopper-Warbler	*Locustella naevia*	M	Least Concern	Schedule IV	-
63	Common Greenshank	*Tringa nebularia*	M	Least Concern	Schedule IV	27
64	Common Gull-billed Tern	*Gelochelidon nilotica*	M	Least Concern	Schedule IV	1500
65	Common Hawk-cuckoo	*Hierococcyx varius*	R	Least Concern	Schedule IV	-
66	Common Hoopoe	*Upupa epops*	R	Least Concern	Not Listed	-
67	Common Iora	*Aegithina tiphia*	R	Least Concern	Schedule IV	-
68	Common Kestrel	*Falco tinnunculus*	M	Least Concern	Schedule IV	-
69	Common Kingfisher	*Alcedo atthis*	R	Least Concern	Schedule IV	1
70	Common Moorhen	*Gallinula chloropus*	R	Least Concern	Schedule IV	-
71	Common Myna	*Acridotheres tristis*	R	Least Concern	Schedule IV	-

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wild Life (Protection) Act. 1972 - Schedules	Max. Number of individuals[1]
72	Common Pochard	*Aythya ferina*	M	Vulnerable	Schedule IV	-
73	Common Quail	*Coturnix coturnix*	M	Least Concern	Schedule IV	-
74	Common Redshank	*Tringa totanus*	M	Least Concern	Schedule IV	350
75	Common Rosefinch	*Carpodacus erythrinus*	M	Least Concern	Schedule IV	-
76	Common Sandpiper	*Actitis hypoleucos*	M	Least Concern	Schedule IV	15
77	Common Shelduck	*Tadorna tadorna*	M	Least Concern	Schedule IV	-
78	Common Snipe	*Gallinago gallinago*	M	Least Concern	Schedule IV	34
79	Common Tailorbird	*Orthotomus sutorius*	R	Least Concern	Schedule IV	-
80	Common Tern	*Sterna hirundo*	M	Least Concern	Schedule IV	-
81	Coppersmith Barbet	*Psilopogon haemacephalus*	R	Least Concern	Schedule IV	-
82	Cotton Pygmy-goose	*Nettapus coromandelianus*	R	Least Concern	Schedule IV	-
83	Crimson-backed Sunbird	*Leptocoma minima*	R	Least Concern	Schedule IV	-
84	Curlew Sandpiper	*Calidris ferruginea*	M	Near Threatened	Schedule IV	3250
85	Desert Wheatear	*Oenanthe deserti*	M	Least Concern	Schedule IV	-
86	Dunlin	*Calidris alpina*	M	Least Concern	Schedule IV	1050
87	Dusky Crag-Martin	*Ptyonoprogne concolor*	R	Least Concern	Not Listed	-
88	Eurasian Buzzard	*Buteo buteo*	M	Least Concern	Schedule I	-
89	Eurasian Collared-Dove	*Streptopelia decaocto*	R	Least Concern	Schedule IV	-
90	Eurasian Curlew	*Numenius arquata*	M	Near Threatened	Schedule IV	80
91	Eurasian Hobby	*Falco subbuteo*	M	Least Concern	Schedule IV	-
92	Eurasian Sparrowhawk	*Accipiter nisus*	M	Least Concern	Schedule I	-
93	Eurasian Spoonbill	*Platalea leucorodia*	R	Least Concern	Schedule I	70
94	Eurasian Wigeon	*Mareca penelope*	M	Least Concern	Schedule IV	-
95	Eurasian Wryneck	*Jynx torquilla*	M	Least Concern	Schedule IV	-
96	European Roller	*Coracias garrulus*	M	Least Concern	Schedule IV	-
97	Ferruginous Duck	*Aythya nyroca*	M	Near Threatened	Schedule IV	-
98	Forest Wagtail	*Dendronanthus indicus*	M	Least Concern	Schedule IV	-
99	Gadwall	*Mareca strepera*	M	Least Concern	Schedule IV	-
100	Garganey	*Spatula querquedula*	M	Least Concern	Schedule IV	-
101	Glossy Ibis	*Plegadis falcinellus*	M	Least Concern	Schedule IV	37
102	Great Cormorant	*Phalacrocorax carbo*	R	Least Concern	Schedule IV	-
103	Great Egret	*Ardea alba*	R	Least Concern	Schedule IV	4
104	Greater Coucal	*Centropus sinensis*	R	Least Concern	Schedule IV	-
105	Greater Crested Tern	*Thalasseus bergii*	R	Least Concern	Schedule IV	-
106	Greater Flamingo	*Phoenicopterus roseus*	M	Least Concern	Schedule IV	1500
107	Greater Painted-snipe	*Rostratula benghalensis*	R	Least Concern	Not Listed	-
108	Greater Sand-Plover	*Charadrius leschenaultii*	M	Least Concern	Schedule IV	1050

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wild Life (Protection) Act. 1972 - Schedules	Max. Number of individuals[1]
109	Greater Spotted Eagle	*Clanga clanga*	M	Vulnerable	Schedule I	-
110	Green Bee-eater	*Merops orientalis*	R	Least Concern	Schedule IV	-
111	Green Sandpiper	*Tringa ochropus*	M	Least Concern	Schedule IV	-
112	Green Warbler	*Phylloscopus nitidus*	M	Least Concern	Schedule IV	-
113	Greenish Warbler	*Phylloscopus trochiloides*	M	Least Concern	Schedule IV	-
114	Grey Heron	*Ardea cinerea*	R	Least Concern	Schedule IV	5
115	Grey Plover	Pluvialis squatarola	M	Least Concern	Schedule IV	19
116	Grey Wagtail	*Motacilla cinerea*	M	Least Concern	Schedule IV	-
117	Grey-bellied Cuckoo	*Cacomantis passerinus*	R	Least Concern	Schedule IV	-
118	Grey-breasted Prinia	*Prinia hodgsonii*	R	Least Concern	Schedule IV	-
119	Greylag Goose	*Anser anser*	M	Least Concern	Schedule IV	-
120	Grey-necked Bunting	*Emberiza buchanani*	M	Least Concern	Schedule IV	-
121	House Crow	*Corvus splendens*	R	Least Concern	Schedule V	-
122	House Sparrow	*Passer domesticus*	R	Least Concern	Schedule IV	-
123	Indian Cormorant	*Phalacrocorax fuscicollis*	R	Least Concern	Schedule IV	1
124	Indian Golden Oriole	*Oriolus kundoo*	R	Least Concern	Schedule IV	-
125	Indian Grey Hornbill	*Ocyceros birostris*	R	Least Concern	Schedule I	-
126	Indian Paradise-flycatcher	*Terpsiphone paradisi*	R	Least Concern	Schedule IV	-
127	Indian Peafowl	*Pavo cristatus*	R	Least Concern	Schedule I	-
128	Indian Pond Heron	*Ardeola grayii*	R	Least Concern	Schedule IV	4
129	Indian Robin	*Saxicoloides fulicata*	R	Least Concern	Schedule IV	-
130	Indian Roller	*Coracias benghalensis*	R	Least Concern	Schedule IV	-
131	Indian Silverbill	*Euodice malabarica*	R	Least Concern	Schedule IV	-
132	Indian Skimmer	*Rynchops albicollis*	M	Endangered	Not Listed	1
133	Indian Spot-billed Duck	*Anas poecilorhyncha*	R	Least Concern	Schedule IV	67
134	Indian Spotted Eagle	*Clanga hastata*	R	Vulnerable	Not Listed	-
135	Indian Thick-knee	*Burhinus indicus*	R	Least Concern	Not Listed	-
136	Indian White-eye	*Zosterops palpebrosus*	R	Least Concern	Schedule IV	-
137	Intermediate Egret	*Ardea intermedia*	R	Least Concern	Schedule IV	25
138	Isabelline Shrike	*Lanius isabellinus*	M	Least Concern	Not Listed	-
139	Isabelline Wheatear	*Oenanthe isabellina*	M	Least Concern	Schedule IV	-
140	Jerdon's Leafbird	*Chloropsis jerdoni*	R	Least Concern	Not Listed	-
141	Jungle Babbler	*Turdoides striatus*	R	Least Concern	Schedule IV	-
142	Jungle Bush-quail	*Perdicula asiatica*	R	Least Concern	Schedule IV	-
143	Jungle Myna	*Acridotheres fuscus*	R	Least Concern	Schedule IV	-
144	Jungle Prinia	*Prinia sylvatica*	R	Least Concern	Schedule IV	-
145	Kentish Plover	*Charadrius alexandrinus*	M	Least Concern	Schedule IV	-
146	Laggar Falcon	*Falco jugger*	R	Near Threatened	Schedule I	-

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wild Life (Protection) Act. 1972 - Schedules	Max. Number of individuals[1]
147	Large-billed Crow	*Corvus macrorhynchos*	R	Least Concern	Schedule IV	-
148	Laughing Dove	*Streptopelia senegalensis*	R	Least Concern	Schedule IV	-
149	Lesser Black-backed Gull	*Larus fuscus*	M	Least Concern	Schedule IV	-
150	Lesser Crested Tern	*Thalasseus bengalensis*	M	Least Concern	Schedule IV	-
151	Lesser Flamingo	Phoeniconaias minor	M	Near Threatened	Schedule IV	432
152	Lesser Sand-Plover	*Charadrius mongolus*	M	Least Concern	Schedule IV	3250
153	Lesser Whitethroat	*Sylvia curruca*	M	Least Concern	Schedule IV	-
154	Little Cormorant	*Microcarbo niger*	R	Least Concern	Schedule IV	38
155	Little Egret	*Egretta garzetta*	R	Least Concern	Schedule IV	20
156	Little Grebe	*Tachybaptus ruficollis*	R	Least Concern	Schedule IV	45
157	Little Pratincole	*Glareola lactea*	R	Least Concern	Not Listed	-
158	Little Ringed Plover	*Charadrius dubius*	R	Least Concern	Schedule IV	1
159	Little Stint	*Calidris minuta*	M	Least Concern	Schedule IV	2100
160	Little Swift	*Apus affinis*	R	Least Concern	Not Listed	-
161	Little Tern	*Sternula albifrons*	R	Least Concern	Schedule IV	-
162	Long-billed Pipit	*Anthus similis*	M	Least Concern	Schedule IV	-
163	Long-tailed Shrike	*Lanius schach*	R	Least Concern	Not Listed	-
164	Loten's Sunbird	*Cinnyris lotenius*	R	Least Concern	Schedule IV	-
165	Malabar Lark	*Galerida malabarica*	R	Least Concern	Schedule IV	-
166	Malabar Starling	*Sturnia blythii*	R	Not assessed	Schedule IV	-
167	Marsh Sandpiper	*Tringa stagnatilis*	M	Least Concern	Schedule IV	29
168	Mongolian Short-toed Lark	*Calandrella dukhunensis*	M	Least Concern	Not Listed	-
169	Montagu's Harrier	*Circus pygargus*	M	Least Concern	Schedule I	-
170	Northern Pintail	*Anas acuta*	M	Least Concern	Schedule IV	-
171	Northern Shoveler	*Spatula clypeata*	M	Least Concern	Schedule IV	-
172	Olive-backed Pipit	*Anthus hodgsoni*	M	Least Concern	Schedule IV	-
173	Orange-headed Thrush	*Geokichla citrina*	R	Least Concern	Schedule IV	-
174	Oriental Honey-buzzard	*Pernis ptilorhynchus*	R	Least Concern	Schedule I	-
175	Oriental Magpie-Robin	*Copsychus saularis*	R	Least Concern	Schedule IV	-
176	Oriental Skylark	*Alauda gulgula*	R	Least Concern	Schedule IV	-
177	Oriental Turtle-Dove	*Streptopelia orientalis*	R	Least Concern	Schedule IV	-
178	Osprey	*Pandion haliaetus*	M	Least Concern	Schedule I	1
179	Pacific Golden-Plover	*Pluvialis fulva*	M	Least Concern	Schedule IV	13
180	Paddyfield Pipit	*Anthus rufulus*	R	Least Concern	Schedule IV	-
181	Paddyfield Warbler	*Acrocephalus agricola*	M	Least Concern	Schedule IV	-
182	Painted Stork	*Mycteria leucocephala*	R	Near Threatened	Schedule IV	185
183	Pale-billed Flowerpecker	*Dicaeum erythrorhynchos*	R	Least Concern	Schedule IV	-
184	Pallas's Gull	*Larus ichthyaetus*	M	Least Concern	Schedule IV	-

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185	Pallid Harrier	*Circus macrourus*	M	Near Threatened	Schedule I	-
186	Peregrine Falcon	*Falco peregrinus*	R	Least Concern	Schedule IV	-
187	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	R	Least Concern	Schedule IV	3
188	Pied Avocet	*Recurvirostra avosetta*	M	Least Concern	Schedule IV	2
189	Pied Bushchat	*Saxicola caprata*	R	Least Concern	Schedule IV	-
190	Pied Kingfisher	*Ceryle rudis*	R	Least Concern	Schedule IV	-
191	Pintail Snipe	*Gallinago stenura*	M	Least Concern	Schedule IV	-
192	Plain Prinia	*Prinia inornata*	R	Least Concern	Schedule IV	-
193	Plum-headed Parakeet	*Psittacula cyanocephala*	R	Least Concern	Schedule IV	-
194	Purple Heron	*Ardea purpurea*	R	Least Concern	Schedule IV	15
195	Purple Sunbird	*Nectarinia asiatica*	R	Least Concern	Schedule IV	
196	Purple Swamphen	*Porphyrio porphyrio*	R	Least Concern	Schedule IV	8
197	Purple-rumped Sunbird	*Leptocoma zeylonica*	R	Least Concern	Schedule IV	-
198	Rain Quail	*Coturnix coromandelica*	R	Least Concern	Schedule IV	-
199	Red Avadavat	*Amandava amandava*	R	Least Concern	Schedule IV	-
200	Red-breasted Flycatcher	*Ficedula parva*	M	Least Concern	Schedule IV	-
201	Red-crested Pochard	*Netta rufina*	M	Least Concern	Schedule IV	-
202	Red-headed Bunting	*Emberiza bruniceps*	M	Least Concern	Schedule IV	-
203	Red-naped Ibis	*Pseudibis papillosa*	R	Least Concern	Schedule IV	-
204	Red-necked Phalarope	*Phalaropus lobatus*	M	Least Concern	Not Listed	1
205	Red-rumped Swallow	*Cecropis daurica*	R	Least Concern	Schedule IV	
206	Red-throated Flycatcher	*Ficedula albicilla*	M	Least Concern	Schedule IV	-
207	Red-vented Bulbul	*Pycnonotus cafer*	R	Least Concern	Schedule IV	-
208	Red-wattled Lapwing	*Vanellus indicus*	R	Least Concern	Schedule IV	3
209	Red-whiskered Bulbul	*Pycnonotus jocosus*	R	Least Concern	Schedule IV	-
210	Richard's Pipit	*Anthus richardi*	M	Least Concern	Schedule IV	-
211	River Tern	*Sterna aurantia*	R	Vulnerable	Schedule IV	-
212	Rock Dove	*Columba livia*	R	Least Concern	Schedule IV	-
213	Rose-ringed Parakeet	*Psittacula krameri*	R	Least Concern	Schedule IV	-
214	Rosy Starling	*Pastor roseus*	M	Least Concern	Schedule IV	-
215	Ruddy Shelduck	*Tadorna ferruginea*	M	Least Concern	Schedule IV	5
216	Ruddy Turnstone	*Arenaria interpres*	M	Least Concern	Schedule IV	-
217	Ruddy-breasted Crake	Zapornia fusca	R	Least Concern	Schedule IV	-
218	Ruff	*Calidris pugnax*	M	Least Concern	Schedule IV	2
219	Rufous Treepie	*Dendrocitta vagabunda*	R	Least Concern	Schedule IV	-
220	Rufous-tailed Lark	*Ammomanes phoenicura*	R	Least Concern	Schedule IV	-
221	Sahyadri Sunbird	*Aethopyga vigorsii*	R	Least Concern	Not Listed	-
222	Sanderling	*Calidris alba*	M	Least Concern	Schedule IV	-

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wild Life (Protection) Act. 1972 - Schedules	Max. Number of individuals[1]
223	Sandwich Tern	*Thalasseus sandvicensis*	M	Least Concern	Schedule IV	-
224	Scaly-breasted Munia	*Lonchura punctulata*	R	Least Concern	Schedule IV	-
225	Shikra	*Accipiter badius*	R	Least Concern	Schedule I	-
226	Short-eared Owl	*Asio flammeus*	M	Least Concern	Schedule IV	-
227	Short-toed Snake-Eagle	*Circaetus gallicus*	R	Least Concern	Schedule I	-
228	Siberian Stonechat	*Saxicola maurus*	M	Not assessed	Schedule IV	-
229	Slaty-breasted Rail	*Lewinia striata*	R	Least Concern	Schedule IV	-
230	Slender-billed Gull	*Larus genei*	R	Least Concern	Schedule IV	36
231	Small Minivet	*Pericrocotus cinnamomeus*	R	Least Concern	Schedule IV	-
232	Spotted Dove	*Spilopelia chinensis*	R	Least Concern	Schedule IV	-
233	Spotted Owlet	*Athene brama*	R	Least Concern	Schedule IV	-
234	Spotted Redshank	*Tringa erythropus*	M	Least Concern	Schedule IV	-
235	Steppe Eagle	*Aquila nipalensis*	M	Endangered	Schedule I	-
236	Stork-billed Kingfisher	*Pelargopsis capensis*	R	Least Concern	Schedule IV	-
237	Streak-throated Swallow	*Petrochelidon fluvicola*	R	Least Concern	Schedule IV	-
238	Striated Heron	*Butorides striata*	M	Least Concern	Schedule IV	-
239	Striolated Bunting	*Emberiza striolata*	R	Least Concern	Schedule IV	-
240	Sykes's Warbler	*Iduna rama*	M	Least Concern	Not Listed	-
241	Tawny Pipit	*Anthus campestris*	M	Least Concern	Schedule IV	-
242	Temminck's Stint	*Calidris temminckii*	M	Least Concern	Schedule IV	-
243	Terek Sandpiper	*Xenus cinereus*	M	Least Concern	Schedule IV	24
244	Thick-billed Flowerpecker	*Dicaeum agile*	R	Least Concern	Schedule IV	-
245	Tickell's Blue Flycatcher	*Cyornis tickelliae*	R	Least Concern	Schedule IV	-
246	Tree Pipit	*Anthus trivialis*	M	Least Concern	Schedule IV	-
247	Tricoloured Munia	*Lonchura malacca*	R	Least Concern	Schedule IV	-
248	Tufted Duck	*Aythya fuligula*	M	Least Concern	Schedule IV	-
249	Watercock	*Gallicrex cinerea*	R	Least Concern	Schedule IV	-
250	Western Crowned Leaf-warbler	*Phylloscopus occipitalis*	M	Least Concern	Schedule IV	-
251	Western Marsh-Harrier	*Circus aeruginosus*	M	Least Concern	Schedule I	3
252	Western Reef-Egret	*Egretta gularis*	R	Least Concern	Schedule IV	10
253	Western Yellow Wagtail	*Motacilla flava*	M	Least Concern	Schedule IV	-
254	Whimbrel	*Numenius phaeopus*	M	Least Concern	Schedule IV	20
255	Whiskered Tern	*Chlidonias hybrida*	M	Least Concern	Schedule IV	872
256	White Wagtail	*Motacilla alba*	M	Least Concern	Schedule IV	-
257	White-bellied Drongo	*Dicrurus caerulescens*	R	Least Concern	Schedule IV	-
258	White-bellied Sea-Eagle	*Haliaeetus leucogaster*	R	Least Concern	Not Listed	-
259	White-breasted Kingfisher	*Halcyon smyrnensis*	R	Least Concern	Schedule IV	1
260	White-breasted Waterhen	*Amaurornis phoenicurus*	R	Least Concern	Schedule IV	2

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wild Life (Protection) Act. 1972 - Schedules	Max. Number of individuals[1]
261	White-eared Bulbul	*Pycnonotus leucotis*	R	Least Concern	Schedule IV	-
262	White-rumped Munia	*Lonchura striata*	R	Least Concern	Schedule IV	-
263	White-spotted Fantail	*Rhipidura albogularis*	R	Least Concern	Schedule IV	-
264	White-tailed Lapwing	*Vanellus leucurus*	M	Least Concern	Schedule IV	-
265	White-Winged Tern	*Chlidonias leucopterus*	M	Least Concern	Schedule IV	-
266	Wire-tailed Swallow	*Hirundo smithii*	R	Least Concern	Not Listed	-
267	Wood Sandpiper	*Tringa glareola*	M	Least Concern	Schedule IV	6
268	Yellow Bittern	*Ixobrychus sinensis*	R	Least Concern	Schedule IV	-
269	Yellow-eyed Babbler	*Chrysomma sinense*	R	Least Concern	Schedule IV	-
270	Yellow-footed Green-Pigeon	*Treron phoenicopterus*	R	Least Concern	Schedule IV	-
271	Yellow-wattled Lapwing	*Vanellus malabaricus*	R	Least Concern	Schedule IV	-
272	Zitting Cisticola	*Cisticola juncidis*	R	Least Concern	Schedule IV	-

4.3.3.5 Protected and Key Biodiversity Area(s)

There is no protected area (PA) within the buffer of 5 km. While, in the buffer of 10 km, two protected areas as well as Important Bird and Biodiversity Areas (IBA) are present, i. Thane Creek Flamingo Sanctuary (recognized Ramsar Site and notified marine protected area), and ii. Karnala Bird Sanctuary[123, 124].

4.3.3.5.1 Thane Creek Flamingo Sanctuary

A newly recognized Ramsar Site - Thane Creek Flamingo Sanctuary is present about 10 km from the terminal in north direction. It is an IBA with Criteria - A1 (Threatened species), A4i (≥1% of biogeographic population of waterbird), and A4iii (≥20,000 waterbirds)[125]. It supports more than 100,000 birds during winter (Kulkarni 2000). These include the Lesser Flamingo (*Phoeniconaias minor*), Greater Flamingo (*Phoenicopterus roseus*), Asian Openbill (*Anastomus oscitans*), White Stork (*Ciconia Ciconia*), Pied Avocet (*Recurvirostra avosetta*), Eastern Golden Plover (*Pluvialis dominica*), Ruddy Turnstone (*Arenaria interpres*), and Dunlin (*Calidris alpina*). About 10,000 Lesser Flamingo were recorded from the Thane Creek near Airoli bridge on 24-26 March 2013, along with thousands of Greater Flamingo and a few hundred Black-tailed Godwit (*Limosa limosa*). Many species occur much above their 1% biogeographic population threshold determined by Wetlands International (2012).

4.3.3.5.2 Karnala Bird Sanctuary

Karnala Bird Sanctuary (also an Important Bird and Biodiversity Area (IBA)) is present in the west of the terminal. The boundary of the eco-sensitive zone of the sanctuary is about 9 km, while the sanctuary boundary is about 15 km from the terminal. It is an IBA with Criteria - A1 (Threatened species), A2 (Endemic Bird Area 123: Western Ghats), Biome 11 (Indo-Malayan Tropical Dry Zone)[126].

The comprehensive checklist of birds from the Sanctuary recorded 222 species belonging to 50 families. Out of which 161 are resident species, 46 winter migrants, three breeding migrants, seven passage migrants and five are vagrant species. The list

[123] http://wiienvis.nic.in/Database/Maps_PAs_1267.aspx

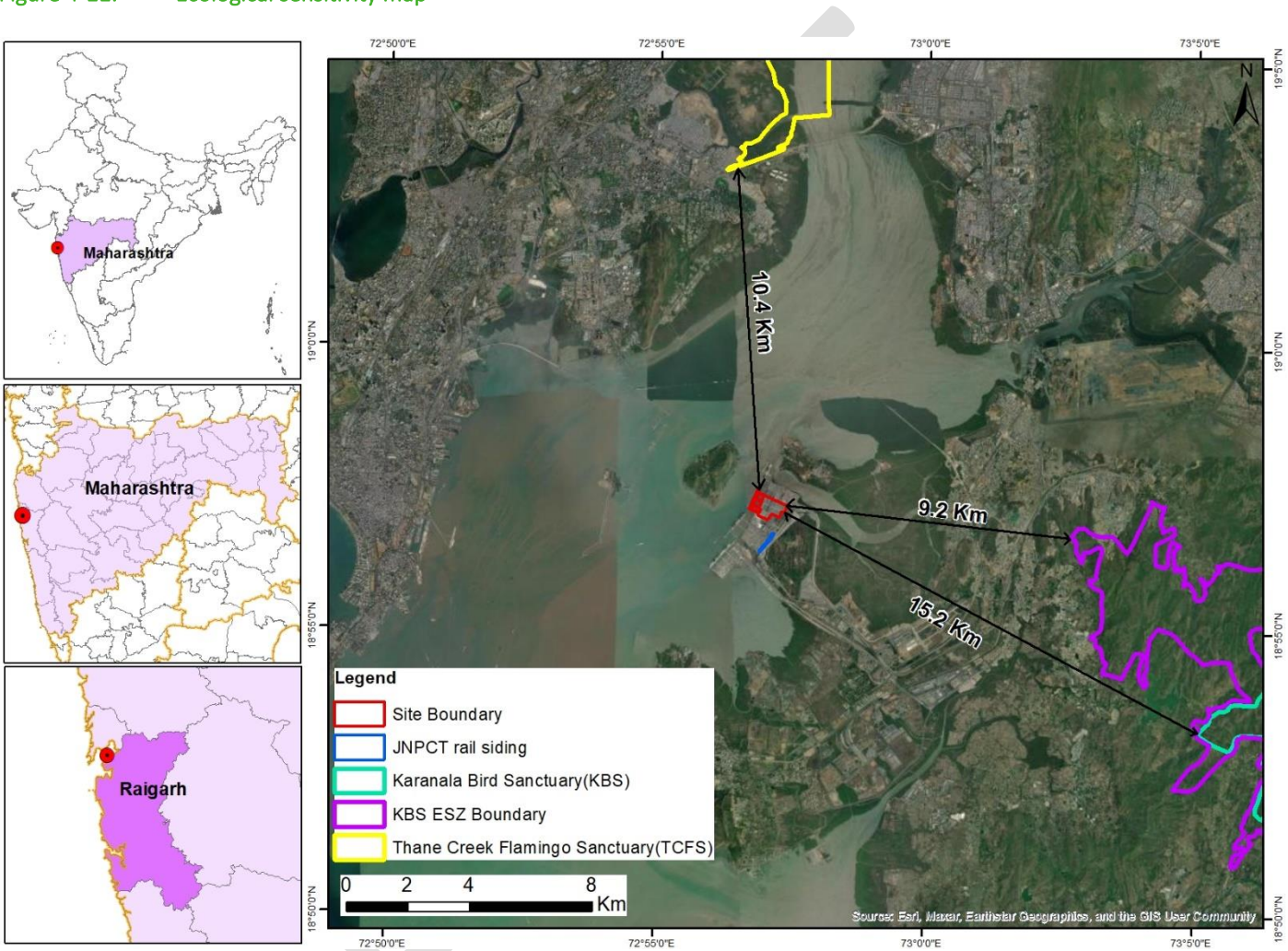
[124] Rahmani A.R., Islam M.Z. and Kasambe R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.), p. 1992 + xii.

[125] Rahmani A.R., Islam M.Z. and Kasambe R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.), p. 1992 + xii.

[126] Rahmani A.R., Islam M.Z. and Kasambe R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.), p. 1992 + xii.

consists of 5 species listed in the IUCN threatened list and 8 Western Ghats endemics. At least 26 out of 59 species of Biome 11 (Indo-Malayan Tropical Dry Zone) are reported from the sanctuary.

Figure 4-11: Ecological sensitivity map



4.3.3.6 Species with Conservation Significance

As per the available secondary information[127,128,129,130], atleast eight (08) species with conservation significance have been identified from the study area (*Table 4-26*). Limited secondary information regarding the foraging/feeding and breeding area of

127
https://www.inaturalist.org/observations?iconic_taxa=Actinopterygii&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

128
https://www.inaturalist.org/observations?iconic_taxa=Reptilia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

129 https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L2745852;
https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L14891370;
https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L17955762;
https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L10982777;
https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L7931230; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L4007948;
https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L15476519;
https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L2919598;
https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L14861634;
https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L4008281;
https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L18148588;
https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L3148420

130
https://www.inaturalist.org/observations?iconic_taxa=Mammalia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

any species of conservation significance within the study area was reported. Most of the migratory birds' activities were reported from the Thane Creek Flamingo Sanctuary (present ~12.5 km from the terminal)[131, 132].

Eight individuals of Fourfinger Threadfin (*Eleutheronema tetradactylum*) were reported from the Sewri and Mahul area in 2008[133]; two more observations were reported near the Thane creek area in this year (2022)[134]. Only one observation of Khaire's Black Shieldtail (*Melanophidium khairei*) was reported from the Vikhroli area towards the Thane creek[135]. The consultation with the fishermen indicates the movement of the Indian Humpback Dolphin (*Sousa plumbea*) in the study area for foraging/feeding, secondary data also supports the same[136]. To understand the water quality, sediments and biological characteristics in the marine environment surrounding the port as well as channel, the port authority (JNPA) appointed National Institute of Oceanography (NIO), a government research institute working in the field of marine sciences. NIO conducted several studies between 1996-2016 and no threatened marine species was observed during this survey(s) of NIO[137]. Indian Skimmer (*Rynchops albicollis*) was reported from Thane Creek Flamingo Sanctuary [19.1410937, 72.9609883][138], and only one observation near Panje wetland in 2018[139]; 30 - 278 Black-tailed Godwit (*Limosa limosa*) were also reported from the same location[140]; 15 - 1500 Greater Flamingo (*Phoenicopterus roseus*) & 1 - 432 Lesser Flamingo (*Phoeniconaias minor*) were also reported from the Panje wetland in 2018[141], but no roosting site was confirmed within the study area[142]; while the Steppe Eagle (*Aquila nipalensis*) was reported away from the study area[143]. As it is an operational port terminal, it is unlikely to have any significant foraging/feeding and breeding areas of species of conservation significance; at the same time no significant direct impact has been anticipated on the surrounding habitats. NIO also identified Indian Skimmer as uncommon with meager population; Black-tailed Godwit as common with average population; Greater Flamingo as common with average population; and Lesser Flamingo as common with medium population in its survey[144]. It is unlikely to have a chance of critical habitat within the study area because, there is no significant nesting/breeding site of the conservation significance species in the study area[145,146,147,148] and no major impact has been anticipated on the above-mentioned species due to the general project activities.

[131] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.
[132] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.
[133] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.
[134] https://www.inaturalist.org/observations/132250784; https://www.inaturalist.org/observations/122764488
[135] https://www.inaturalist.org/observations/32106533
[136] https://www.inaturalist.org/observations/124927845; https://www.inaturalist.org/observations/120857383
[137] Studies on the impact of dredging on marine ecology at Jawaharlal Nehru Port, Navi Mumbai. CSIR-National Institute of Oceanography, Mumbai, India.
[138] https://macaulaylibrary.org/asset/48009701
[139] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.
[140] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.
[141] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.
[142] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.
[143] https://ebird.org/species/steeag1/IN-MH-MS
[144] Studies on the impact of dredging on marine ecology at Jawaharlal Nehru Port, Navi Mumbai. CSIR-National Institute of Oceanography, Mumbai, India.
[145] https://macaulaylibrary.org/asset/48009701
[146] https://ebird.org/species/steeag1/IN-MH-MS
[147] https://openjicareport.jica.go.jp/pdf/12270369_04.pdf
[148] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.

Table 4-26: Species with Conservation Significance [149,150,151,152]

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wild Life (Protection) Act. 1972 - Schedules	Reported Individuals	Source
Fish							
1	Fourfinger Threadfin	*Eleutheronema tetradactylum*	-	Endangered	Not listed	8, 2	153, 154
Herpetofauna							
2	Khaire's Black Shieldtail	*Melanophidium khairei*	-	Endangered	Not listed	1 Observation	155
Mammal							
3	Indian Humpback Dolphin	*Sousa plumbea*	-	Endangered	Schedule I	2 Observations	156
Bird							
4	Indian Skimmer	*Rynchops albicollis*	M	Endangered	Not Listed	1 Observation	157
5	Steppe Eagle	*Aquila nipalensis*	M	Endangered	Schedule I	1 away from study area	158
6	Black-tailed Godwit	*Limosa limosa*	M	Near Threatened	Schedule IV	30 - 278	159
7	Greater Flamingo	*Phoenicopterus roseus*	M	Least Concern	Schedule IV	15 - 1500	160

149 https://www.inaturalist.org/observations?iconic_taxa=Actinopterygii&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

150 https://www.inaturalist.org/observations?iconic_taxa=Reptilia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

151 https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L2745852; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L14891370; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L17955762; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L10982777; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L7931230; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L4007948; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L15476519; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L2919598; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L14861634; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L4008281; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L18148588; https://ebird.org/barchart?bmo=1&emo=12&byr=2011&eyr=2022&r=L3148420

152 https://www.inaturalist.org/observations?iconic_taxa=Mammalia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

153 Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.

154 https://www.inaturalist.org/observations/132250784; https://www.inaturalist.org/observations/122764488

155 https://www.inaturalist.org/observations/32106533

156 https://www.inaturalist.org/observations?iconic_taxa=Mammalia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=&taxon_id=469961&page=

157 Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.

158 https://ebird.org/species/steeag1/IN-MH-MS

159 Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.

160 Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wild Life (Protection) Act. 1972 - Schedules	Reported Individuals	Source
8	Lesser Flamingo	Phoeniconaias minor	M	Near Threatened	Schedule IV	1 - 432	[161]

[161] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.

4.4 Socio-economic Profile Sensitivity

4.4.1 Approach

For the purpose of establishing the social baseline for the Project, aa participatory approach was adopted. Through this approach an attempt was made to integrate the local understanding (through visual observation and limited consultations) into the social baseline.

The project is situated in Uran and Panvel tehsil of Raigarh district in Maharashtra. The sections below provide an overview of these administrative units.

Further, details of consultation undertaken during the site visit are presented below:

Table 4-27: Consultation undertaken during the Site Visit

Sr. No.	Stakeholder Details	Objective of the consultation	Criteria for selecting and determining consultation with the stakeholders
1.	JM Baxi - Environment Manager	Discussion on the Environmental aspects planned for the proposed project including: • Expansion plans and environmentally friendly initiatives aspects considered as part of the expansion • Plans and Procedures on Environmental, Health and Safety (EHS) proposed for the Project • EHS Policy for the Project • EHS Organisation Structure • EHS trainings planned for the workers to be deployed during construction as well as operation phase	The stakeholder is critical for the project to maintain the environmental related compliances of the Project. Further, the stakeholder has been consulted to understand the environmental aspects planned for the project
2.	JM Baxi – Human Resource Representative	Discuss the human resource processes and safeguards: • Process of appointment of any employee • Process of appointment of human resource providing contractual workers and their compliance checks • Process of providing induction to newly appointed employees (on-roll and contractual workers) • HR related policies, SOPs and commitment, and other labour welfare commitments • Internal HR related audit procedure • Safeguards available for women to protect them against GBVH and SAE • Stakeholder Engagement Procedure • Grievance Redressal Mechanism • Recognition of Trade Unions • Appointment of security guards providing contractors and training procedure for security guards • Proposed number of employees (on-roll and contractual) for the Project	The stakeholder is critical to understand the HR policy planned for the project and strategies to meet the compliance with the applicable reference framework of this report in reference to workers' working conditions and terms of employment

Sr. No.	Stakeholder Details	Objective of the consultation	Criteria for selecting and determining consultation with the stakeholders
2.	JNPA's HR department	Discuss JNPA's adopted human resource management and safeguards: • Total number of employees engaged in JNPCT • Process adopted for SRVS • Trade union recognition and process of collaboration with trade unions • Labour related legacy issue • SRVS benefits • Other benefits provided to employee who have adopted SRVS	The stakeholder is critical to understand the JNPA' policy and strategies to maintain the employees' (on-roll and contractual) working conditions and terms of employment. Further, the stakeholder is also considered to be critical to understand the process adopted by the JNPA to lay-off their on-roll employees at the JNPCT
3.	JNPA's Land Department	Discussion on: • Total land acquired for the JNPA port • Process adopted during land acquisition • Total number of affected villages • R&R Schemes adopted during land acquisition • GRM for impacted households • Legacy Issue with R&R implementation	The stakeholder is critical to understand the land acquisition process adopted for the port, status of the rehabilitation and resettlement strategies adopted for the port and any legacy issues related to the land acquisition. (For more details refer to section 2.4)
4.	Local Community (in-depth interview) in Mora Koliwada village, mora fish market, Mori Jetty **Note:** Mori Koliwada is the nearest fishing community and are the nearest sensitive receptors (due to stoppage of fishing activities) in terms of impact due to development of the JNPA	Discussion on (but not limited to): • Socio-economic profile • Fishing activities and impact due to construction of the port • Fishing market • welfare characteristics of affected communities • living conditions	The stakeholder is the nearest fishing community and are the nearest sensitive receptors (due to stoppage of fishing activities) in terms of impact due to development of the JNPA.
5.	Consultation with stakeholders of Raj Bandargaon and Mora Bandargaon – Gharapuri Island **Note:** The stakeholders include the women, opinion holders, sarpanch, fishermen and other local community	Discussion on (but not limited to): • Socio-economic profile • Fishing activities and impact due to construction of the port • Fishing market • welfare characteristics of affected communities • living conditions • Impact on Elephant Caves (world heritage site)	The stakeholder is other nearest community to the JNPA and is living near the elephant caves.

4.4.2 State Profile: Maharashtra

Maharashtra is a state in the western Peninsular region of India, occupying a substantial area of the Deccan Plateau. It is the third-largest state in India (in terms of geographical area). It is the second-most populous state in India. It shares a boundary with Karnataka and Goa in the south, Telangana in the southeast, Chhattisgarh in the east, Gujarat and Madhya Pradesh in the north, and the Indian Union Territory of Dadra and Nagar Haveli and Daman and Diu in the northeast. On the western side of the state lies the Arabian Sea. The state administers 307,713 sq. km. of area which is 9.36% of the total geographical area of the country

and its accounts for 9.3 percent population of India, according to the provisional data of Census 2011. The capital of the state is Mumbai.

Figure 4-12: Maharashtra State Map

Source: https://www.mapsofindia.com/maps/maharashtra/ (Accessed in October 2022)

The state of Maharashtra is divided into 35 districts, 355 Tehsils, 534 Towns and 43,665 populated villages.

The state comprises of a population of 11,23,74,333 individuals, who pre-dominantly reside in rural areas. The rural population makes up 54.8 percent of the state's total population. The decadal population growth has reduced from 22.73 percent during the period 1991-2001 to 15.99 percent during 2001 to 2011. The sex ratio in the state is 929, which has increased from 922 in the past decade; however, it is still lower than the sex ratio of India, being 940 females per 1000 males. The population density of India is 382 persons/sq. km. while that of Maharashtra is 365 persons/sq. km. The state has the third largest geographical area of any state in the country.

Table 4-28: Maharashtra Demographic Profile

Attribute	Number
Area (sq. km)	307,713 (9.36% of India)
Total population	11,23,74,333(9.3% of India)
Males	5,82,43,056
Females	5,41,31,277
Sex ratio	929
Percentage of rural Population	54.8%
Percentage of urban population	45.2%
Population density	365

Attribute	Number
Percentage of SC population	11.8%
Percentage of ST population	9.4%
Total literacy rate	82.3%
Male Literacy rate	88.4%
Female Literacy Rate	75.9%
Rural Literacy	77%

Source: Primary Census Abstract data of India, 2011

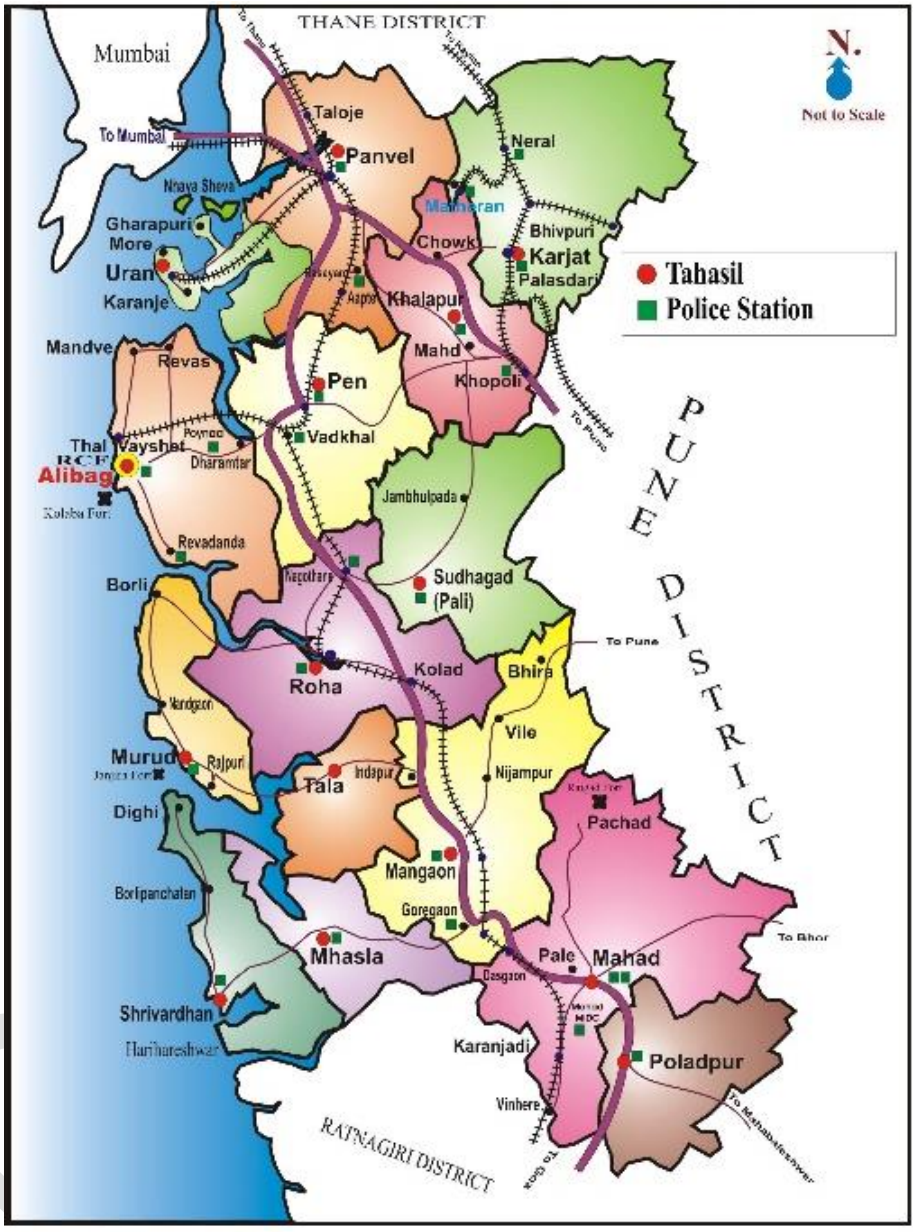
The literacy rate of Maharashtra is 82.3 percent (of which the rural literacy stands at 77%) which is higher than that of the country, at 74.04 percent. The male literacy rate is relatively higher, at 88.4 percent while the female literacy rate is 75.9 percent, which is considerably higher than the national female literacy rate of 65.46 percent.

The proportion of ST population in the state is 9.4 percent and SC population is 11.8 percent.

4.4.3 District Profile: Raigarh

Raigarh district is located in Maharashtra and lies at 18°30’56.7072’’ latitude and 73°10’55.7832’’ longitude. Raigarh district is enveloped by dense forests and Western Ghats of Sahyadri Ranges. It is bounded by Mumbai Harbor, Thane, Pune, and Ratnagiri district. Towards the west, it is bounded by the Arabian Sea.

Figure 4-13: Raigarh District Map



Source: https://raigad.gov.in/en/other-maps/ (Accessed in October 2022)

The total area of the district is 7152 km^2 and it is comprised of 1,909 inhabited villages. There are a total of 15 Tehsils[162] in the district. The district is divided into four sub-divisions – Alibag, Panvel, Mangaon and Mahad.

With a population of 2,634,200 individuals, the district accounts for 2.34 percent of the population of Maharashtra. The decadal population growth rate from 2001-2011 is 19.31%.

The population density of Raigarh district (368/ km^2) is marginally higher than that of Maharashtra. Per the Census survey 2011, most of the district resides in rural areas, with a rural population of 1,664,005 and an urban population of 970,195. The proportion of Scheduled Caste people is about 5.12 percent of the population in Raigarh, which is lower than the state figure of 11.8 percent. On the other hand, the Scheduled Tribe population in Raigarh is 11.58 percent, which is slightly higher than the state figure of 9.35 percent. The sex ratio of the district at 959 is also higher than the state figure of 929 and the country's sex ratio of 940 females per thousand males.

[162] Uran, Panvel, Karjat, Kahalapur, Pen, Alibag, Murud, Roha, Sudhagad, Mangaon, Tala, Shrivardhan, Mhasla, Mahad, and Poladpur

The status of literacy in the district reflects an average scenario with the proportion of literate population (83.14 percent), marginally higher than that of the state (82.34 percent). The female literacy rate (76.92 percent), higher than that state figure (75.87 percent). Most of the population resides in rural areas, with 63.16 percent of the population of the district being rural, and the rest is classified as urban.

Table 4-29: Raigarh District Profile

Variables	Raigarh District
Area (sq. km)	7,152
Total Population	26,34,200
Males	13,44,345
Female	12,89,855
Population Growth (percentage)[163]	19.31%
Sex Ratio[164]	959
Child Sex Ratio (0-6 age)	935
Population density[165] (sq. km)	368
Total Child Population (0-6 Age)	3,00,815
Male Population (0-6 Age)	1,55,437
Female Population (0-6 Age)	1,45,378
Total Literacy Rate[166] (percent)	83.14
Male Literacy Rate (percentage)	89.13
Female Literacy Rate (percentage)	76.92

Source: Primary Census Abstract data of India, 2011

4.4.4 Tehsil Profile: Uran and Panvel

The study area of the Project is spread across ten (10) villages in Uran and Panvel tehsils. In terms of schedule caste (SC) population, Uran tehsil has 4.5 percent of the population as SC, while Panvel has a share at 6.6 percent.

In the study area of the Project, Uran Tehsil has scheduled tribe (ST) population of 7625, while Panvel tehsil has an ST population of 48,162. Uran tehsil has a share of 4.8 percent of the total ST population in the district and Panvel tehsil has 6.4 percent. In terms of sex ratio, Uran tehsil exhibits a relatively higher Sex Ratio at 934, while Panvel tehsil has a lower ratio of 889.

Table 4-30: Demographic Profile of Tehsils

Attribute	Raigarh District	Uran Tehsil	Panvel Tehsil
Population	2634200	160,303	750,236
% of District Population	Not Applicable	6.08%	28.48%
% SC population	5.12%	4.5%	6.6%
% ST population	11.58%	4.8%	6.4%
Sex Ratio	959	934	889
% Total literacy rate	83.14%	85.69%	87.77%
% Female literacy rate	76.92%	79.81%	83.29%

[163] Population Growth from year 2001 to 2011
[164] It is the number of females per 1000 males.
[165] Population Density is a measurement of population per square kilometer
[166] It denotes ability to write a letter in any language. Literacy status assessment made for population 7 years and over.

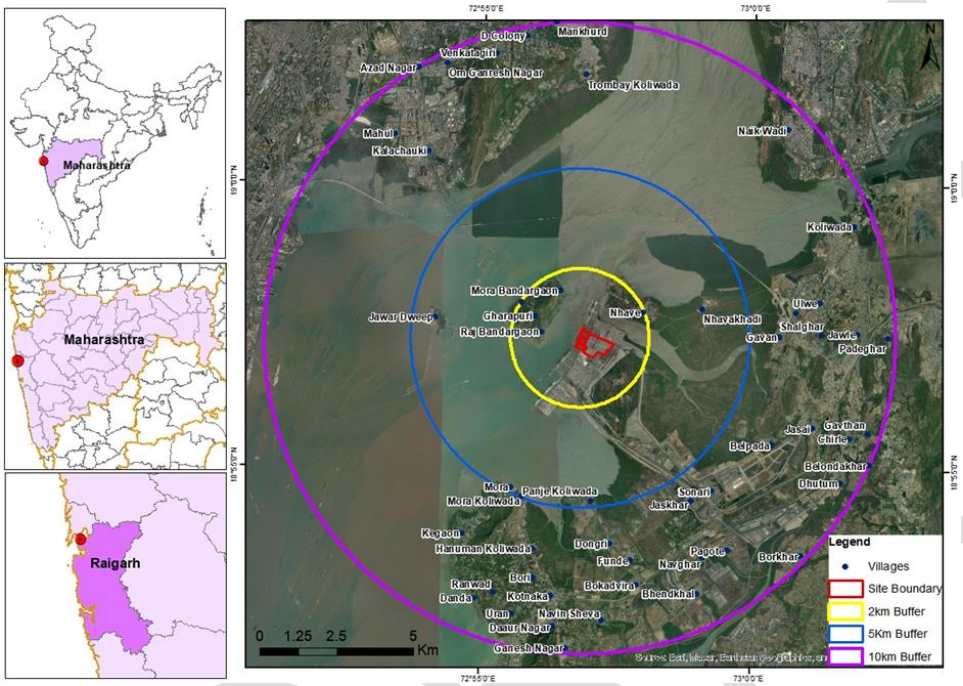
Source: Primary Census Abstract data of India, 2011

4.4.5 Study Area

The Study Area for the current assessment comprises of the area identified for the project as well as villages under the 5 km radius from the Project location. The use of the term "Study Area" has already been defined in Section 4.1. It consists of ten (10) villages -–Bokadvira, Gharapuri, Raj Bandargaon, Mora bandargaon, Nhave, Sheva, Panje, Mora Koliwada, Mora, Hanuman Koliwada) combined from the Uran and Panvel tehsils.

Refer to ***Table 4-1*:** and ***Figure 4.1*** for more details on villages falling under the study area.

Figure 4-14: Map depicting villages falling under the study area and tentative distance from the project location



4.4.5.1 Demographic Profile of Study area

The study area comprises of 2,178 households supporting a population of 9,541 individuals. The average size of the households is 4.38. Gharapuri village is the only one reporting a positive sex ratio amongst the Project villages with the number of females at 1035 per 1000 males. Further, per the consultation at the Gharapuri village, the number of the HHs has been increased to ~200 (154 – census survey 2011) and 1,200 population (647 – census survey 2011).

Overall, the study area have a sex ratio of 955.6 females per 1000 males, which is at a similar level to the district figure (959) and considerably higher than the state figure (929).

Table 4-31: Demographic Profile of the study area

Study area villages	No of HHs	Population	Sex Ratio	% SC	% ST	% Lit	% F Lit
Gharapuri	154	647	1035	0.15	0.77	76.04	68.99
Raj Badargaon	NA*	NA	NA	NA	NA	NA	NA
Mora Bandargaon	NA	NA	NA	NA	NA	NA	NA
Nhave	798	3531	874	1.5	0.67	80.68	73.95
Sheva	NA	NA	NA	NA	NA	NA	NA

Study area villages	No of HHs	Population	Sex Ratio	% SC	% ST	% Lit	% F Lit
Panje	270	1268	963	0	0	77.91	73.47
Mora Koliwada	NA	NA	NA	NA	NA	NA	NA
Mora	NA	NA	NA	NA	NA	NA	NA
Hanuman Koliwada	277	1285	974	1.24	50.89	72.99	66.71
Bokadvira	679	2810	932	4.34	1.13	77.97	73.06
Total	**2178**	**9541**	**955.6**	**7.23**	**53.46**	**77.11**	**71.23**

*NA = Not Available – primary census survey for villages and hamlets (Raj Bandargaon, Mora Bandargaon, Sheva, Mora Koliwada, Mora) are not available. Thus, the total calculation of numbers and quantity information does not include villages and hamlets for which data is not available.

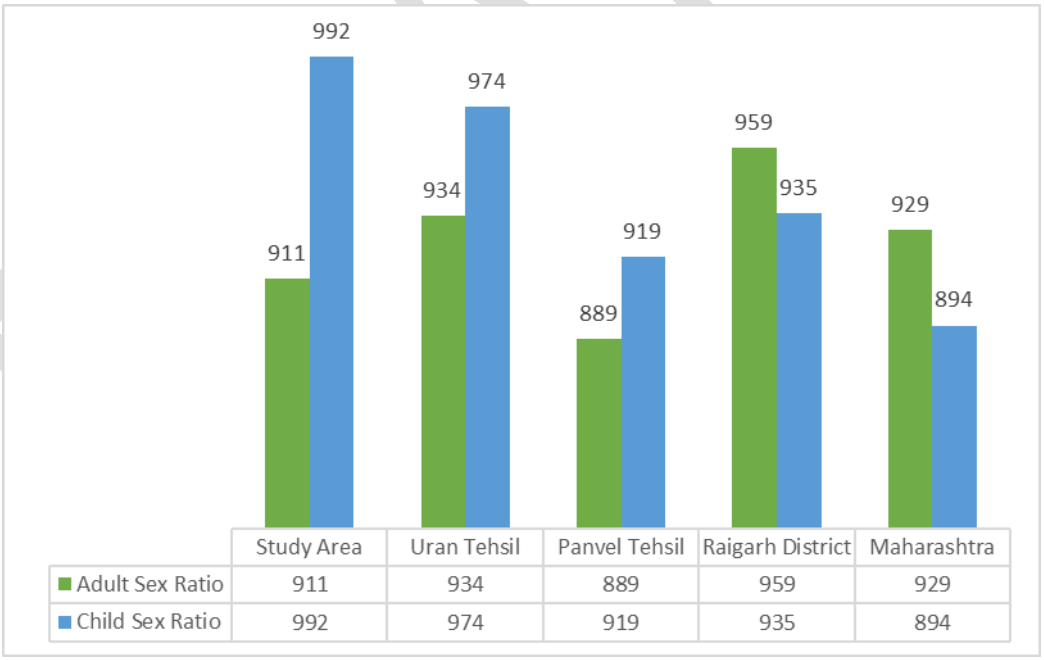
Source: Primary Census Abstract data of India, 2011

The total literacy in the Study Area is 77.11 percent whereas the female literacy rate is lower (71.23 percent). However, considering the villages has been shifter to peri-urban area the overall literacy rate and the female's literacy rate is anticipated to be improved in the area.

4.4.5.2 Gender bifurcation: Sex Ratio

The study area exhibits higher child sex ratio as compared to the tehsils, district and the state figures of child sex ratio. However, the highest adult sex ratio is in the Raigarh district, followed by Maharashtra state, Uran tehsil, project villages, and lastly by Panvel tehsil.

Figure 4-15: Comparison of Adult and Child Sex ratio across study area, tehsil and district



Source: Primary Census Abstract data of India, 2011

Per the consultation with the women in Gharapura, it is understood that there is no gender related harassment in the village, girl child have equal right to study as the boy child and even the women in the village take part in political activities, for example, the present sarpanch and the past sarpanch of the villages is women.

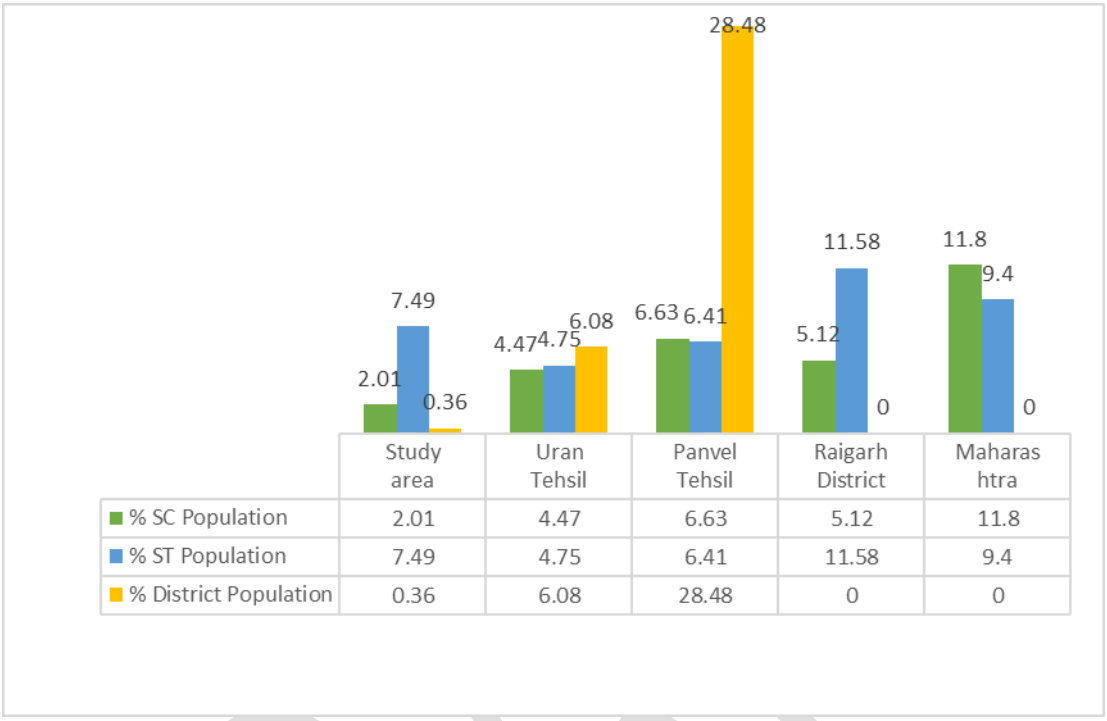
4.4.5.3 Social Stratification

Per the census survey the entire population in the study area falls in the rural category. However, as observed during the site visit the rural area has shifted to the peri-urban category at present. Further, per the census data there is only 7.49 percent is ST and

SC consist of 2.01 per cent, respectively, of the total population. However, the village Hanuman Koliwada village have almost half (~51 per cent) of the total population been ST population.

Furthermore, as reported by the Gharapuri villagers, there are no ST and SC community residing in the village.

Figure 4-16: Proportion of SC/ST, and General Population in the villages of the study area vis-à-vis District



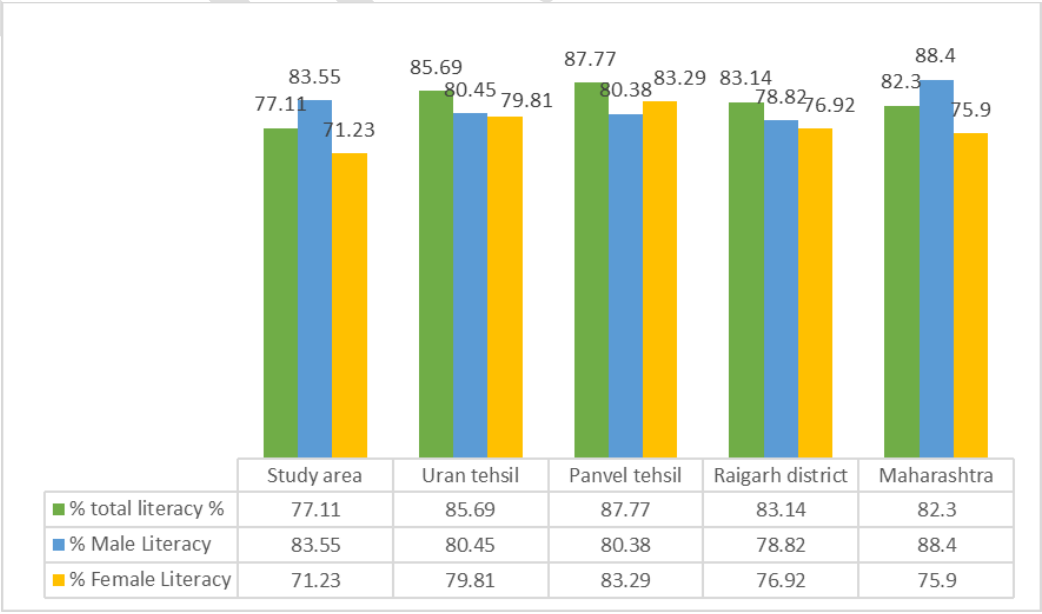
	Study area	Uran Tehsil	Panvel Tehsil	Raigarh District	Maharashtra
% SC Population	2.01	4.47	6.63	5.12	11.8
% ST Population	7.49	4.75	6.41	11.58	9.4
% District Population	0.36	6.08	28.48	0	0

Source: Primary Census Abstract data of India, 2011

4.4.5.4 Literacy and Education

The total literacy rate and female rate in the study area is low as compared to the tehsils, districts and state figures.

Figure 4-17: Comparative overview of the Literacy Rate across study area, tehsil, district and state



	Study area	Uran tehsil	Panvel tehsil	Raigarh district	Maharashtra
% total literacy %	77.11	85.69	87.77	83.14	82.3
% Male Literacy	83.55	80.45	80.38	78.82	88.4
% Female Literacy	71.23	79.81	83.29	76.92	75.9

Source: Primary Census Abstract data of India, 2011

Further, as the villages are converting into the peri-urban areas and the schooling system is changing in the area (as observed and understood during consultation with local community during the site visit), the scenario have changed in terms of overall education availability, children schooling (especially of girl education). Further, per the secondary research number of private schools[167] and colleges has been established in the area and the villages are also receiving facility of established education system in Mumbai (as there are good transport facilities available in between the study area and Mumbai)

Considering, the urbanisation of the area it is envisaged that there is no stated bias amongst the local community against sending their girl children to schools.

Furthermore, as reported by women in the Gharapura village, there is no restriction on girl child to go to school, they have equal right to go to school as the boy child have.

4.4.5.5 Land ownership and usage

This section presents an overview of the ownership and use of land in the project area, based on the Census 2011. The area has a non-agrarian economy and hence the dependence on land as a resource is less. The table for land utilization reiterates the low dependence on agriculture, making it one of the secondary sources of their livelihood.

As can be observed **Table 4-32**, agriculture does not play a major role in the lives of the inhabitants. Majority of the land usage is used for non-agricultural purposes. This could be due to the fact that most of these villages partake in fishing or household industrial work, as well as "other work", besides agriculture.

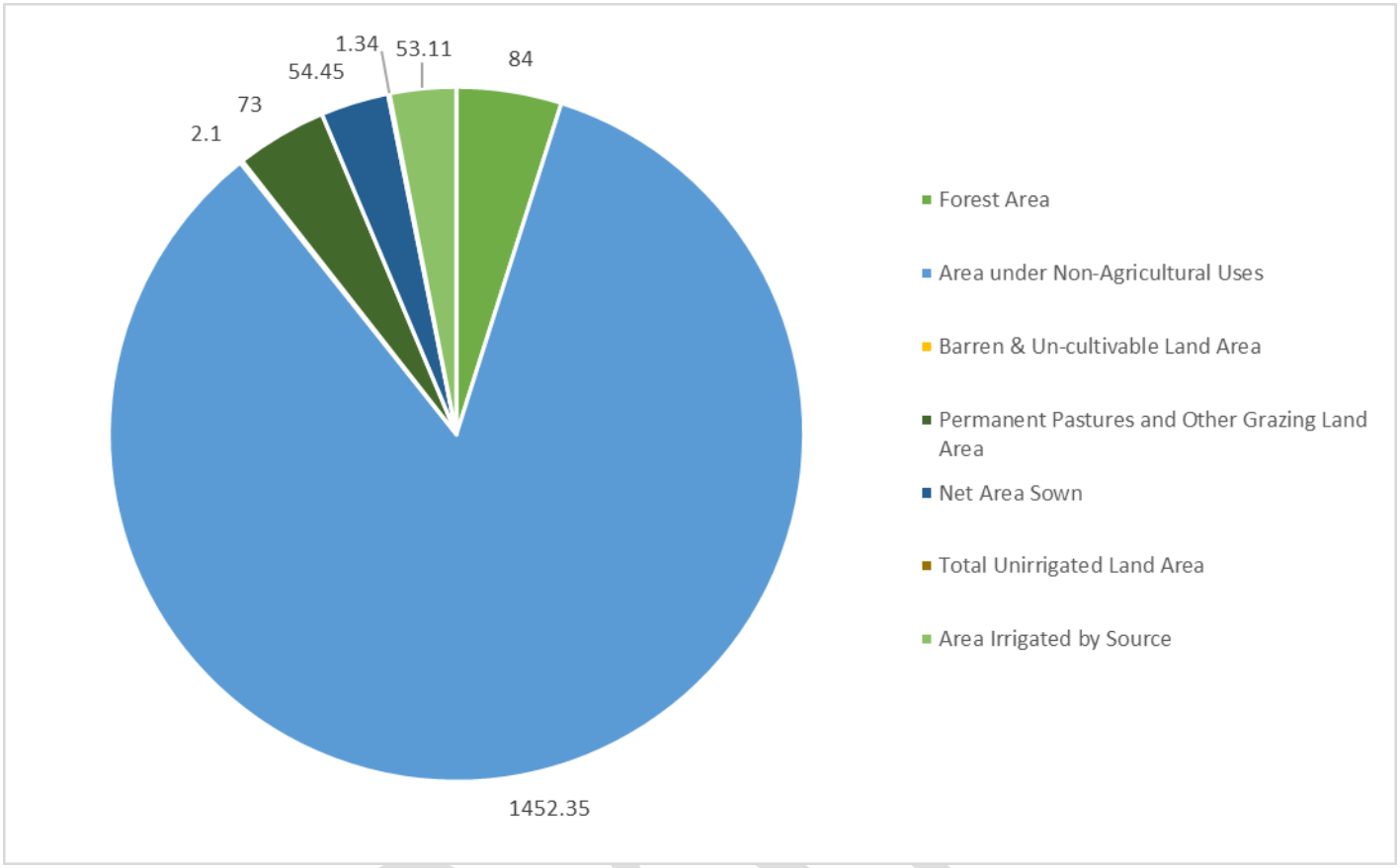
Table 4-32: Land Use break up in the study area

Village	Forest Area (in Hectares)	Area under Non-Agricultural Uses (in Hectares)	Barren & Un-cultivable Land Area (in Hectares)	Permanent Pastures and Other Grazing Land Area (in Hectares)	Land Under Miscellaneous Tree Crops etc. Area (in Hectares)	Culturable Waste Land Area (in Hectares)	Fallows Land other than Current Fallows Area (in Hectares)	Current Fallows Area (in Hectares)	Net Area Sown (in Hectares)	Total Unirrigated Land Area (in Hectares)	Area Irrigated by Source (in Hectares)
Gharapuri	84	20.45	2.1	73	0	0	0	0	18.45	1.34	17.11
Panje	0	126	0	0	0	0	0	0	0	0	0
Hanuman Koliwada	0	2	0	0	0	0	0	0	36	0	36
Bokadvira	0	608.58	0	0	0	0	0	0	0	0	0
Nhave	0	695.32	0	0	0	0	0	0	0	0	0
Raj badargaon	Not Available (NA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mora Badargaon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sheva	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mora Koliwada	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mora Badargaon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	**84**	**1452.35**	**2.1**	**73**	**0**	**0**	**0**	**0**	**54.45**	**1.34**	**53.11**

Source: Primary Census Abstract data of India, 2011

[167] https://www.studyapt.com/schools/all-schools/uran-raigad-maharashtra (Accessed in October 2022)

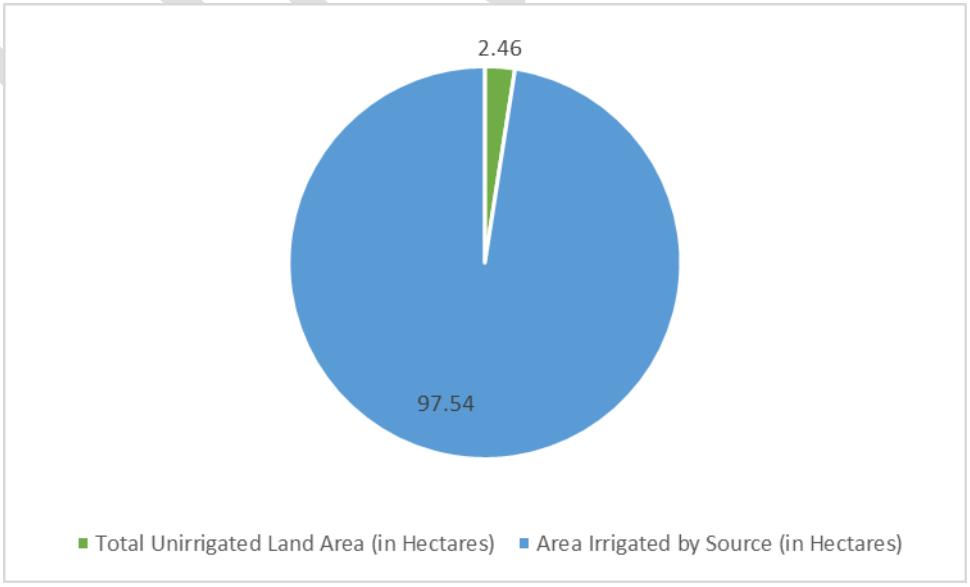
Figure 4-18: Proportion of Land use (percentage of total geographical area) in the study area



Source: Primary Census Abstract data of India, 2011

The non-agricultural usage of land is prevalent in the area, as the population in the area is not dependent on agricultural activities. This is due to urbanization in the area and setting up of industrial area (due to JNPA).

Figure 4-19: Proportion of net area shown – unirrigated and irrigated



Source: Primary Census Abstract data of India, 2011

As can be inferred from **Figure 4-19**, the area which is utilized for agricultural activities is well connected through the irrigation facilities.

4.4.5.6 Occupation Profile

The Study Area is categorized by about 36 percent working population, where majority of the working population comes under "Main Workers", i.e., being employed for more than 6 months in a year. The Project Villages have 89.4% Main workers of the total working population. **Table 4-33** below depicts that women are relatively lesser contributors to the Main Working Population as men with the difference sometimes more than threefold, except in the case of a singular village "Gharapuri", where women comprise of the majority of the main workforce. In the case of Marginal Workers, men are in higher proportion (7.51%) in the Project Villages, as compared to women (4.83%).

The proportion of non-working population, comprising of children, the older folks as well as unemployed youth, in the Project Villages is 66.87%.

Table 4-33: Working Population in the Study area (as per Census 2011)

Villages	Working Population Rate (WPR)	Main[168] (% of WPR)	Main Male (% of WPR)	Main Female (% of WPR)	Marginal[169] (% of WPR)	Marginal Male (% of WPR)	Marginal Female (% of WPR)	Non-Work (% of Total Population)
Gharapuri	72.64	97.65	47.87	49.78	2.34	1.7	0.63	27.36
Raj Badargaon	NA*	NA	NA	NA	NA	NA	NA	NA
Mora Bandargaon	NA	NA	NA	NA	NA	NA	NA	NA
Nhave	37.07	93.27	78.68	14.59	6.72	4.5	2.21	62.93
Sheva	NA	NA	NA	NA	NA	NA	NA	NA
Panje	30.04	78.21	72.44	5.77	21.78	16.53	5.24	69.96
Mora Koliwada	NA	NA	NA	NA	NA	NA	NA	NA
Mora	NA	NA	NA	NA	NA	NA	NA	NA
Hanuman Koliwada	33.54	82.36	72.38	9.97	17.63	15.08	2.55	66.46
Bokadvira	33.13	87.64	78.41	9.23	12.35	7.51	4.83	66.87
Total	**36.91**	**89.4**	**73.05**	**16.35**	**10.59**	**7.52**	**3.06**	**63.08**

Source: Primary Census Abstract data of India, 2011

NA = Not Available

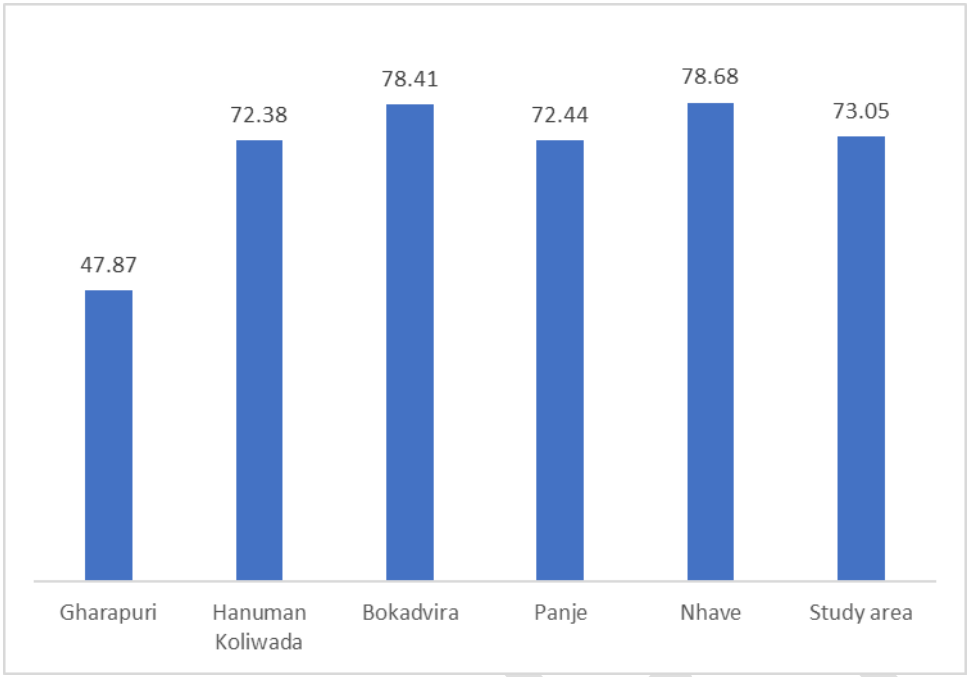
Out of the Main Working Population, the majority of the population can be categorized as Household Industries and Other work. While agriculture is not widely practiced, it still plays an important role in the economy of the region. Uran and Panvel produce the majority of the rice for the Raigad district. Additionally, the working population takes part in ship building, shipping, and port support. Many locals are also employed in the JNPA port, leading to an increase in employment in the area.

Further, during the site visit it is observed that fishing is one of the primary occupations in the area (as reported by the local community the fishermen from the area go to the Gujarat border to capture fishes). The second major occupation is farming, as reported, rice cropping is the primary crop in the area. Further, local communities are also involved and employed in industrial activities – specific to transportation (trucking), commodity shops and other household level business activities such as renting, eateries, etc.

[168] Main Workers are those workers who had worked for a major part of the reference period (i.e. 6 months or more);

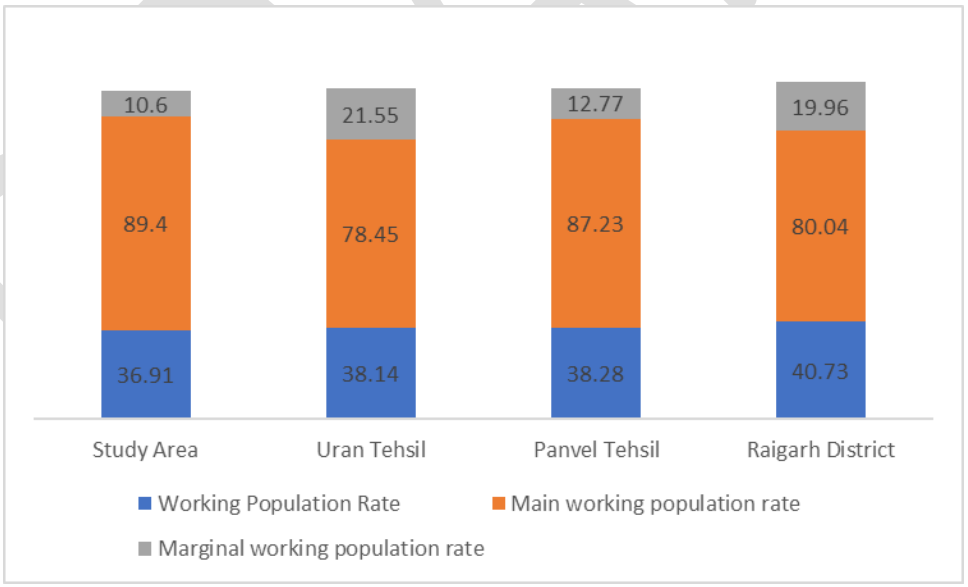
[169] Marginal Workers are those workers who have not worked for major portion of reference period (i.e. less than 6 months)

Figure 4-20: Distribution of Main working population to the overall working population



Source: Primary Census Abstract data of India, 2011

Figure 4-21: Distribution of working population, main working population and marginal working population across study area, tehsils and district level



Source: Primary Census Abstract data of India, 2011
**Working population rate = working population / total population * 100*
***main working population rate = main working population / working population * 100*
**** marginal working population rate = marginal working population/ working population * 100*

As can be inferred from the ***Figure 4-21***, the working population in the study area (36.91%) is less than the tehsils (Uran – 38.14% and Panvel – 38.28) and district (40.74%) level. However, the rate of main working population is higher than the tehsil and district. This is indicative of the availability of long term and continued livelihood opportunity in the study area due to the economic activities emerged from the development of port. Similarly, the local community of the Gharpura has reported that the people from the village have received employment at terminal operated by private terminal operators.

As reported, the project will employee ~2,400 and the project and its contractor shall provide preferential employment or recruitment to local labour, vulnerable group and ex-employee of JNPA (provided equal qualification), if they apply in compliance with local intent policy.

4.4.5.6.1 Income Profile

As reported by the local community at the Mora Koliwada, the local community have an income profile in between a range of INR 50,000/month to INR 1,00,000/month for a household. However, there are some households whose income is equal to more than INR 5,00,000 per month.

Further, the Gharapuri has reported an income profile in between a range of INR 20,000/month to INR 30,000. There is a difference in between the income range of these two villages – this is because of urbanization in and around the Mora Koliwada and the Gharapuri is still an island village with less to limited resources and the income of the Gharapuri is dependent on the tourist activity in the island (due to Elephanta caves).

However, the income profile of Mora Koliwada and Gharapuri is lower than the average per capita income of Raigarh which was INR 1,32,607 in 2012-13[170]. The lower income profile in the region can be inferred to limited resources to earn a higher income and participation of large number of people in the available employment market.

4.4.5.7 Vulnerability[171] in local community

As stated in **Figure 4-16**, the study area have 2.01% of SC and 7.49% of ST population as compared to the total population. The percentage of SC and ST in the study area is lower than the percentage in district (SC – 5.12% and ST – 11.58%) and the state (SC – 11.8% and ST – 9.4%). Therefore, the vulnerability of the study area is lower than the district and state level.

4.4.5.8 Fishing activities and livelihood of fishermen due to development of JNPA

As reported by the local community of Gharapuri villagers no impact on fishing activities due to development of JNPA. Further, after the development of JNPA, the fishermen does not need to go deep inside the sea to catch fishes which was done earlier, now after the construction of JNPA the fishermen find fishes near to the island.

4.4.5.9 Physical Infrastructure

4.4.5.9.1 Water Supply and Sanitation

As per the Census data of 2011, majority of the villages form the Panvel and Uran tehsil get their water from treated tap water sources (82.3% and 88% of households respectively). The remaining of the households get their water from nearby covered and uncovered wells, handpump, tube well, borewell, or natural sources of water such as lake, pond, etc. The similar arrangement has been observed in the study area.

4.4.5.9.2 Education Infrastructure

According to Census of India, Primary Schools provide education from class 1st to 5th, Middle Schools cater to children studying from classes 6th to 8th, Secondary School provides education to students of classes 9th and 10th and similarly, senior secondary school teaches children studying in classes 11th and 12th. One interesting fact here is that a composite school with classes 1st to 12th, will be treated as four separate units and will be counted separately as a Primary, Middle, Secondary and Senior Secondary school.

All the Project Villages have co-educational primary schools. Further, as per census survey 2011, there is an insufficiency of middle and secondary and senior secondary schools in the area. However, in contrast to what was informed by the local community, the schooling system in the area has been changed, now the number of public schools and government schools (secondary and higher secondary) have been established in the area. Additionally, JNPA as part of their CSR activity has also constructed schools in the area.

[170] https://www.ijmra.us/project%20doc/2017/IJRSS_SEPTEMBER2017/IJMRA-12286.pdf (Accessed on November 17, 2022)

[171] As per the Government of India (GoI) – Department of Family Welfare Ministry of Health & Family Welfare, vulnerable communities include those groups who are underserved due to problems of geopgraphical access and those who suffer social and economic disadvantages such as **Schedule Castes and Schedule Tribe** (https://main.mohfw.gov.in/sites/default/files/5885071084Project%20Implementation%20Plan%20%28PIP%29%20for%20VULNERABLE%20GROUPS%20UNDER%20RCH.pdf – Accessed on November 17, 2022)

Table 4-34: Availability of Schools in the Study Area

Villages	Government Primary school (P)	Government Middle school (M)
Gharapuri	1	1
Raj Badargaon	NA	NA
Mora Bandargaon	NA	NA
Nhave	1	1
Sheva	NA	NA
Panje	1	1
Mora Koliwada	NA	NA
Mora	NA	NA
Hanuman Koliwada	1	1
Bokadvira	3	0
Total	7	4

Source: Primary Census Abstract data of India, 2011

4.4.5.9.3 Health Facilities and health seeking behavior

The health facilities in the Study Area are next to nowhere, with not a single medical facility available in the region, as per the Census 2011. In Uran and Panvel, the most common form of medical facility, according to the 2011 census survey, are the Anganwadi and Self-Help Groups, with a minority of Primary health care units.

Key diseases in the study area[172]

The following key diseases have been captured in the study area:

- **Malaria:** The Plasmodium parasites, the cause of malaria, are spread to people through the bites of the infected female Anopheles mosquitoes, active mainly during dusk and dawn. Out of the 5 malaria causing parasite species, P. falciparum and P. vivax are the most common P. falciparum is the most dangerous with the highest rate of mortality. As reported by Navi Mumbai Municipal Corporation (NMMC), in 2018-19, around 33% decrease in malarial cases has been reported with the number of cases decreasing from 138 in 2017-18 to 92 in 2018-19
- **Dengue:** Dengue or Dengue fever is a mosquito borne viral infection which causes flu like symptoms and occasionally develops into a potentially lethal complication called 'Severe Dengue'. The occurrence of this disease has grown drastically with about half of the world's population at risk of acquiring infection. Dengue virus is transmitted by female mosquitoes mainly of the species Aedes aegypti and, to a lesser extent, Aedes. As per the NMMC, in the financial year 2018-19, the number of persons getting affected by Dengue in NMMC area has decreased with only 4 persons having been affected with dengue compared to 6 during the previous year (2017-18)
- **Tuberculosis:** Tuberculosis is caused by a Mycobacteria species, called Mycobacterium tuberculosis. As per the NMMC, in the year 2018-19, a decreasing trend was observed in the case of smear negative patients while emergence of 790 new cases and 208 relapse cases of Pulmonary TB were recorded. Prevalence of Extra-Pulmonary TB cases have increased by around 13% from 677 cases in 2017-18 to 762 cases in 2018-19.

4.4.5.10 Energy Usage

During the site visit, it was observed that the study area is well connected through the energy infrastructure. Additionally, due to the proximity of the highly urbanized area (Mumbai) and industrial area, the availability of energy is reported to be appropriate to the demand.

172 https://www.nmmc.gov.in/navimumbai/assets/251/2020/02/mediafiles/ESR_2018-19_English.pdf (Accessed on November 01, 2022)

5 Stakeholder Identification and Analysis/Mapping

Stakeholder engagement is an ongoing process that may involve, in varying degrees, the following elements: stakeholder analysis and planning, disclosure and dissemination of information, consultation and participation, grievance mechanism and ongoing reporting to Affected Communities" Stakeholder Engagement is thus an umbrella term which encompasses a range of activities or interactions between a company and its internal and external stakeholders, through the life of the project.

Stakeholders for the Project are those people or groups that will have an interest in the terminal operations or have an ongoing relationship with NSFTPL and can influence the NSFTPL operation. This section presents the stakeholder identification, analysis and engagement process for NSFTPL.

Based on the stakeholder analysis, mapping and consultations conducted as part of IESE, an SEP and GRM for the Project has been developed (refer to ***Annexure H***). The SEP is aimed at managing and facilitating future engagement activities with identified stakeholders through the various stages of the Project's lifecycles (construction and operation). The primary purpose of the plan is to allow for the Project development to be undertaken in a manner that is consistent with the principle of information disclosure and stakeholder engagement of ADB.

5.1 Consultation undertaken during site visit

Consultation with the stakeholders to understand the land procurement process, labour issues, project overview, project's proposed activities, social and environmental management plan and safeguards, socio-economic profile of local community and legacy issues with the port. **Table 5-1:** provides the details of the consultation undertaken during the site visit.

Table 5-1: Consultation undertaken during the site visit

Sr. No.	Stakeholder Details	Objective of the consultation	Criteria for selecting and determining consultation with the stakeholders
1.	JM Baxi – Environment Manager	Discussion on the Environmental aspects planned for the proposed project including: • Expansion plans and environmentally friendly initiatives aspects considered as part of the expansion • Plans and Procedures on Environmental, Health and Safety (EHS) proposed for the Project • EHS Policy for the Project • EHS Organisation Structure • EHS trainings planned for the workers to be deployed during construction as well as operation phase	The stakeholder is critical for the project to maintain the environmental related compliances of the Project. Further, the stakeholder has been consulted to understand the environmental aspects planned for the project
2.	JM Baxi – Human Resource Representative	Discuss the human resource processes and safeguards: • Process of appointment of any employee • Process of appointment of human resource providing contractual workers and their compliance checks • Process of providing induction to newly appointed employees (on-roll and contractual workers) • HR related policies, SOPs and commitment, and other labour welfare commitments	The stakeholder is critical to understand the HR policy planned for the project and strategies to meet the compliance with the applicable reference framework of this report in reference to workers' working conditions and terms of employment

Sr. No.	Stakeholder Details	Objective of the consultation	Criteria for selecting and determining consultation with the stakeholders
		• Internal HR related audit procedure • Safeguards available for women to protect them against GBVH and SAE • Stakeholder Engagement Procedure • Grievance Redressal Mechanism • Recognition of Trade Unions • Appointment of security guards providing contractors and training procedure for security guards • Proposed number of employees (on-roll and contractual) for the Project	
2.	JNPA's HR department	Discuss JNPA's adopted human resource management and safeguards: • Total number of employees engaged in JNPCT • Process adopted for SRVS • Trade union recognition and process of collaboration with trade unions • Labour related legacy issue • SRVS benefits • Other benefits provided to employee who have adopted SRVS	The stakeholder is critical to understand the JNPA' policy and strategies to maintain the employees' (on-roll and contractual) working conditions and terms of employment. Further, the stakeholder is also considered to be critical to understand the process adopted by the JNPA to lay-off their on-roll employees at the JNPCT
3.	JNPA's Land Department	Discussion on: • Total land acquired for the JNPA port • Process adopted during land acquisition • Total number of affected villages • R&R Schemes adopted during land acquisition • GRM for impacted households • Legacy Issue with R&R implementation	The stakeholder is critical to understand the land acquisition process adopted for the port, status of the rehabilitation and resettlement strategies adopted for the port and any legacy issues related to the land acquisition. (For more details refer to section 2.4)
4.	Local Community (in-depth interview) in Mora koliwada village, mora fish market, Mori Jetty **Note:** Mori Koliwada is the nearest fishing community and are the nearest sensitive receptors (due to stoppage of fishing activities)	Discussion on (but not limited to): • Socio-economic profile • Fishing activities and impact due to construction of the port • Fishing market • Welfare characteristics of affected communities • Living conditions	The stakeholder is the nearest fishing community and are the nearest sensitive receptors (due to stoppage of fishing activities)
5.	Consultation with stakeholders of Raj Bandargaon and Mora Bandargaon – Gharapuri Island **Note:** The stakeholders include the women, opinion holders, sarpanch,	Discussion on (but not limited to): • Socio-economic profile • Fishing activities and impact due to construction of the port • Fishing market • Welfare characteristics of affected communities	The stakeholder is other nearest community to the JNPA and is living near the elephant caves.

Sr. No.	Stakeholder Details	Objective of the consultation	Criteria for selecting and determining consultation with the stakeholders
	fishermen and other local community	• Living conditions • Impact on Elephant Caves (world heritage site)	

5.2 Stakeholder Identification and Analysis/Mapping

This section provides stakeholder identification and mapping for the Project based on the current planning stage. The identification is based on present status and understanding developed during the consultations with Project proponent. The analysis of the identified stakeholder is based on stakeholders' profiling and the significance of impact/influence of each stakeholder in relation to the Project.

5.2.1 Stakeholder Identification and Characterization

A stakeholder is "a person, group, or organization that has a direct or indirect stake in a project/organization because it can affect or be affected by the Project/company's actions, objectives, and policies". Stakeholder thus vary in terms of degree of interest, influence and control they have over the Project. While those stakeholders who have a direct impact on or are directly impacted by the Project are known as primary Stakeholders, those who have an indirect impact or are indirectly impacted are known as Secondary Stakeholders.

Keeping in mind the nature of the Project and its setting, the stakeholders have been identified and listed in the table given below:

Table 5-2: Stakeholder Group Identification

Category	Primary Stakeholder	Secondary Stakeholders	Remarks
Community	• Fishing community • Local community • Opinion Holders • Community Leaders • Local workers • Women Group	Nil	Consultation with the primary stakeholders has been undertaken during the site visit
Vulnerable group	• Schedule Caste • Schedule Tribe	Nil	As part of the consultation with local community, consultation with SC and ST has been undertaken.
Institutional Stakeholders	• Jawaharlal Nehru Port Authority (JNPA) • Local gram Panchayats • Project Investors • Trade Unions and labour related legacy workers (workers who may seek employment and contractors and their workforce, workers who will be reallocated and retired/will retire) • Neighboring terminal operators	• Village Institutions (education and health department) • Political Parties	As part of this assessment neighboring terminal operators have not been consulted due to restricted access to their terminals.
Government Bodies	• District Administration	• State Administration	Nil

Category	Primary Stakeholder	Secondary Stakeholders	Remarks
	• Regulatory Authorities (Labour and environment)		
Other Groups	• Employees • Contractors and sub-contractors • Suppliers • Contractual workers	• Media • Local NGOs – environmental organizations and CSOs • Elephanta Caves world heritage site	Nil

5.2.2 Stakeholder Analysis/Mapping

"Stakeholder mapping" is a process of examining the relative influence that different stakeholders have over the Project as well as the influence of the Project over them. The purpose of stakeholder mapping is to:

- Identify each stakeholder group
- Study their profile and the nature of the stakes
- Understand each group's specific issues, concerns as well as expectations from the Project
- Gauge their influence on the Project

Based on such an understanding, the stakeholders are categorized into High influence/priority, medium influence/priority, and low influence/priority.

The stakeholder engagement starts in the early stages of the Project, also needs to be included in the impact assessment and risk identification process and continues across the life cycle of the Project. The stakeholder analysis also shapes the stakeholder engagement strategy for the Project and needs to be continuously update the stakeholder analysis and helps in integrating the impacts and risk identified in the Project designing and during the implementation stages to help the company better addresses the associated impacts with the Project.

Table 5-3: Stakeholder Analysis/Mapping

Relevant Stakeholders	Expectations and concerns	Influence of stakeholder on Project	Influence of Project on Stakeholders	Influence Rating
Fishing Community residing in Mora koliwada, Raj Bandergaona (Gharapuri) and Mora Bandergaon villages (Gharapuri) and Mora fish market	The key expectations from the group are: • Allowing fishing in the area where they are undertaking at present • Health and safety of fishermen during incoming of large cargo ships	The stakeholder has a limited influence over the project as NSFTPL is under the concession agreement of operation and construction of a terminal and the controlling of shipping route is under the scope of the JNPA. Thus, any request pertaining to fishing activity in the area is directed towards the JNPA.	The project will not have direct contact with fishermen and thus has **Low** influence over the stakeholder	• Influence of the Stakeholder: **Low** • Influence of the Project: **Low**
Vulnerable Group	The key expectations from the group are: • Receiving benefits from the Project in terms of corporate social responsibility related developments • Employment opportunity from the proposed project • As reported, the Project will undertake community development through their CSR activities and special preference shall be provided to this group.	The stakeholder group has a very limited interaction with the Project. As the scope of rehabilitation comes under the JNPA and the local district administration. Additionally, if there are any pending legal cases, then those will be in between JNPA and households. Further, if judgement comes in favor of the households, then the direction from the judicial system will be towards the JNPA to implement and no direction toward project will not be there. **Note:** As reported, by JNPA there are no pending legal cases related to resettlement and rehabilitation. However, the above provided justification covers future scenario even.	The project will not have direct contact with rehabilitated households and thus has **Low** influence over the stakeholder	• Influence of the Stakeholder: **Low** • Influence of the Project: **Low**
Local Community and workers	The key expectations for this group from the project are: • Receiving benefits from the Project in terms of corporate social responsibility related developments • Employment opportunity from the proposed project • As reported, the Project will undertake community	The stakeholder group may have role to play in the public opinion towards the entire port. The project is part of the port operations	The project may prove to be potential employer of the local community The need-drive CSR activities can play a critical role in the development of the community through CSR projects	• Influence of the Stakeholder: **Low** • Influence of the Project: **Medium**

Relevant Stakeholders	Expectations and concerns	Influence of stakeholder on Project	Influence of Project on Stakeholders	Influence Rating
	development through their CSR activities			
Opinion Holders, community leaders and Local Gram panchayats **Note:** Consultation with present sarpanch and past sarpanch of Gharapura has been undertaken	The key expectations of this group from the Project includes: • Receiving benefits from the Project in terms of employment and development of infrastructure and the community • Minimal disturbance to the community regarding the fishing activities	This group is envisaged to be powerful enough to affect the functioning of the Port This stakeholder group may play an important role in the public opinion formation, and implementation of the CSR activities planned by the Project	• This group due to their social status, may already have access to several economic benefits from the JNPA and other private terminal operators' introduced CSR projects. Thus, may not be completely depended upon the Project for access to development opportunities	• Influence of Stakeholder: **Medium** • Influence of Project: **Low**
Jawaharlal Nehru Port Authority (JNPA)	JNPA is the concessioning authority for the Project, the expectation of JNPA includes: • Compliance with the provisions of concessionaire agreement • Compliance with all applicable Acts, Laws, Rules and advisories issues by the government authority • Pay the land tax in the given timeline • Undertake the construction and operation activities as per the concession agreement • Pay the land tax properly	JNPA as a concessioning authority for the Project will have a significant impact on the Project. Further, JNPA may issue advisory or make rules on construction and operations of terminal under the ports	• The project is the partner with JNPA to construct and operate the port. Thus, the Project is also the key stakeholder of the JNPA. Further, similarly, the influence of the Project on the JNPA is significant	• Influence of Stakeholder: **High** • Influence of Project: **Medium**
Trade Unions	Trade unions' principal purpose is to represent the interests of its members and he worker's family member's wellbeing. The key expectation from the group includes: • Employment preferences to their members at the project • Maintain employee and employer relation: there shall be harmony	• The influence of the stakeholder group is significant, as the understood during the consultation with JNPA and the project proponent, most of workers are part of trade unions	• The influence of the project is also significant – providing collective bargaining, recognizing trade unions, workers welfare, etc.	• Influence of Stakeholder: **High** • Influence of Project: **High**

Relevant Stakeholders	Expectations and concerns	Influence of stakeholder on Project	Influence of Project on Stakeholders	Influence Rating
	between the employer and the employee • Maintain collection bargaining for workers – through collective bargaining[173] trade unions safeguards workers' rights • Strengthening labour relations – trade unions by devising mechanisms for resolving labour issues, trade unions also help strengthen labour relations			
Village Institutions (education and health department, etc.), and Local NGOs	The main expectations of the group from the Project pertains to: • Adequacy of community development activities in the area • Contribution of the Project towards the overall development of the area • Involvement in the formulation and implementation of community development activities Further, based on the secondary information NGO – NatConnect Foundation has filled RTI (right to information) related to information on CRZ clearance174	The influence of the group on the project pertaining to the role played by these institutions in the opinion formation and implementation of community development programmes and CSR activities	The influence of the Project on the group pertains to the role of the Project in the development of these institutions	• Influence of Stakeholder: **Low** • Influence of Project: **Medium**
Political Parties	The key expectations and concerns of the group are: • The role of the Project in the overall development of the area	The influence of this stakeholder group to the Project pertains to the role of the political parties in the formulation of public opinion towards the Project	The influence of the Project on the group is expected to be extremely limited, pertaining to the role of the	• Influence of stakeholder: **Medium** • Influence of Project: **Low**

[173] Collective bargaining consists of discussions and negotiations between employer and representatives of workers' organization for the purpose of determining working conditions and terms of employment by joint agreement.

174 https://www.deccanherald.com/national/west/jnpt-has-no-record-of-mangroves-in-port-area-reveals-rti-997253.html (Accessed on October 31, 2022)

Relevant Stakeholders	Expectations and concerns	Influence of stakeholder on Project	Influence of Project on Stakeholders	Influence Rating
	• The impact of the Project on the local community • Adequate community development activities throughout the life of the Project • Timely disclosure of information pertaining to the Project activities		Project in the development of the area	
State and District Administration, and Regulatory Authorities (labour and Environment)	The key expectations of the group from the Project includes: • Project's continuous compliance to the regulatory requirements • Timely disclosure of information and provisioning of updated compliance throughout the life of the Project	• The stakeholder group is critical for obtaining the various permits/clearances required for the commissioning of the Project and its smooth functioning thereafter • This group serves as important points of contact between the state level authorities and the local community • Welfare of the employees and protection of local environment falling in the vicinity of the Project	The influence of the project on the stakeholders pertaining to the role the project will play in obtaining the legal documents and making update compliance with the applicable regulatory requirements	• Influence of stakeholder: **High** • Influence of Project: **Low**
Contractors and Sub-contractors And suppliers	The primary expectation of the group from the Project will be: • The role of the Project in continued economic opportunity and work generations • Avoidance of any reputation risk associated with the Project due to any future community unrest or project's non-compliance with applicable rules and regulations • Clarity in terms of scope of work, expectations, key performance indicators and timelines • Timely and adequate disclosure of information to be carried out • Grievance redressal mechanism • Fair business opportunities and contract closure	The stakeholder group is critical for the smooth functioning and timely implementation of the Project This group may also play an important role in the formation of public opinion towards the project	The influence of the Project on the group pertains to the role of the Project in business opportunities and the process of contract closure	• Influence of stakeholder: **Medium** • Influence of Project: **High**

Relevant Stakeholders	Expectations and concerns	Influence of stakeholder on Project	Influence of Project on Stakeholders	Influence Rating
	• Business continuity			
Employees and contractual workers	The primary expectations of the stakeholder groups pertaining to the Project will be: • The role of the Project in continued economic opportunities, work generation and source of income • Timely providing salaries and compliance with the applicable rules and regulations[175] • Timely and adequate disclosure of information to be carried out • Grievance redressal mechanism • Fair business opportunities and contract closure • Business continuity	• The stakeholder group is critical for the smooth functioning and timely implementation of the Project • This group may also play an important role in the formation of public opinion towards the project	The influence of the Project on the group pertains to the role of the Project in the continuance of economic opportunities, timely payment of wages and employees' benefits, and ensuring the health and safety of workers and employees	• Influence of stakeholder: **Medium** • Influence of Project: **High**
Media	The media, comprising of both print and visual media. The primary expectations of the group from the project includes: • Compliance to the regulatory requirements for the Project' role in the development of the area • Maintenance of positive relationships with the local community and other stakeholders • Timely disclosure of information regarding the Project activities	• The influence of the stakeholder group of the Project is likely to pertain to the opinion formation amongst other stakeholders towards the Projects	The influence of the Project on the stakeholder is likely to be extremely limited	• Influence of stakeholder: **Medium** • Influence of Project: **Low**

[175] The Central Labor and HR laws that may be applicable to the Project: The Building and Other Constructions Workers' (Regulation of Employment and Conditions of Service) Act, 1996, the Minimum Wages Act, 1948, the Payment of Wages Act, 1936, the Payment of Bonus Act, 1965, the Equal Remuneration Act, 1976, the Contract labor (Regulation and Abolition) Act, 1970, the Bonded Labor System (Abolition) Act, 1976, the Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979, the Child Labor (Prohibition and Regulation) Act, 1986, and other legislations concerning employee benefits

6 Climate Change Vulnerability Assessment

6.1 Introduction

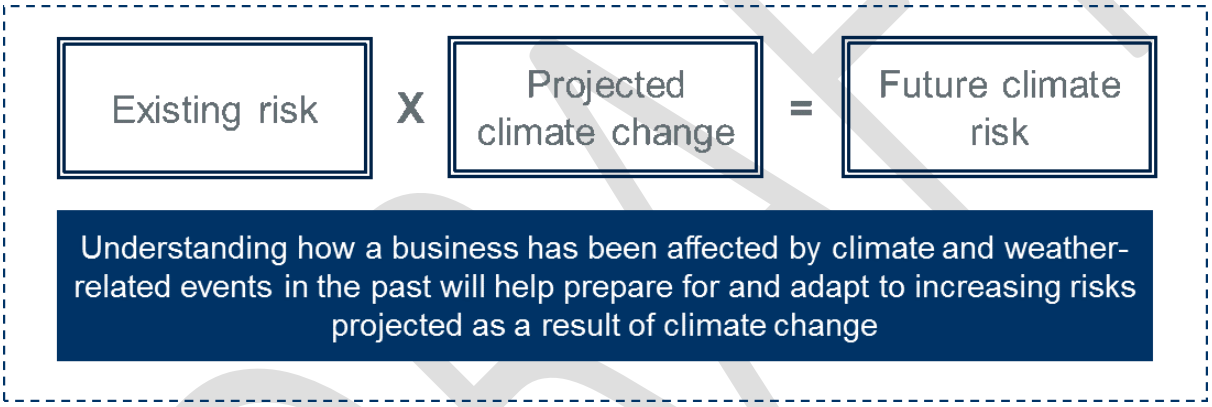
Climate change vulnerability assessment is based on historical data from global, regional, and national databases followed by qualitative evaluation of impacts of climate change on natural hazards. It should be noted that this is a very high-level review of publicly available information and no detailed site-specific analysis or modelling has been undertaken. Hence, further investigation may be required to quantify the risks in more detail for consideration of adaptation.

This report refers projections from Coupled Model Intercomparison Project (CMIP6), which was featured in Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6). CMIP6 has expanded the number of models participating and the number of future scenarios. CMIP6 has created new versions of these scenarios, which are tied to a Shared Socio-Economic Pathway (SSP): SSP1-2.6, SSP2-4.5, SSP4-6.0, and SSP5-8.5.

6.2 Natural Hazards and Climate Change Assessment

In short, the process of assessment of climate risks involve the evaluation of likely impacts from climate change projections on the existing baseline risks to inform on potential future risks.

Figure 6-1: Process to evaluate threats due to natural hazards under climate change scenario

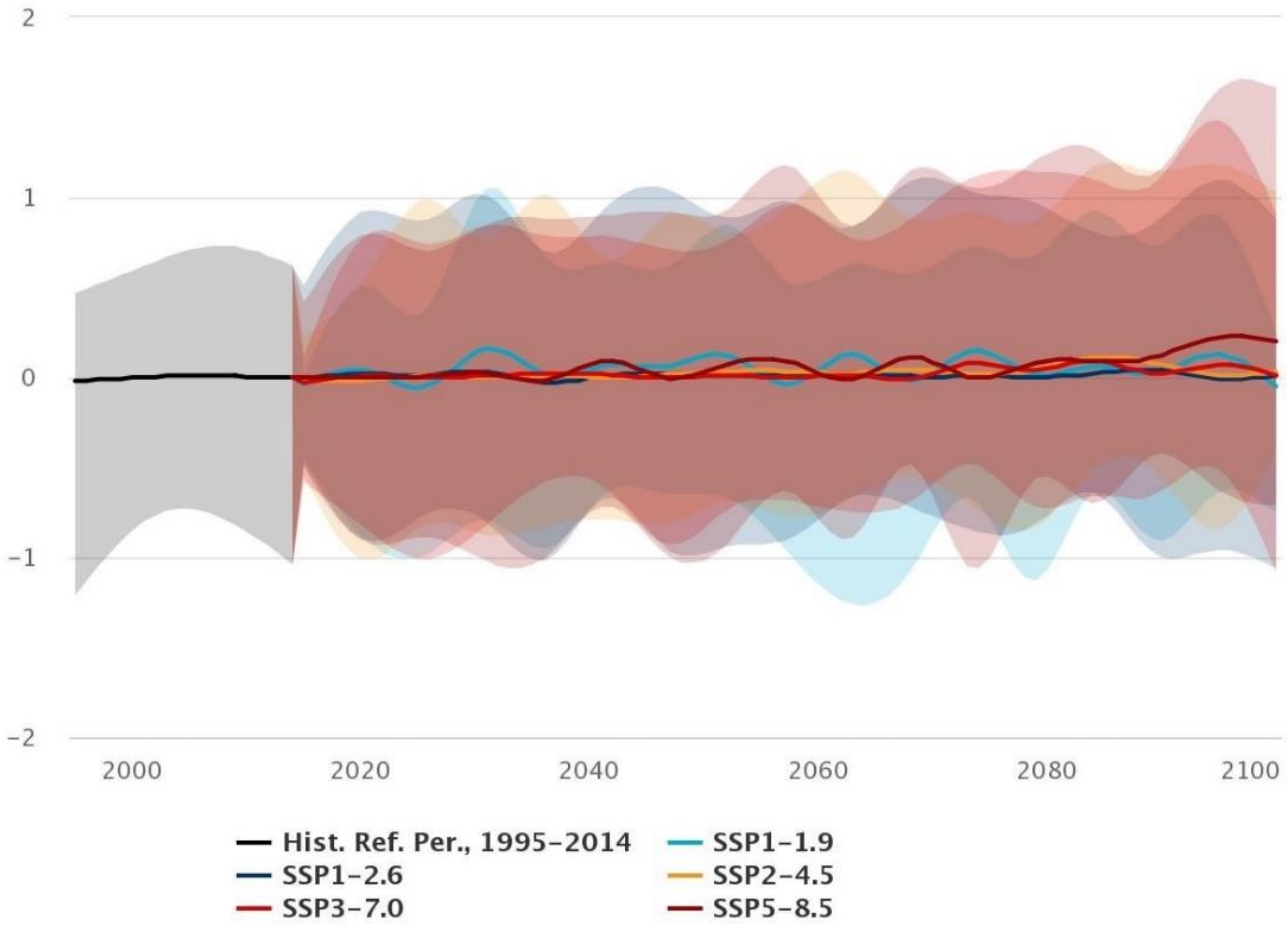


6.2.1 Water Availability and Drought

World Bank Climate Change Knowledge Portal has been used to estimate annual Standardized Precipitation Evapotranspiration Index (SPEI). Negative value of SPEI indicates increase drought and decrease water availability, positive value indicates decrease drought and increase water availability and no changes in SPEI Index means no changes about water availability. ***Figure 6-2*** shows the Projected Annual SPEI Drought Index anomaly (relative to the 1995-2014 reference period) for each of the chosen scenarios (CMIP6 SSP2 and SSP5) and the range of results for the model ensemble.

The annual SPEI Drought Index average values indicates small positive value in the future for both scenarios (CMIP6 SSP2 and SSP5). There is distinct asymmetry in the ensemble values, with a tendency for more extreme positive values (indicating decreased drought risk). The range on the positive side is nearly one-and-half that on the negative side and it indicate a tendency to decrease drought in future.

Figure 6-2: Projected annual SPEI index for Maharashtra (Ref. time period: 1995-2014) for 2020-2010

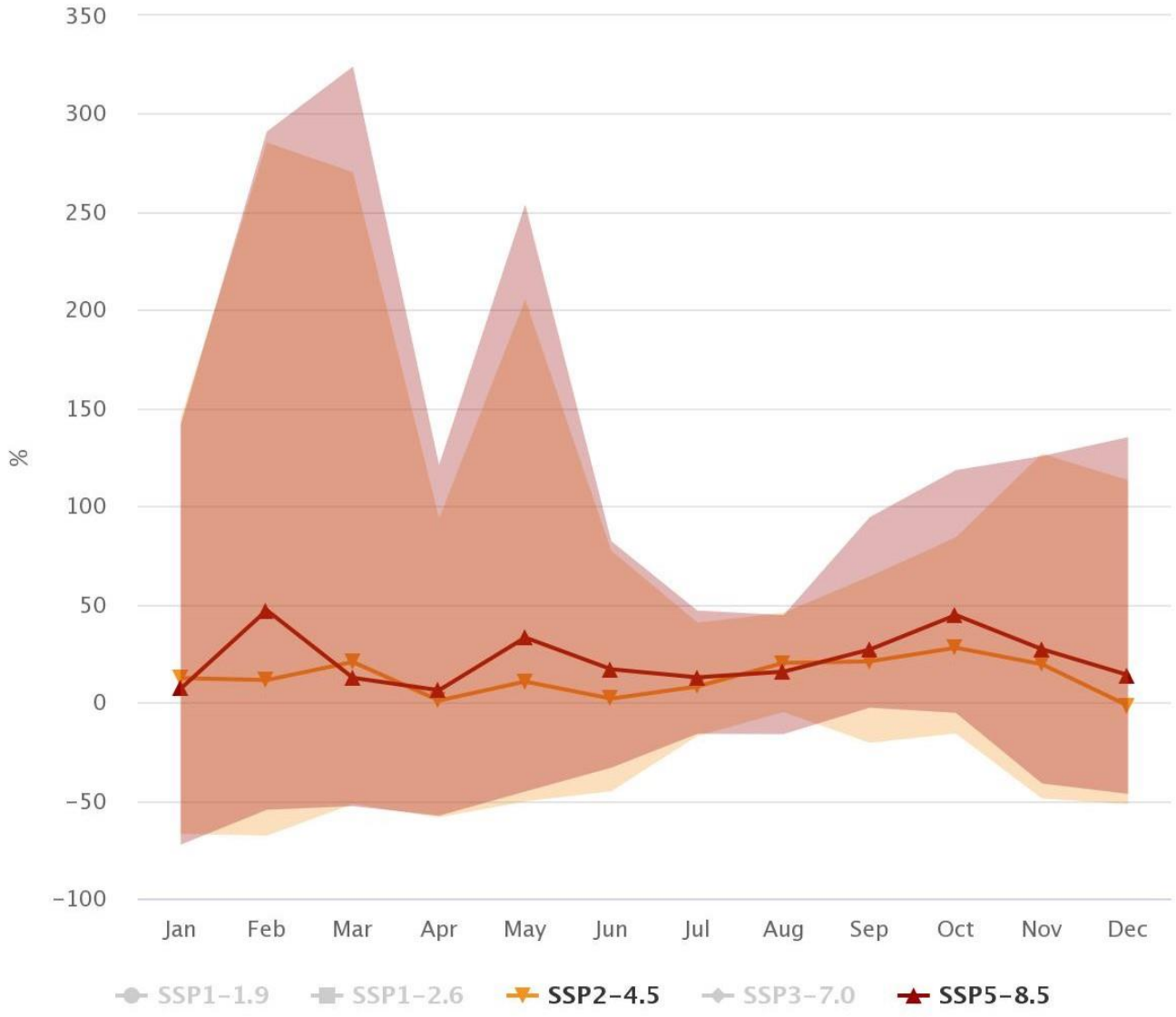


Source: Climate Change Knowledge Portal

6.2.2 Precipitation

World Bank Climate Change Knowledge Portal has been used to project future precipitation in the study area. The future time period considered is 2060-2079 ***Figure 6-3*** below shows the monthly mean projected precipitation percentage change anomaly (reference period – 1995-2014) for each of the chosen scenarios (CMIP6 SSP2 4.5 and SSP5 8.5) and the range of results using the multi-model ensemble. Average precipitation anomaly is the indicator for precipitation increase, where any change greater than 0 signals precipitation increase from historical trend. Figure 6.3 indicates increase precipitation in summers, largely in March month and this is consistent with the possibility of increased monsoon precipitation. The range of values is so high on the upside that it would be prudent to allow for the possibility of greater increases in precipitation. Increase precipitation will implies an increased risk of debris flows and an increase in surface winds associated with more monsoon rainfall for the study area. Increase precipitation trend leads to high likelihood of large runoff, debris and flash floods in medium confidence.

Figure 6-3: Monthly Mean Projected Precipitation Percentage Change Anomaly for 2060-2079 Maharashtra (Reference Period: 1995-2014)



Source: World Bank Climate Change Knowledge Portal

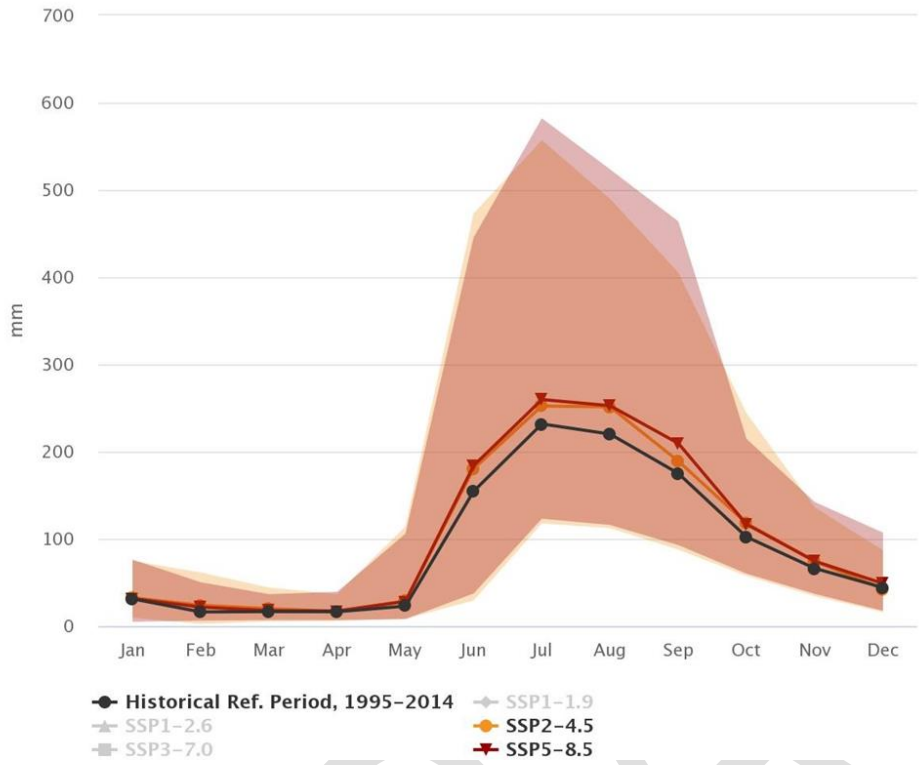
6.2.3 Flood and Wind Speed

The indicator for flood risk is average largest 5-day cumulative rainfall during the monsoon season and the threshold constitutes more than 150mm of rainfall in the monsoon season. There is no direct indicator for wind speed, indirect indicator is average largest 5-day cumulative rainfall which indicate a likelihood of higher winds. Same condition will apply for onshore storms, indirect indicator – average largest 5-day cumulative rainfall indicates a likelihood of onshore storms and it indicates intensity of storm frequency and conditions.

World Bank Climate Change Knowledge Portal, using estimate average largest 5-day cumulative rainfall has been used to project future flood risks (time period 2060-2079) in the study area. Figure below shows the monthly mean 5-day cumulative rainfall anomaly (relative to the 1995-2014 reference period) for each of the chosen scenarios (CMIP6 SSP2 4.5 and SSP5 8.5) and the range of results using multi-model ensemble. Figure 6-4 shows during May to November month, average largest cumulative rainfall exceeds the historical values that indicates heavy rainfall in this period. It clearly shows that in future projections, average

largest 5-day cumulative rainfall largely increases in the months of July and August and summer months which indicate high likelihood of increase large run-off (flows) in the study area with low confidence.

Figure 6-4: Projected average monthly mean 5-days cumulative rainfall for 2060-2079

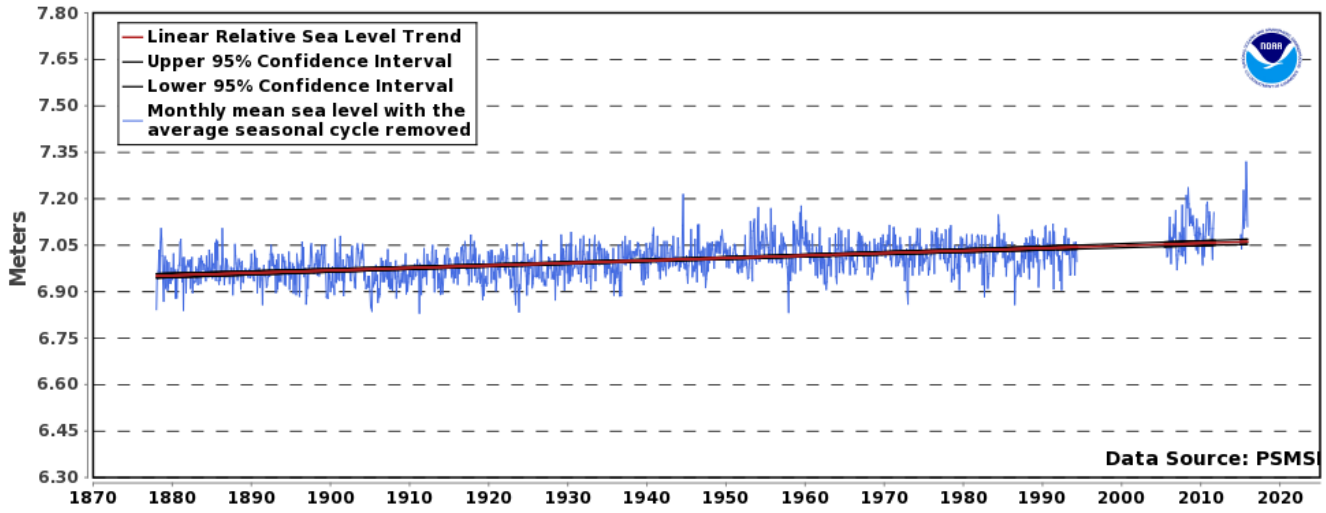


Source: World Bank Climate Change Knowledge Portal

6.2.4 Sea Level Rise

Records of sea level have been maintained in Mumbai since 1878 and are available online from the U.S. National Oceanic and Atmospheric Administration (NOAA). The relative sea level trend is 0.8 millimetres/year with a 95% confidence interval of +/- 0.09 mm/yr based on monthly mean sea level data from year 1878 to 2011 which is equivalent to a change of 0.26 feet in 100 years (*Figure 6-5*).

Figure 6-5: *Relative sea level trend at station 500-041 Mumbai, India*

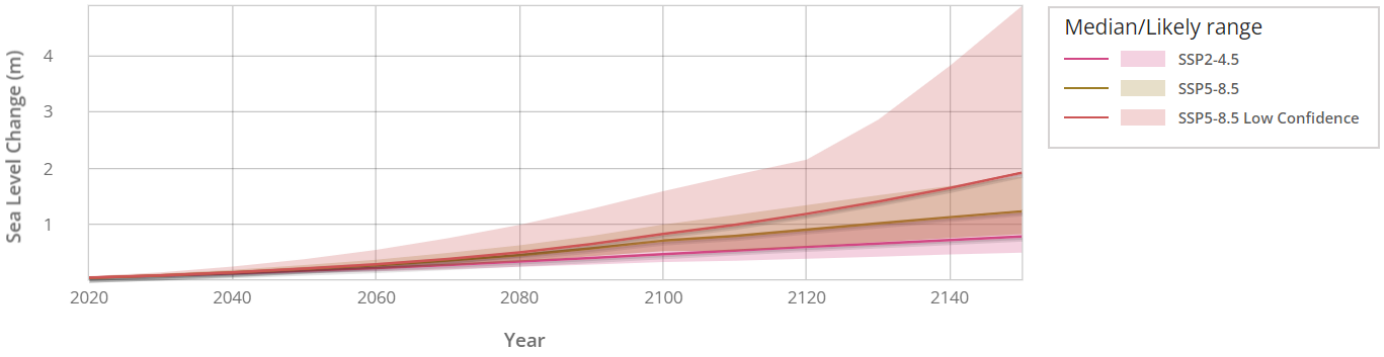


Source:NOAA

Data from NOAA IPCC Sea level rise tool, Mumbai station has been used for SLR projections using IPCC AR6 two scenarios (SSP2 4.5 and SSP5 8.5). Figure 6-6 shows IPCC Sea level rise projections for the year 2020-2150. IPCC SSP2 4.5 projection for the year 2040 with medium confidence SLR 0.12 +/- 0.04m and for the year 2080, SLR 0.33 +/- 0.15m. IPCC SSP5 8.5 projection for the year 2040 SLR 0.14 +/- 0.1m and for year 2080 SLR 0.44 +/- 0.18m. This figure also shows IPCC SSP5 8.5 projection with low confidence for year 2040 SLR 0.18 +/- 0.12m and for year 2080 SLR 0.49 +/-0.50m. Sea level rise high likelihood by 0.6m with medium confidence and sea level increase in low likelihood by 1.0m for the year 2080.

Based on the future projections, sea level at study area will rise by lowest 0.6m and largest increase by 1.0m in 60 years.

Figure 6-6: Projected Sea Level Rise (SLR) under three scenarios for Mumbai at time period for 2020 to 2150



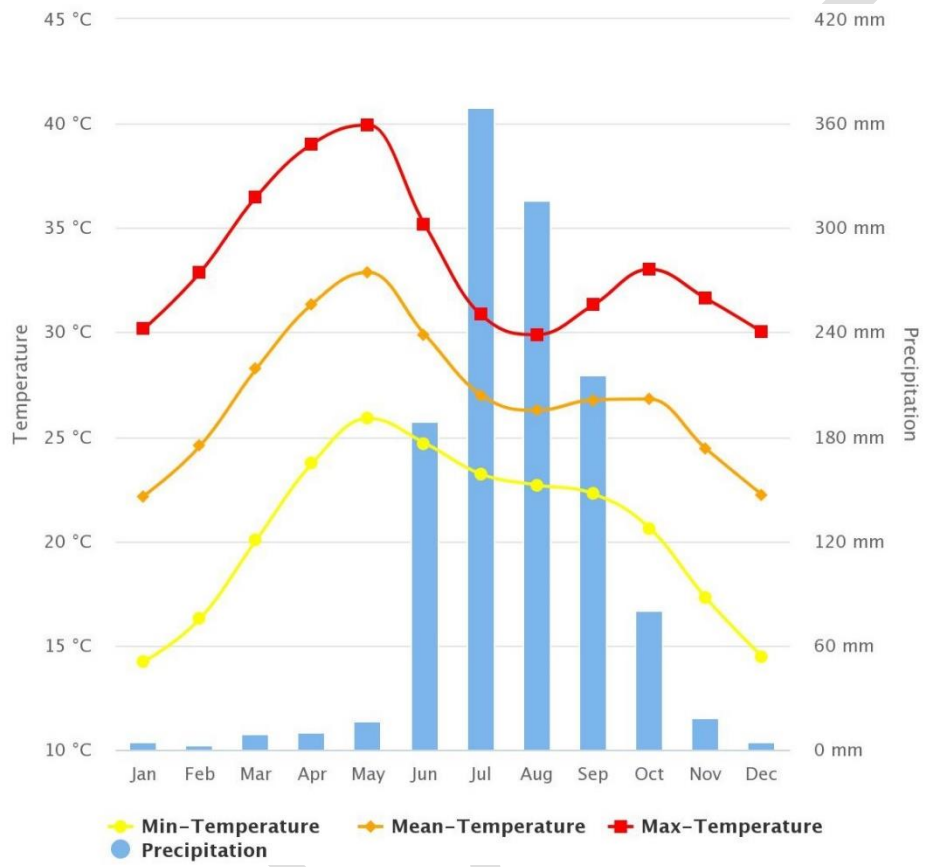
Source: NOAA IPCC AR6 Sea Level Projections

6.2.5 Temperature

As per World Bank Climate Change Knowledge Portal, historical temperature data (period 1991-2000) for Maharashtra state, mean low temperature have not fallen below 22°C and extreme low temperatures do not fall below 14°C (***Figure 6-7***). The average mean maximum temperature recorded in the month of May is 40°C.

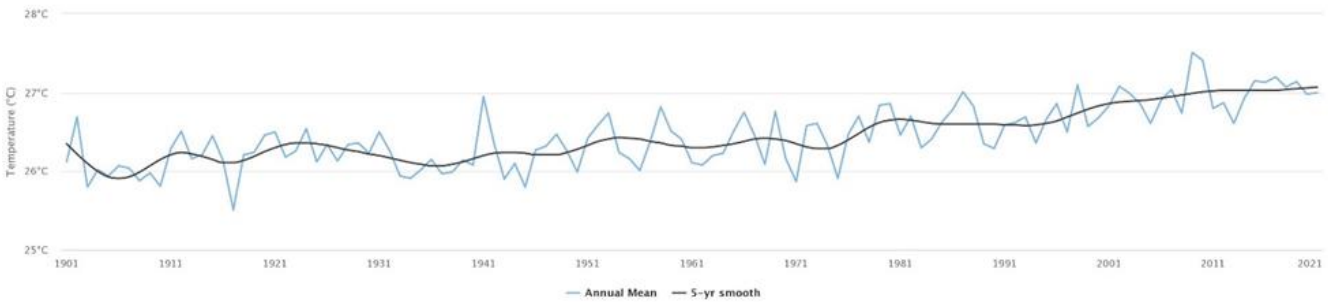
Temperature in Maharashtra has an increasing trend over the historical record and gradually increasing in recent decades (***Figure 6-8***). The average temperature changes over the period 1960 to 2020 from 26.41°C to 26.98°C and it means almost 0.5°C increase temperature over the period of 60 years.

Figure 6-7: Average monthly Temperature (minimum, mean and maximum) and Precipitation for the period 1991 – 2020, Maharashtra, India



Source: World Bank Climate Change Knowledge Portal

Figure 6-8: Observed average annual mean temperature for the period 1901 – 2021, Maharashtra, India



Source: World Bank Climate Change Knowledge Portal

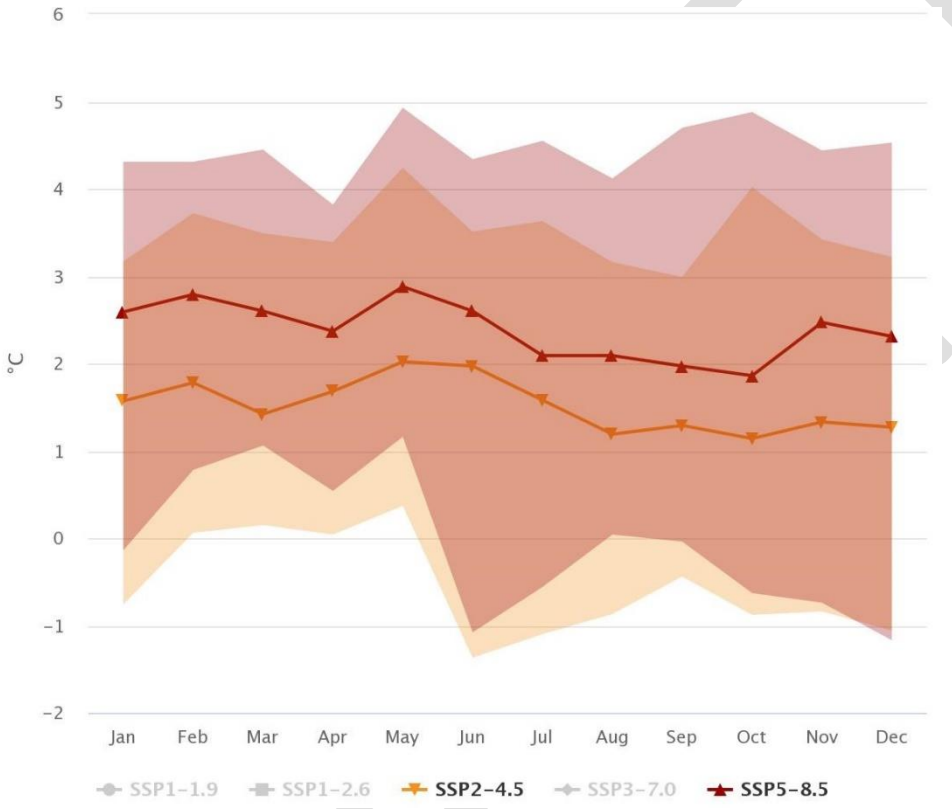
6.2.6 Extreme High Temperature

Projected monthly maximum temperature anomaly for future time period 2060-2079 (reference period – 1995-2014) for Maharashtra state with CMIP6 SSP2 4.5 and SSP5 8.5 pathways is presented in ***Figure 6-9***.

Figure below (Projection) indicates increase in monthly mean temperature under both scenarios, SSP5-8.5 increased by 2.37°C to 2.88°C and SSP2-4.5 increase by 1.59°C. SSP5 8.5 pathway increases 1.3°C larger than SSP2 4.5 pathway. Projected values are positive for both the scenarios, also largely there is an increasing trend from January to June and decreasing trend from July to December. SSP5-8.5 shows a larger increase in temperature in comparison to SSP2-4.5.

With respect to seasonal period – Increase tend is lower in summer months for both scenarios. Likelihood is high that maximum temperatures will increase in all months at high confidence.

Figure 6-9: Projected maximum temperature anomaly for 2060 – 2079



Source: World Bank Climate Change Knowledge Portal

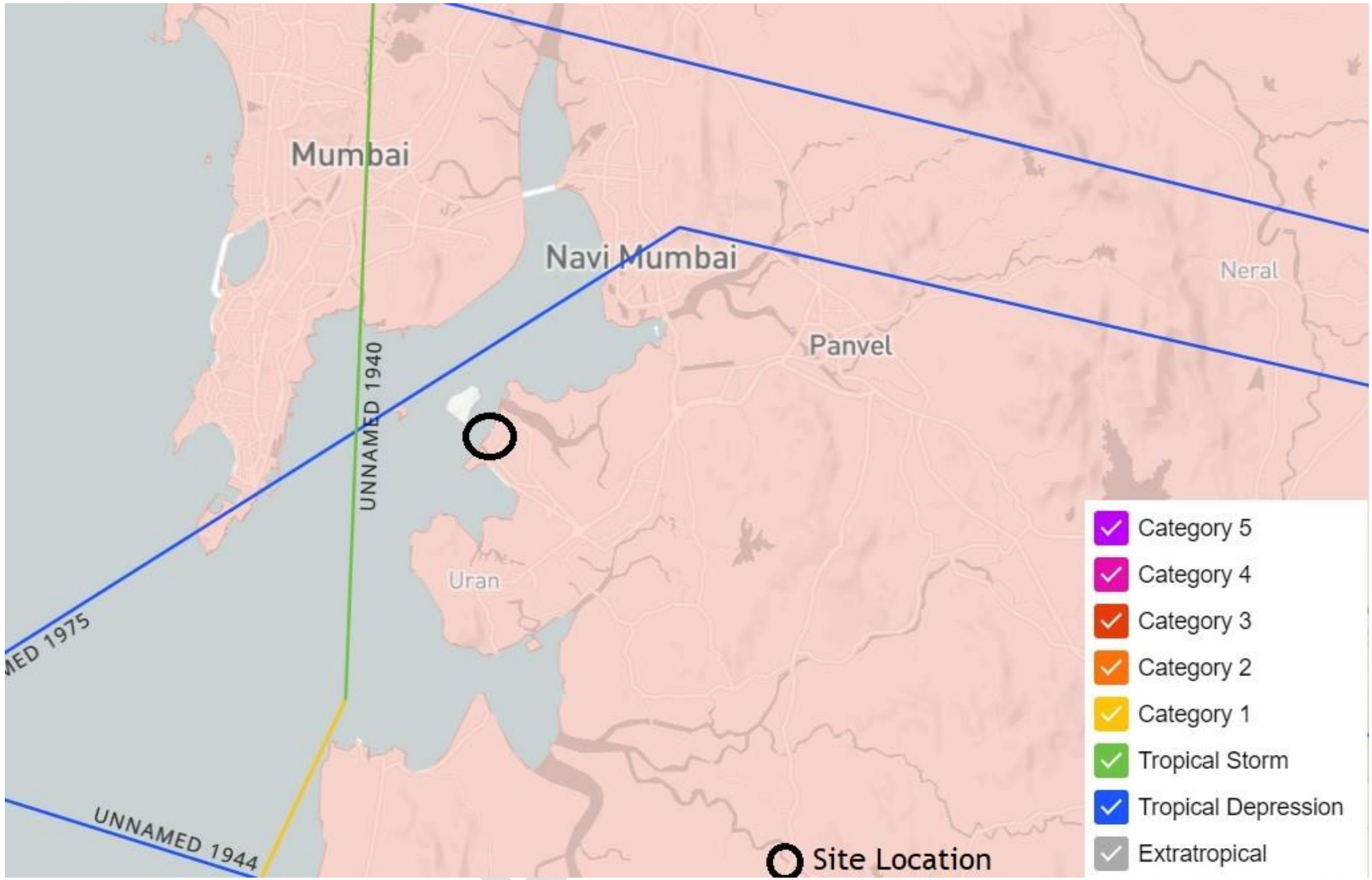
6.2.7 Cyclone

NOAA cyclone tracks data indicates, 3 cyclones tracks passed within ~10 km of the study area with intensity of Category 1 in 1940, tropical storm in 1944 and 1975. However, as presented in ***Figure 6.10*** the cyclones were dissipated to tropical depression soon after entering the 10 km buffer distance. The maximum wind speed during 1940 storm was estimated to be between 60-64 kt (30-33 m/s), 1944 storm was estimated 25-30 kt (13-15 m/s), and 1975 storm was estimated 25-28 kt (13-15 m/s). Accordingly, the baseline hazard due to cyclone is considered to be 'Low' at all assets within the study area.

Tropical storms can inflict damage in the form of high wind speeds (destroying buildings and infrastructure), storm surges, and flood. Although, the damage due to high winds and storm surges are limited to the coastal locations, flash floods due to heavy rainfall may occur at far inland locations.

In general, as per NOAA, Category 1 Cyclones can damage the roofs of buildings, topple the shallow rooted tress, or snap the branches. It can inflict extensive damage to power line resulting power outages over several days.

Figure 6-10: Historical Cyclone Track

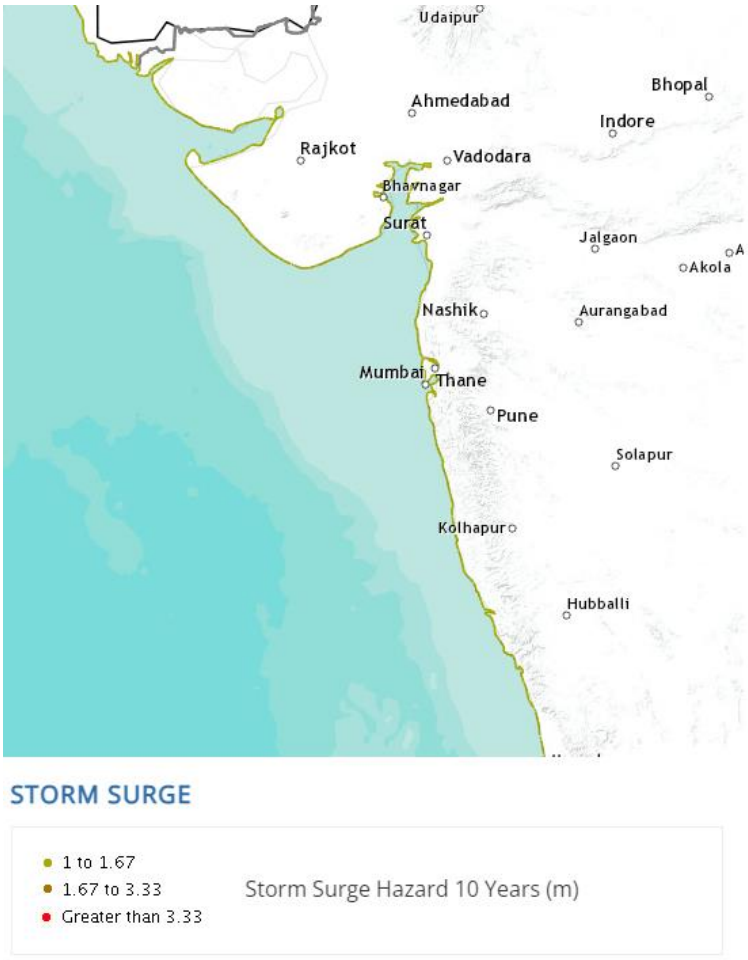


Source: NOAA

6.2.8 Storm Surge

As per NOAA, projected storm surge, maximum amount per 10-year period is presented in ***Figure 6.11***. Storm surge is projected to increase by up to 1.67m in 10-year average value in low confidence. Storm surge pattern is consistent with other inferences of an increase in monsoon storms. Below figure indicates that storm surge in Maharashtra state will not exceed more than 1.67 m in the period of interest (i.e. 10 years average).

Figure 6-11: Storm surge maximum (green line) expected (10 years average) in Maharashtra



Source: World Bank Climate Change Knowledge Portal

6.3 Summary

Summary of various hazards assessment described above with mitigations in presented in table below.

Table 6-1: Summary of Hazard assessment

Hazard	Results	Mitigation
Water Availability and Drought	Low likelihood of decrease droughts in medium confidence	No action needed
Precipitation	High likelihood of large runoff, debris and flash floods	Prepare plan for increased runoff, debris and flash floods

Hazard	Results	Mitigation
Flood	High likelihood of increase large runoff in low confidence	Develop plan for increased flood risk and debris flows
Wind Speed	High likelihood of increase wind speed in low confidence	Prepare plan for increased wind speed
Sea Level Rise	High likelihood of 0.6m in medium confidence and medium likelihood of 1.0m in low confidence	Plan for increased Sea Level of 1m
Extreme High Temperature	High likelihood maximum temperature increase in all months (Medium confidence	Plan for thermal stress on staffs and equipment
Storm Surge	Storm Surge increase by up to 1.67m in low confidence	Plan for additional storm surge of 1.67m combined with SLR 1m

6.4 Additional Mitigation/ Recommendations

Extreme weather caused by climate change causes accelerating risks to infrastructure, operations, and business continuity, as well as the safety of vessels and people. Following are key recommendations to improve extreme weather risk management:

- Undertake weather risk assessments, contingency and response plans
- Arrange partnership for accurate weather observation and solutions with real-time alerts to enable dynamic, just-in-time operations
- Ensure there is a dedicated, forward-looking budget for mitigating weather-related risks
- Undertake risk screening pertaining to cyclones and their frequencies in next 30-50 years

As the port is already in operations it leaves very little scope for adaptation measures, however there is a need to develop a climate road map and work towards implementing some of the recommended mitigation measures in a phased manner.

Renewable Energy

Open spaces and large buildings make ports suitable candidates for renewable energy, mainly solar. Generating renewable energy at ports can decrease the need for fossil fuels, thereby reducing emissions and air pollution. It is already proposed that NSFTPL will explore the possibility of rooftop solar for the terminal and aims to achieve 400 kW of power through it.

Electrification

Electrification involves replacing engines that use fossil fuels like diesel with ones that run on electricity. Electrifying port machinery like cranes, forklifts, and tractors reduces air and noise pollution (wherever possible), can help reduce the GHG footprints. Electric engines are also easier and cheaper to maintain and refuel. Ideally, renewable energy can be used as the source of electricity, resulting in even fewer greenhouse gas emissions. NSFTPL has plans to convert all diesel RT cranes used within JNPCT to electrical driven RT Cranes.

Shore Powering

Ships at port, known as berthed ships, are often the largest source of greenhouse gas emissions at ports. Shore powering facilities or electrical hookups available (can be provided) to berthed ships that allow their engines to be shut off while at port. This can reduce air pollution from berthed ships significantly.

Use of Rail and Replacement Plans for old trucks

Heavy-duty vehicles at ports and terminals are a significant source of greenhouse gas emissions and other pollutants, such as particulate matter and nitrogen oxides, that contribute to the climate crisis and impact the health of near-port communities. NSFTPL shall emphasize on use of existing rail connectivity as a major means for transportation. Also, to reduce emissions, some NSFTPL may explore truck replacement programs, replacing older trucks with models featuring cleaner burning and more efficient engines.

7 Impact Assessment & Mitigation Measures

This section assesses the manner in which the Project will interact with elements of the physical, ecological or social environment to produce impacts on resources/ receptors. It has been organized as per the construction and operation phases of the project life cycle to understand the risks and impacts associated with each phase.

7.1 Project Activities

An overview of the typical activities during different phases of the proposed project has been summarised below.

Note: *As part of the proposed project, the construction and operation activities of the proposed project will be carried out simultaneously by NSFTPL for the initial 15 to 18 months till the construction phase is completed.*

Table 7-1: Project Activities

Sr. No.	Project Phase	Activities
1.	Project Handover	• Currently the JNPCT is being operated by JNPA and handover is planned by end of December 2022 post which NSFTPL will undertake expansion as well operation in parallel for initial 15 to 18 months. JNPA will hand hold NSFTPL for around 15 days before handing over all the operations to NSFTPL. Post-handover of the operations, JNPA will monitor operational performance of terminal. JNPA will also grant (permits those are within its authority)/ assist in obtaining all the applicable permits / approvals required by NSFTPL and make available all the records/ documents related to JNPCT on request. • As confirmed by NSFTPL, environmental, health, safety, social permits as per the concession agreement (CA) will be transferred by JNPA under NSFTPL's name. NSFTPL will ensure that all the applicable EHS permits have been obtained and are transferred to its name. NSFTPL will apply for other permits like Fire NOC which are in its purview at its own cost. Currently fees to third party monitoring lab for undertaking environmental monitoring is being paid by JNPA. However as agreed in CA, after project handover, JNPA will continue to conduct environmental monitoring at the port including JNPCT, however, fees for environmental monitoring at JNPCT will be paid by NSFTPL.
2.	Pre-Construction and Mobilization Phase	• Site Survey • Project Approval and Clearance • Selection, Finalization and Appointment of Structural and Master Planning Consultant • Topographical Survey • Soil Investigation • Contractor Mobilization • Installation of Construction Equipment including batching plant, transit mixers etc.
3.	Construction Phase	• Transportation of Construction Machinery • Labour Engagement • Transportation and unloading of construction material • Storage and handling of construction cement, bricks, steel etc. • Mixing of construction material and operation of construction machinery • Piling and foundation work for berth expansion • Construction of new facilities and refurbishment of existing facilities • Handling and disposal of construction wastes including hazardous and non-hazardous wastes • Dismantling and removal of temporary support construction equipment/structure.
4.	Operation and Maintenance Phase	• Movement of vessels • Stacking of containers at the container yard • Movement of ITVs from berth to container yard, railway siding for transportation of containers • Operation of RMGC, RMQC, RT cranes and forklift for loading, unloading and stacking of containers • Operation of berth including mooring and docking of vessel for loading and unloading of containers and movement of ITVs and other vehicles

Sr. No.	Project Phase	Activities
		• Painting and greasing at substation and other areas • Waste generation including solid waste and sewage from toilet blocks, hazardous waste such as used oil, contaminated cotton rags from substations. • Waste generation including solid waste and oily sludge from vessels • Repair and maintenance of cranes, lifting appliances, firefighting system etc.

7.2 Scoping

As part of IESE study, scoping exercise has been carried out to identify the potential area of influence for the project to identify potential interactions between the project and resources/receptors in the area of influence and the impacts that could result from these interactions and to prioritize these impacts in terms of their significance. This stage is intended to ensure that the impact assessment focuses on the issues that are most important for decision-making and stakeholder interest.

The impact interaction matrix highlighting the potential interaction between project activities and resources/receptors has been presented in ***Table 7-2.***

Table 7-2: Potential Impact Interaction Matrix

Potential Impact Interaction Matrix		Resource														
		Topography and Drainage	Land Use	Soil and Sediment Environment	Water Availability	Marine Environment	Air Environment	Noise Environment	Terrestrial Ecology	Aquatic Ecology	Land Based Livelihood	Economic Environment / Employment	Social and Cultural Environment	Occupational Health and Safety	Community Health & Safety
Project Activities	**Pre -Construction and Mobilization Phase**														
	Site Survey														
	Project Approval and Clearance														
	Selection, Finalization and Appointment of Structural and Master Planning Consultant														
	Topographical Survey	√													
	Soil Investigation		√	√											
	Transportation and Installation of Construction Machinery	√				√	√	√				√		√	√
	Construction Phase														
	Labour Engagement	√		√	√	√	√	√	√	√				√	√
	Loading and unloading of construction material			√				√	√	√				√	
	Storage and handling of construction cement, bricks, steel etc.	√		√		√			√	√		√	√	√	√
	Mixing of construction material and operation of construction machinery				√		√	√	√	√				√	√
	Piling and foundation work for upgradation of berth			√		√	√	√	√	√		√		√	
	Construction of new facilities and refurbishment of existing facilities	√		√	√	√	√	√	√	√				√	
	Handling and disposal of construction wastes including hazardous and non-hazardous wastes			√		√	√		√	√				√	√
	Dismantling and removal of temporary support construction equipment/structure			√			√	√	√	√				√	
	Employment of workers (local and migrant)				√	√						√	√		
	Operation and Maintenance Phase														
	Increased movement of vessels and road traffic post terminal expansion			√		√	√	√	√	√				√	
	Stacking and storage of hazardous and non-hazardous containers at the container yard			√		√	√	√	√	√				√	
	Movement of ITVs from berth to container yard, railway siding for transportation of containers						√	√		√				√	
	Operation of RMGC, RMQC, RT cranes and forklift for loading, unloading and stacking of containers			√		√	√	√		√				√	
	Operation of berth including mooring and docking of vessel for loading and unloading of containers and movement of ITVs and other vehicles			√		√	√	√						√	√
	Operation and maintenance of watch tower, IT tower, firefighting system				√			√						√	
	Waste generation and disposal including solid waste and sewage from porta cabins, hazardous waste such as used oil, contaminated cotton rags from substations			√	√	√			√	√				√	
	Waste generation and disposal including solid waste and oily sludge from vessels			√	√	√			√	√				√	
	Repair and maintenance of cranes, lifting appliances, firefighting system etc			√	√	√			√	√				√	
	Employment of workers (local and migrant)											√	√		

No interaction	
Potential Interaction	√

7.2.1 Scoped Out-Potential Interactions

Based on interactions defined in ***Table 7-2***, the impacts on the following resources have been scoped out.

Table 7-3: Scoped Out-Potential Interactions

S.no.	Impact	Rationale for Scoping Out
1.	Land Use	The proposed project is an upgradation of the existing terminal. The landuse of the terminal is already established as industrial land. Therefore, there will be no conversion and no associated change in the existing landuse of the study area. Furthermore, since no workers accommodation will be constructed and it will be rented, therefore there will be no change in the existing landuse pattern due to development of workers accommodation. Hence the project activity and receptor interaction has been scoped out.
2.	Topography and Drainage	The proposed project is an upgradation of the existing terminal. Therefore, there will be negligible or insignificant changes in the topography and drainage pattern of the project area. Furthermore, since upgradation of berth will be undertaken to the other side of the berth (i.e., opposite side of the vessel and towards the port area), there will be no change in the depth and draft allowance for vessels or navigation of vessels. Hence the impact interaction has been scoped out.
3.	Dredging Activities	Since dredging activities does not fall within the scope of proposed project, the impact on underwater noise, water quality, aquatic species due to dredging activities has been scoped out.
4.	Land Acquisition and related impact of R&R	The proposed project is an upgrade of the existing terminal. There is no requirement for extra land to be acquired or leased for the Project. Thus, the project will not trigger forced / compulsory land acquisition and does not entail expropriation of land and other assets. As the proposed project does not have adverse potential impacts related to involuntary resettlement associated with compulsory land acquisition and expropriation therefore impacts related to involuntary resettlement / R&R has been scoped out
5.	Vegetation clearance	As it is an operational terminal and there is no need of vegetation removal for any kind of construction activities. Thus, vegetation clearance and its related impact has been scoped out As no baseline of marine vegetation (excluding phytoplankton) is available for the study area, and the dredging activities are in practice since a long time, it is unlikely to have an additional impact on the marine vegetation due to the terminal activities. Thus, marine vegetation clearance and its related impact has also been scoped out.
6.	Impact on terrestrial wildlife	The existing container transportation by road is ~ 84 % which is expected to decrease to 70% by FY 2027-28, due to increase in transportation through rail

S.no.	Impact	Rationale for Scoping Out
		network as discussed with the JNPA authorities. Thus, there will be no significant increase in traffic is going to be contributed by the terminal. Although, there is no document available about the presence and movement of wildlife along the road from the study area, but the consultation with the truck drivers, locals, literature review as well as primary observations does not support the movement of wildlife near the road in the study area. At the same time, no suitable habitat for terrestrial wildlife of conservation significance is present in the study area. There is no significant direct and/or indirect impact on terrestrial wildlife (not of conservation significance) during construction as well as operation phase because, it is an operational terminal and terrestrial wildlife has already adapted itself for anthropogenic disturbances (specifically – vegetation clearance for port infrastructures, roads, and increased people presence & activities long time back). Thus, the impact on terrestrial wildlife has been scoped out.
7.	Cultural Heritage	The project is not a new construction on green field and no new land will be procured, thus it is anticipated that there will be no impact on any cultural heritage. However, to reconfirm any form of impact on any cultural heritage due to operation of port, local community consultation and secondary data review has been undertaken. The finding of the assessment is provided below: • As per the Archaeological Survey of India, no centrally protected monuments/sites[176] and state protected monuments/sites[177] is present in the vicinity of the project location. However, approximately 2 km on the western side of the project across the ship sea path, there is a World Heritage Site named Elephanta caves. • ESAF to check the impact of the port to the world heritage site, has undertaken the consultation with the local community at the Gharipura island (where the Elephanta Cave is located). During the consultation with the community, it was reported that there is no impact on the heritage site due to construction and operation of the port. Further, the JNPA is in the process of construction of protection wall of ~3.2 km at the island, so that the world heritage site shall be protected from any unforeseen event (such as flooding and increasing of sea level) in future. Furthermore, presence of no other cultural heritage is reported by the local community in the vicinity of the project **Note:** As a safeguard, chance find procedure has been developed as part of this assignment which will be applicable on project and implemented during construction activity (refer to ***Annexure K***)

176 https://asi.nic.in/wp-content/uploads/2021/08/Maharashtra-Aurangabad-Circle-Mumbai-Circle-and-Nagpur-Circle.pdf (Accessed on October 31, 2022)

177 https://asi.nic.in/protected-monuments-in-maharashtra/ (Accessed on October 31, 2022)

7.3 Impact Assessment Methodology

7.3.1 Impact Estimation & Assessment

Impact identification and assessment starts with scoping and continues through the remainder of the Impact Assessment (IA) Process. The Impact Assessment steps comprises of the following:

- Step 1: Impact Estimation – Is undertaken to determine the impacts on the resources/receptors as a result of the project and its associated activities. Impact Estimation is carried out with an objective to determine what is likely to happen to the environment and socioeconomics as a consequence of the Project and its associated activities.
- Step 2: Assessment of Impacts- Is undertaken to understand the significance of the estimated impacts by considering their magnitude and likelihood of occurrence, and the vulnerability of the affected resource/receptor. Each identified impact will be described in terms of its various relevant characteristics (e.g., type, likelihood). Once an impact's characteristics will be defined, each impact will be assigned a 'magnitude'. Details and definition and factors considered have been provided in *Table 7-4*:.
- Step 3: Mitigation and Enhancement measures- To identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts.
- Step 4: Impact Evaluation post implementation of mitigation measures- To evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.

Table 7-4: Factors considered for Defining and Characterization of Impacts

Factors	Definition
Impact Characteristic: Are of 4 types as defined below. These apply to planned and unplanned events	
Nature of Impact	An indicator of the relationship of the impact to the project (in terms of cause and effect) • **Beneficial:** Impacts resulting in positive or beneficial change in project area • **Adverse:** Impacts resulting in negative or adverse change in project area
Spread of Impact	Defined as the "reach" of the impact (e.g., confined to a small area around the Project Footprint, projected for several kilometers, etc.) • Insignificant/ Localised • District/State • National
Period of Impact	Defined as the time period over which a resource/ receptor is affected. • Provisional – Limited for duration of less than 6 months • Short Duration: 6-24 months • Long Duration– 2- 10 years • Permanent
Frequency	A measure of the constancy or periodicity of the impact.
Once an impact's characteristics were defined, each impact is assigned a 'magnitude'. **Magnitude** is typically a function of a combination (depending on the resource/receptor in question) of the impact characteristics as defined and mentioned above,	
Magnitude Characterisation	The universal magnitude designations are • **Negligible** • **Small** • **Medium** • **Large**

In addition to characterizing the magnitude of impact, the other principal impact assessment step is vulnerability of the impacted resource/receptor. Factors such as legal protection, government policy, stakeholder views and economic value are considered when characterizing vulnerability,

The ***vulnerability characterization*** used herein for all resources/receptors are

- Low

- Medium
- High

As magnitude of impact and sensitivity/ vulnerability/ importance of resource/ receptor have been defined and assigned, the ***significance of impact is assigned*** for each impact is as presented in ***Table 7-5.***

Impact significance is designated using the matrix shown below.

Table 7-5: Impact Significance Matrix

		Vulnerability Receptor and/or resource		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Substantial	Minor	Moderate	Major
	Large	Moderate	Major	Critical

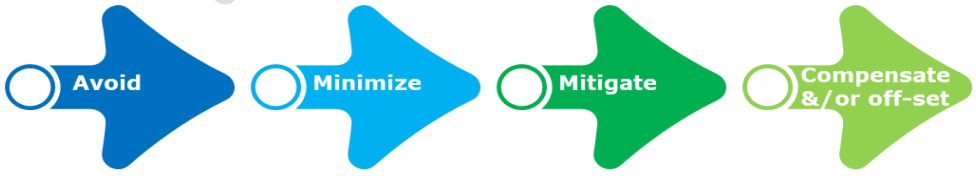
Impact Significance

- **Negligible Significance**: A resource/ receptor (including people) is not affected in any way by any particular activity or the impacts deemed to be undifferentiated from natural background.
- **Minor Significance**: A resource/ receptor will experience a perceptible effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low vulnerability. In either case, the magnitude should be well within applicable standards/ guidelines.
- **Moderate:** Impact magnitude that is within applicable standards/guidelines but falls within the levels where the impact is minor, up to a level that is just short of breaching a legal limit or impact which is Major.
- **Major:** An impact magnitude where the accepted limit or standard has been exceeded, or large magnitude impacts occur to medium valued vulnerable resource/receptors or medium magnitude impacts occurs to highly valued vulnerable resource/receptors.
- **Critical:** An impact where an accepted limit or standard has exceeded, and/or large magnitude impacts occur to highly valued vulnerable resource/receptors.

It is important that impact prediction and evaluation considers any embedded controls (i.e., physical, or procedural controls that are already planned as part of the Project design, regardless of the results of the IA Process).

7.3.2 Identification of Mitigation and Enhancement Measures

Once the Impact Significance has been done, the next step will be to evaluate the mitigation and enhancement measures needed. For the purposes of this IA, the following Mitigation Hierarchy has been adopted:



Measure	Definition
Avoid at Source, Reduce at Source	Avoidance or Reduction measures undertaken during the designing phase of the project

Measure	Definition
Abate on Site	Additions to be done at the design stage for abatement of impact
Abate at Receptor	Implementation of control measures on site if an impact cannot be abated during the design stage.
Repair or Remedy	Unavoidable Impact on a resource (e.g., agricultural land and forestry due to creating access, work camps or materials storage areas), so mitigate these impacts repair, restoration or reinstatement measures are to be implemented
Compensate in Kind, Compensate Through Other Means	In case the adopted mitigation measures are not fully effective, then provision of compensation for loss, damage and disturbance might be approximated and is considered appropriate

7.3.3 Environment and Social Management Plan

The final step in the IA Process is the definition of the basic management and monitoring measures that are needed to identify whether: a) impacts or their associated Project components remain in conformance with applicable standards/ guidelines; and b) mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent Estimated. The mitigation measures recommended in individual impact assessments were compiled for project construction and operation phases. The ESMP prepared has undertaken context of the project (sectoral, regional, and socio-cultural external environment) to determine practical and effective mitigation measures.

7.4 Impacts on Physical Environment

7.4.1 Pre- Construction Phase: Impact Assessment

The pre-construction phase of the project will include the following:

- Site survey
- Completion of project approvals and clearances
- Selection, Finalization and Appointment of Structural and Master Planning Consultant
- Topographical Survey
- Soil Investigation
- Contractor Mobilization
- Installation of Construction Equipment including batching plant.

The list of equipment to be installed by the contractor during mobilization phase are mentioned below.

- F-55 winch
- Hydraulic rotary rig
- PTC Vibro Hammer
- Crane
- Hydra Crane
- Boat
- Compressor
- Jack Hammer
- Concrete Batching Plant
- Concrete Pump
- Transit Mixer
- Welding Transformer
- Workshop tools
- Trailer
- Truck
- Dumper

- DG sets
- Plate blending machinery

Though, site survey, selection of contractors, topographical and soil survey will not have any environmental impacts, however, contractor mobilisation and installation of construction equipment may have impact on environmental parameters. Since during pre-construction phase, there may be deployment of vehicles for contractors' commuting purpose. Furthermore, transportation of construction materials through road and setting up of batching plant, DG sets, transit mixers, concrete pumps etc., may result in fugitive dust emissions and noise emissions impacting the air and noise environment of the project area. Furthermore, since majorly national and state highways will be used for transportation of equipment and materials, community may be exposed to accidents during material and equipment transportation. Furthermore, since operation of JNPCT will be undertaken in parallel with construction phase, there may be exposure to occupational health and safety risks of existing workers at JNPCT such as accidents due to hit by vehicles, respiratory issues sue to increase in fugitive emissions, hearing problems due to movement of vehicles at JNPCT. Therefore, the receptor vulnerability has been classified as ***medium*** and, since the mobilization phase will last only for limited time period, the impact magnitude has been classified as ***Small.***

The Impact significance is assessed to be **Minor.**

7.4.1.1.1 Proposed Measures

- NSFTPL to develop Mobilization E&S Plan (MESP) to manage E&S risks during mobilization phase.

Note: *E&S measures suggested for construction and operation phase in subsequent sections will address the impacts for mobilization phase.*

7.4.1.2 Pre-construction Phase: Cultural Heritage

The project is not a new construction on green field and no new land will be procured, thus it is anticipated that there will be no impact on any cultural heritage. However, to reconfirm any form of impact on any cultural heritage due to operation of port, local community consultation and secondary data review has been undertaken. The finding of the assessment is provided below:

- As per the Archaeological Survey of India, no centrally protected monuments/sites178 and state protected monuments/sites179 is present in the vicinity of the project location. However, approximately 2 km on the western side of the project across the ship sea path, there is a World Heritage Site named Elephanta caves.
- E&S advisory firm (ESAF) to check the impact of the port to the world heritage site, has undertaken the consultation with the local community at the Gharipura island (where the Elephanta Cave is located). During the consultation with the community, it was reported that there is no impact on the heritage site due to construction and operation of the port. Further, the JNPA is in the process of construction of protection wall of ~3.2 km at the island, so that the world heritage site shall be protected from any unforeseen event (such as flooding and increasing of sea level) in future. Furthermore, presence of no other cultural heritage is reported by the local community in the vicinity of the project
- Impact of new construction on underwater remain (if any): based on the review of secondary information, "there were underwater remains, specifically, coins were found in and around the Morabandar, Rajbandar and Shetbandar villages180". However, as stated above (refer to section 4.2.8), the Elephanta cave is located on an island on the western side of the terminal and is divided by the ship channel. The new construction as part of the project will be undertaken on the eastern side of the terminal, where there is no evidence of underground remains found (based on the secondary review). The distance between the new construction location and the Elephanta cave is ~1.12 distance181. The image provided below provides a snippet of the construction location and the Elephant Caves marked on a Google imagery.

178 https://asi.nic.in/wp-content/uploads/2021/08/Maharashtra-Aurangabad-Circle-Mumbai-Circle-and-Nagpur-Circle.pdf (Accessed on October 31, 2022)

179 https://asi.nic.in/protected-monuments-in-maharashtra/ (Accessed on October 31, 2022)

180 https://drs.nio.org/drs/bitstream/handle/2264/1582/Hemakuta_2001_1_89.pdf?sequence=2 (Accessed on December 12, 2022)

181 The distance is based on the review of Google Imagery.

Therefore, based on the review of secondary information and review of google imagery, it is anticipated that there will be no impact of new construction on the elephanta cave or the underwater remains. Furthermore, as a safeguard, chance find procedure has been developed as part of this assignment which will be applicable on project and implemented during construction activity (refer to ***Annexure K***). **Note:** as reported by JNPA officials, JNPA is complying with the conditions of the environmental clearance (EC) for protection of Elephanta Caves. Monthly air quality is being conducted by JNPA as per the conditions of the EC.

7.4.2 Construction Phase: Impact Assessment

Note: Construction and operation phase of the proposed project will be carried out simultaneously by NSFTPL. Therefore, specific measures at relevant sections have been provided for environmental impacts when construction and operation phase will be carried out parallelly. However, separate measures suggested for both construction and operation phases will also address the E&S impacts due to interface of construction and operation phases.

The Project during construction and operation phase will not lead to any odour impacts. Therefore, impact due to odour on resource and receptors have not been considered as part of the report.

7.4.2.1 Ambient Air Quality

During construction phase, air quality may be impacted largely due to the following activities:

- Fugitive dust emissions from construction works, handling of construction materials at project site
- Vehicular emissions due to increased traffic movement at terminal and transportation route for transportation of construction material and machinery
- Dust emission due to loading, unloading and storage of construction material like cement, sand, silt
- Emission from batching plants, transit mixers
- Exhaust emissions from construction machinery and other equipment, if any; and
- Emissions from diesel generators used for power back up.
- VOCs emissions from paints, building and furnishing materials and other solvents, movement of diesel-based vehicles and other construction equipment.
- GHG emission due to diesel combustion in DG sets, diesel and petrol consumption in construction vehicles and vehicles owned by NSFTPL, electricity consumption for construction activities including electricity use at site office, toilet blocks and other areas

According to the annual ambient air monitoring report (refer Table 4-8) the PM 10 and PM 2.5 levels at all the locations exceeded the annual NAAQS standards of 60 µg/m3 and 40 µg/m3 and annual ambient air quality guidelines of 20 µg/m3 and 10 µg/m3 and interim targets as per IFC/WB EHS guidelines. The higher concentrations of particulate matter were attributed to the fact that construction activities were undertaken at JN port during the monitoring period which resulted in increase in dust particles in ambient air. Other parameters were observed to be within the NAAQS and IFC/WB EHS guidelines permissible limit. Furthermore, according to the continuous ambient air quality monitoring conducted by IIT Madras JN Port, it was observed that PM 10 and PM 2.5 exceeded the annual standards by NAAQS and IFC/WB EHS guidelines at all the locations.

Since the airshed for PM 10 and PM 2.5 is already degraded as per ambient air monitoring report, it is anticipated that there will be impact on the existing air quality increasing the PM levels due to increase in number of vehicles deployed at the construction site and increase in traffic due to transportation of construction material at site. VOC emission will be in small quantity during construction phase but it may have impact on the air quality due to its toxicity. However, impacts will be confined to 500 m of the construction area as, the emissions largely gets absorbed within 100m and does not disperse beyond 500m. Since there are no settlements located within 500 m of the proposed project, impact on community is negligible, however, there will be workers working at other terminals located adjacent to the port who are anticipated to be impacted. Furthermore, the project will use national and state highways and other roads for transportation of construction material, therefore, settlements located adjacent to the roads may be impacted due to transportation of construction material. As per Section 4.2.5.3, the predominant wind direction at the project area is WNW, therefore, dust emission from batching plant, transit mixers, and soil heaps if kept uncovered may flow towards the sea. However, the dust emission from such activities may not be significant to cause increase in turbidity of water. As confirmed by NSFTPL, GHG emissions182 (scope 1, Scope 2 and Scope 3) due to the project will be calculated from April 2023.

Note*: there will be no use of ozone depleting substance during construction phase of the project*.

Therefore, the receptor vulnerability has been classified as ***medium*** and, since the construction phase will last only for limited time period i.e. 15-18 months, the impact magnitude has been classified as ***Medium.***

Impact on occupational health and safety due to construction activities has been detailed in ***Section 7.6.1.6 .***

7.4.2.1.1 Impact Significance

As per ***Table 7-5*** the Impact significance is assessed to be **Moderate.**

7.4.2.1.2 Proposed Measures

- Excavated soil and waste at the construction site should be carefully handled and soil heaps should be appropriately covered to minimize dust generation
- Batching plant should be set up away from marine water or drainage lines. Periodic sprinkling should be done in the batching plant area to suppress dust emissions
- Speed of vehicles on site will be limited to 10-15km/h which will help in minimizing fugitive dust emissions due to vehicular movement.
- Unloading from cement delivery trucks would be done on pallets which would be covered with tarpaulin sheets during non-working periods
- Vehicles entering site should be Pollution Under Control (PUC) certified
- In case of excessive fugitive dust, work should be phase down until source of dust is identified and suppression measures have been implemented
- Periodic water sprinkling at construction site such as concrete or unpaved areas at toilet blocks, watch tower area, reefer platform, workshop area, yard work areas etc. should be done to avoid dust emission
- Periodic inspection of construction equipment and DG sets should be conducted.
- DG sets should be provided with adequate stack height based on capacity as per CPCB norms. The stack height of the DG sets should be compliant to CPCB as well as IFC EHS Guidelines. Periodic stack monitoring of new DG sets should be conducted
- NSFTPL should ensure periodic maintenance of DG sets with regulated temperature of the stacks
- NSFTPL should install Selective Catalytic Reduction (SCR) system at the DG sets to reduce exceeded Nox levels.

[182] GHG emission calculation will be a voluntary activity by NSFTPL, since there is no mandatory requirement for calculating GHG emissions from Project as per Indian regulations.

- Soil heaps and other dust emitting sources shall be kept covered and away from marine water to avoid sand, silt, cement flow in water causing increase in turbidity of marine water
- Ambient air quality monitoring during construction phase should be conducted at JNPCT (at the berth area and other under construction location) and reports to be shared at the corporate level and to the lenders
- Substitute less volatile solvents such as aqueous solvents in furnishing materials
- Construction material will be transported in covered vehicles to prevent any dust emission along the transportation route.
- NSFTPL to calculate its GHG emissions (Scope 1 and Scope 2) during construction phase and share report at the corporate level and to the lenders

Note: the construction and operation phase of the proposed project will be carried out simultaneously by NSFTPL. Therefore, the following mitigation measures are proposed.

- Separate route for movement of construction vehicle and ITVs should be defined, wherever there will be common access marshals will be provided to ensure coordination.
- Separate area for storage of construction material and containers should be defined
- Separate workers should be appointed for construction and operation activities.

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude of Impact	Significance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Medium**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Medium**	Minor

7.4.2.2 Noise and Vibration

The primary sources of noise during the construction phase will be use of construction vehicles and various construction equipments. The sources of noise in the construction phase also include civil work, operation of construction machineries, D.G. sets and movement of vehicles at project site. There will also be increased noise levels because of increased anthropogenic movement and increased traffic at the terminal. Construction work will be undertaken during night time as well, therefore, there will be increase in noise levels due to construction activities during night time. Since there are no settlements located within 500 m of the proposed project, noise impact due to construction activity at the terminal on community is not anticipated. However, there will be workers working at the proposed project and other terminals located adjacent to the project, who area anticipated to be impacted due to high noise levels due to operation of machineries, cranes, batching plant and vehicles.
Furthermore, there is potential for increase in underwater noise and vibration levels from the limited piling works and operation of pile drivers which may impact the marine environment including aquatic species. Proposed expansion / upgradation does not include dredging and blasting activity. Therefore, noise impacts due to dredging and blasting activity has not been considered as part of the IESE.

According to the noise monitoring results presented in ***Table 4-11***, the Leq day time and Leq night for all the locations were observed to be within permissible limits of 75 dB (A) and 70 dB(A) respectively as per CPCB and IFC EHS guidelines for industrial areas. However, construction activities may increase noise levels in the project area which will last for limited period of time i.e. 15-18 months (while some of the high noise activities such as operation of machineries, vehicles may be limited to lesser duration).

Impact due to increase in noise levels on occupational health and safety has been elaborated in ***7.6.1.6.***

7.4.2.2.1 Impact Significance

Based on the above, the receptor vulnerability is classified as ***medium.*** The Impact magnitude is classified as ***medium*** considering the construction period of the project to last for approximately 15-18 months.

As per ***Table 7-5*** the Impact significance is assessed to be **Moderate.**

7.4.2.2.2 Proposed Mitigation Measure

- Select equipment with lower sound power levels
- Use noise barriers at the construction area and muffling devices for combustion engines
- Ambient noise quality monitoring should be conducted onsite quarterly.
- Provide acoustic enclosures for equipment causing radiating noise.
- Periodic inspection of machineries and vehicles should be done and appropriate lubrication and tightening of moving parts should be done in case of increased noise levels during operation
- All vehicles entering the project site will be instructed to obey speed limits and not to blow horns unless absolutely necessary.
- Anti-honking sign boards to be placed in the parking areas and at entry / exit points
- Acoustic enclosure for D.G. set as required in the Power Generator MoEFCC's notification
- Machine emitting high noise during operations should be inspected and regular lubrication of machine parts should be carried out to reduce noise levels.
- Implementing noise mitigation techniques for offshore pile driving, such as bubble curtains, pile caps, and cofferdams (where practicable) to absorb/scatter pile driving energy
- Vibration dampers and sheet barriers will be used to effectively mitigate vibration during construction phase
- Use soft-start/slow ramp-up during pile driving to allow time for sensitive aquatic species to vacate the area
- Since JNPA conducts noise monitoring once in every six months, noise monitoring should be conducted at the under-construction site by NSFTPL on quarterly basis and reports should be shared at the corporate level and to the lenders.

Note: the construction and operation phase of the proposed project will be carried out simultaneously by NSFTPL. Therefore, the following mitigation measures are proposed.

- Construction equipment should be kept away from equipment used for operational activities
- Route of construction vehicles and operation vehicles should be separated to the extent possible

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Medium**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Medium**	Minor

7.4.2.3 Soil and Sediment Environment

During construction phase, construction wastes will be generated onsite in the form of construction debris, scrap materials, concrete, wooden pallets, cement, sand, silt, etc. Wastewater in the form of sewage and municipal wastes including food waste will be generated from site office and labour shed. The project will also generate hazardous waste in the form of used oil from diesel generators and construction machineries, empty containers of paints, contaminated cotton rags, hydraulic fluids etc. If such wastes are not handled adequately, it may lead to land and soil contamination. Any leaks or spills of oil and lubricants from heavy equipment during drilling activities at site or at workshop area and/or improper discharge of wastewater at site may lead to long term negative impact on land and soil quality. Furthermore, there are other terminals located adjacent to the project in north, south and east directions, in case of surface run off due to excavation activities for development of new structures at the project site, it is anticipated that the runoff may flow directly into the sea increasing turbidity or may potentially flow into other terminals causing water logging. Physical desegregation of soil may occur during excavation work resulting in mixing of different soil layers. Spillage from various construction vehicles and equipment if not handled properly, may result in chemical desegregation and contamination of soil.

In addition to the above, since the project involve upgradation of berth, waste generation such as marine debris due to underwater piling and civil work at berth areas may increase turbidity and sedimentation at the sea impacting the marine ecology. The proposed structures will have limited footprint in water, which will remain inside the limits of existing piles and therefore will not lead to sediment deposition. Presence of any permanent structures that protrudes into water and influence the flow or

current, leads to settling of sediments in newer areas, which is not expected in this case. Furthermore, spoil piles if generated from land based activities due to construction of new structures will be reused for back filling and the remaining spoils which cannot be reused will be disposed through vendor. No spoil (if generated due to excavation work) will be disposed into the sea.

Overall the receptor vulnerability and impact magnitude has been classified as ***medium*** considering the construction activities will last for 15-18 months.

7.4.2.3.1 Control Measures Planned for Project

NSFTPL will develop dedicated waste management plan applicable to the project during construction and operation phase. The plan will provide measures for disposal of hazardous waste, e-waste, battery waste solid waste and construction and demolition waste from the project as per waste management rules in India. An STP will be developed at the terminal for treatment of sewage at site. Since operation of JNPCT will be carried out simultaneously with the construction phase, sewage will be disposed through septic tank until the STP is constructed, post which sewage generated at the terminal during construction and operation activities will be treated in the STP.

7.4.2.3.2 Impact Significance

As per ***Table 7-5*** the Impact significance is assessed to be **Moderate.**

7.4.2.3.3 Proposed Mitigation Measure

- Measures suggested in water and wastewater quality management plan (refer ***Annexure A***) should be implemented at site.
- Silt traps should be constructed to control onsite surface runoff
- Install sediment traps to control sediments and particulates from reaching marine water
- Storm water at the construction site should have oil water separator or stormwater be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea. Storm water drains to have oil – water separator and it is to be ensured that contaminated water is not discharged into the sea. Oil-water separators to be regularly monitored.
- Silt curtains / silt screens shall be provided to contain fine particles of silt discharged into the water from construction activities
- Dedicated waste storage areas should be developed at site
- No discharge of construction waste water into sea shall be allowed at any point of construction
- NSFTPL should ensure that no waste (hazardous or non-hazardous) is disposed into the sea without prior treatment in compliance to CPCB limit and IFC EHS Guidelines.
- Spoil piles, if generated shall be reused to the extent possible and the remaining spoil which cannot be reused shall be disposed through authorized vendor.
- Onsite workers should be provided with adequate trainings on waste management
- Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP.
- Construction waste generated at the site should be reused/recycled to the extent possible and remaining waste such as scraps, metals etc. should be disposed through authorized vendor.
- Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, 2016
- Municipal waste generated onsite should be segregated and proper collection and handover to vendor appointed by JNPA.
- Records on waste generated at site should be maintained and monthly/quarterly waste generation data should be shared at the corporate and with lenders
- During servicing/repair of equipment or vehicles, a suitable drip tray shall be used to prevent oil/grease spills onto the soil, especially in case of emergency repairs
- Oil spill kits should be maintained onsite to handle minor leaks and spillage
- Unloading and loading protocols should be prepared for diesel, oil and used oil respectively and onsite workers should be trained to prevent/contain spills and leaks.

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude of Impact	Significance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Medium**	Moderate

With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Medium**	**Minor**

7.4.2.4 Water Environment

7.4.2.4.1 Water Availability

Water during construction phase will be required for civil work and domestic purpose. Approximately, 1.2 crore litres of water will be required for civil work and ~45 lakh litres of water will be required for domestic purpose. Source of water at JNPCT is through pipeline water supply from Maharashtra Jeevan Pradhikarn (MJP) and City and Industrial Development Corporation of Maharashtra Limited (CIDCO). The same source will be used during construction phase. Potable water requirement will be met through packaged drinking water in line with WHO drinking water standards.

The connection for water supply at JNPCT has been already provided by JNPA, and no additional water supply connection will be required by NSFTPL. However, NSFTPL may need to intimate JNPA for increase in quantity of water supply during construction phase. Currently, JNPA has a water supply scheme of 15 MLD water combined at the port area and township area. However, there has been constant use of 8 MLD water at the port area.

Furthermore, the water supply at the labour accommodation (if provided) is expected to be from same source.

Since no groundwater will be used for construction activities, no impact on groundwater has been envisaged for the project. However, there will be impact on the pipeline water supply due to increase in water demand for construction activities that will last for 15-18 months.

7.4.2.4.1.1 Impact significance

Based on the above context, receptor vulnerability and impact magnitude has been classified as *medium and small respectively* considering the construction activities will last for 15-18 months.

As per ***Table 7-5*** the Impact significance is assessed to be **Minor**

7.4.2.4.1.2 Proposed Measures

- Explore feasibility of rainwater harvesting system at project site
- Sensitize workers on water conservation and encourage optimal use of water
- Regular inspection should be carried out for identifying water leaks and preventing water wastage from water supply tankers in order to use water efficiently.
- Optimum use of water during sprinkling on roads for dust settlement, washing of vehicles, concrete mixing for foundation etc.
- Water consumption records should be maintained, and monthly/quarterly water consumption data should be shared from site to corporate and to the lenders.

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Small**	**Minor**
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Small t**	**Negligible**

7.4.2.4.2 Marine Water Quality

The project construction activities will include upgradation of existing JNPCT berth. Therefore, during civil work, there may be increase in sedimentation depending on weather conditions, tides and current at the sea. The construction activities such as piling work may increase suspended solids causing turbidity in marine water causing potential impact on the marine water quality. Generation of construction waste such as debris, sand and silt, and other wastes such as wastewater, waste oil if not handled properly may contaminate the marine water quality. Additionally, surface water runoff may also contribute towards increase in turbidity and further impacting the marine environment.

According to the secondary data for annual marine water quality (April 2021 – March 2022) presented in ***Table 4-13,*** it is observed that all the parameters are well within the prescribed standard limits for Primary Water Quality Criteria for Class IV Waters [for Harbour Waters] by CPCB for physico-chemical parameters and bio-chemical parameters. As per National Sanitation Foundation – Water Quality Index (NSFWQI) estimation, the overall quality of port's water is in good category. However, during construction phase of the project, there are potential chances of impact on the marine water quality due to increase in turbidity and sedimentation. Increased turbidity degrades the water quality by decreasing the oxygen level in the water column. Fine suspended particles have a high oxygen demand and thus depress the oxygen level in the water column with increased turbidity. The degree of oxygen depletion generally increases with depth and increasing concentration of total suspended solids and oxygen level usually increases with increasing distance from the source of suspension, due to dilution and settling of the suspended material.

Increased turbidity may have limited adverse impact on the aquatic life at the sea. Refer ***Section 7.5.1.1***, for impact on marine ecology due to construction activities.

As presented in ***Section 4.2.4.1***, the sea water temperature remains within 24 oC to 31 oC throughout the year. The maximum current speed in the outer Bay exceeds 1m/s. The maximum current speed decrease in the inner Nhava creek and are typically around 0.8 m/s, decreasing during neap tide. With respect to impact on sediment transport it is noted that the scale of proposed construction is small, furthermore the construction works proposed for berthing area will remain within the boundary limits of the existing terminals. The proposed structures will have limited footprint in water, which will remain inside the limits of existing piles and therefore will not have any significant influence on the movement of current, change in river circulation and/or tidal bore, sediment pattern or littoral drift. Presence of any permanent structures that protrudes into water and influence the flow or current, leads to settling of sediments in newer areas, which is not expected in this case. It is envisaged that any influence on sediment transport will be very negligible. Hence detailed modelling is not proposed. Refer ***Section 7.5.1.1***, for impact on marine ecology due to construction activities.

7.4.2.4.2.1 Impact Significance

Based on the above, receptor vulnerability and impact magnitude has been classified as ***medium.***

As per ***Table 7-5*** the Impact significance is assessed to be **Moderate.**

7.4.2.4.2.2 Proposed Measures

- Silt traps should be constructed to control onsite surface runoff
- Storm water at the construction site should be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea.
- The mobile mixing plants to be set up away from any drain inlet and a perimeter bund should erected all around the mixing plant. Silt curtains / silt screens shall be provided to contain fine particles of silt discharged into the water from construction activities
- Marine water quality to be monitored during construction phase and it is to be ensured that water quality is not compromised, and all the parameters are well within the prescribed standards. The parameters for the monitoring should be in line with CPCB as well as water and sediment quality monitoring as per IFC/WB EHS guidelines for ports, terminals and harbours.
- Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, 2016
- Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP.
- Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, 2016
- Oil spill kits should be maintained to avoid oil spills and leakage into the sea. An oil spill contingency plan should be developed in line with JNPA's Oil Spill Response Contingency Plan
- Records of marine water quality monitoring conducted by JNPA shall be maintained and shared at the corporate level and with the lender

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact

Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Medium**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Medium**	Minor

7.4.3 Operation Phase: Impact Assessment

7.4.3.1 Air Quality

During operation phase, primary sources of air emission from the project will include the following:

- Increased movement of trucks (2961 from 2440 trucks per day) for transportation of containers from vessel to container yard, at rail siding and road network.
- Exhaust Emission from diesel generators used at the RMQC, RMGC and RT cranes and DGs used at substations for power back up
- Emission due to accidental leakage from containers carrying dangerous goods of IMDG class explosives of classification 2 to 9 and explosives of IMDG class 1.1 and 1.2.
- Emission due to vessel traffic at the berth for container loading and unloading
- Exhaust emissions from diesel engines used for propulsion of ships
- GHG emission due to diesel combustion in RTGC, RMQC, DG sets, diesel and petrol consumption in ITVs, forklifts and vehicles owned by NSFTPL, purchased electricity consumption in High Mast, engineering workshop, container yard, electric substation, storeroom, canteen etc.
- Increase in number of vessels due to the proposed project from 220 vessels for 0.4 million TEU (operating at under capacity) to attain its design capacity of 1.5 million by FY 2027 TEUs to 520 vessels for 1.8 million TEUs by 2029
- VOCs emissions from paints and other solvents used for maintenance of cranes, equipment, yard area etc. and transportation of crude oil generated from vessel for disposal183.

Note: During operation phase, NSFTPL will handle refrigerated containers and it will be stacked in the container yard wherein NSFTPL will provide electrical supply to containers to maintain the certain temperature advised by the customer. It is anticipated that the refrigerated containers/ reefer points may contain ozone depleting substances (ODS) over which NSFTPL may not have control.

Major air pollutants envisaged to be released during operation phase is particulate matter, sulphur dioxide (SO2) and nitrogen oxides (Nox) and greenhouses gases like carbon dioxide from operation of machinery and vehicles. According to the annual ambient air monitoring report (refer ***Table 4-8***), the PM 10 and PM 2.5 levels at all the locations exceeded the annual NAAQS standards of 60 µg/m^3 and 40 µg/m^3 and annual ambient air quality guidelines of 20 µg/m^3 and 10 µg/m^3 and interim targets as per IFC/WB EHS guidelines. Furthermore, according to the continuous ambient air quality monitoring conducted by IIT Madras JN Port, it was observed that PM 10 and PM 2.5 exceeded the annual standards by NAAQS and IFC/WB EHS guidelines at all the locations.

As per ***Section 2.2.8.1***, JN Port handles 16413 trucks per day at the port. Based on projections shared by JM Baxi and JNPA, JNPCT handles 2440 trucks per day to cater 1.5 million TEUs container traffic at the terminal which will be increased to 2961 trucks per day for proposed 1.8 million TEUs capacity.

As mentioned in ***Section 2.3.6.2***, JNPCT operated at a capacity of 0.4 million TEUs in FY 2021-22. However, the existing capacity of the terminal is 1.5 million TEUs. Therefore, It is anticipated that there will not be immediate increase in the number of trucks due to the proposed project, however, as projected if the terminal runs at full capacity of 1.8 million TEUs by 2029, there will be addition of only 520 trucks to the 2440 number of trucks. Furthermore, since there is daily movement of 16,413 trucks at JN Port, 3% increase in the number of trucks may not have adverse impact on the air quality.

[183] Crude oil disposal service to be facilitated by NSFTPL only on request by vessel operator

Additionally, as mentioned in ***Section 2.2.8.1,*** JNPA has also initiated an infrastructural development project to enhance the existing road network connecting to the port for smooth container traffic management. With expansion of roads, there will be smooth movement of trucks, decreasing road traffic and further reducing air emissions.

As mentioned in ***Section 2.3.6.1***, NSFTPL will handle 520 vessels per year for 1.8 million TEU capacity. Since, the terminal is currently running under capacity and JNPCT only handled 220 vessels in FY 2022 for 0.4 million TEUs, therefore, it is anticipated that there will not be immediate increase in vessel from 220 to 520 due to the proposed project in upcoming years. It is anticipated that JNPCT will first attain its actually capacity of 1.5 million TEUs by 2027 and then increase the vessel numbers for 1.8 million TEUs depending on the type of vessel. Thus, there will be increase in air emissions due to increase in vessels due to the proposed project by 2029. However, as per JNPA's sustainability report for FY 2021-22, JNPA shall provide shore power to all vessels up to 150 KW. For other vessels rated above 150 KW or working on 60 Hz power supply, ports shall adopt a 3-phase targeted approach. Therefore, reducing the air emissions from the vessels.

As reported by JM Baxi, the engine of vessels will remain on but with low speed during loading and unloading of containers. Therefore, no significant impact on air quality is anticipated due to operation of vessel engines during loading and unloading. Also, I engines of the vessels arriving at the port are required to comply with the MARPOL Annex VI guidelines and IMO 2020 rule.

Furthermore, currently JNPA is handling 15 to 17 rakes per day including 4 rakes per day at JNPCT. JNPCT will continue to handle 4 rakes per day of 90 TEU capacity. Therefore, significant impact on existing air quality is not envisaged. Though, the airshed for PM 10 and PM 2.5 is already degraded as per ambient air monitoring report, however, It is anticipated that there will not be significant contribution to the air emission levels due to the proposed project . As confirmed by NSFTPL, GHG emission for the project will be calculated from April 2023. However, based on data shared by JM Baxi, a broad estimate of GHG emission has been provided in ***Section 2.9.*** As per the data available, the project will emit ~145,635 tCO2 per annum of scope 1 emission and ~ 4,721 tCO_2 per annum of Scope 2 emissions.

Since the PM levels of existing airshed is already degraded, there may be gradual increase in pollutants to the degraded airshed.

The impact on air emission at the terminal will be confined to 500 m of the proposed project, since major emission during operation phase will be limited to movement of trucks within the terminal which will get absorbed within 100m and will not disperse beyond 500m. Since there are no settlements located within 500 m of the proposed project, impact on community is negligible, however, there will be workers working within JNPCT and at other terminals located adjacent to the port, who are anticipated to be impacted.

Impact on occupational health and safety due to operational activities have been detailed in ***Section 7.6.2.6***.

7.4.3.1.1 Control Measures Proposed for the Project

NSFTPL has plans to convert all diesel RT cranes used within JNPCT to electrical driven RT Cranes. Furthermore, NSFTPL also plans to outsource electric Internal Terminal Vehicles (ITVs). There will be 54 electrical ITVs deployed at the terminal. Furthermore, NSFTPL will also calculate its annual GHG emission and implement measures to reduce GHG emissions year on year basis. Periodic stack emission monitoring will be conducted by JNPA at the terminal.

As per JNPA's sustainability report 2021-22, JNPA shall mandate and adopt current SOPs of providing shore power to all vessels up to 150 KW. For other vessels rated above 150 KW or working on 60 Hz power supply, ports shall adopt a 3-phase targeted approach

7.4.3.1.2 Impact Significance

Since the project plans to deploy electrical ITVs and the diesel cranes used for loading and unloading containers will be converted to electric cranes. Therefore, it is envisaged that there will be limited impact on the existing air quality due to marginal increase in air emissions due to operational activities. However, since the construction activities will go simultaneously with operation phase, there will be use of diesel based vehicles for construction work and operation of construction machineries and batching plant causing impact on the air quality for the initial 15 months till the construction work is completed.

During operation phase, there will be no impact on the community, since there are no settlements located within 500 m of the project, however, workers working at the terminal may have impact due to increase in number of vehicles, vessels etc., at the proposed project. Furthermore, there may be marginal increase in air emissions due to increase in vessel and road traffic from FY 2027 to FY 2029. Based on the above context, receptor vulnerability and impact magnitude has been classified as ***medium*** respectively.

As per *Table 7-5* the Impact significance is assessed to be **Moderate.**

7.4.3.1.3 Proposed Measures for the Project.

- Vehicles owned by NSFTPL shall use manufacturer recommended engine maintenance program regardless of the size of the vehicle
- Drivers should be instructed on driving practices to reduce fuel consumption including measures acceleration and safe driving limits
- Implement regular vehicle maintenance and repair program
- Implement pollution prevention management plan at site as provided in ***Annexure L***
- Diesel Generators at site should be provided with adequate stack height as per CPCB guidelines. DG sets which are already installed should be maintained at regular intervals and temperature within the stacks should be regulated. Stack emission should be within CPCB limits.
- NSFTPL should install Selective Catalytic Reduction (SCR) system at the DG sets to reduce exceeded NOx levels.
- Passenger Vehicles (excluding the ITVs) used by the SPV or contractors for inspection and O&M purpose should be Pollution Under Control (PUC) certified
- Separate route for movement of ITVs and construction vehicles should be provided during the first initial 15-18 months till the construction phase is completed
- Regular inspection of containers carrying dangerous goods should be conducted and a separate container storage area should be demarcated for storage of dangerous goods and explosives.
- Monthly ambient air quality monitoring shall be conducted at JNPCT and report to be shared at the corporate level as well as to the lenders
- Validate ship engine performance documentation and certification while arriving at the berth to ensure compliance with MARPOL Annex VI guidelines, combustion emissions specifications (including NOx, SOx, and PM), within the limits established by international regulations
- Avoid restorage and reshuffling of containers to the extent possible
- Maintain container transfer equipment in good condition such as forklifts, ITVs, cranes
- Reduce and avoid engine idling to the extent possible during loading and unloading of containers
- NSFTPL to calculate its annual GHG emissions (Scope 1 and Scope 2) from operational activities and share report at the corporate level and to the lenders
- Use of machines, DG, equipment and vehicles only with appropriate pollution fitness certificates. Also carry out periodic maintenance of equipment and vehicles
- Substitute less volatile solvents such as aqueous solvents for painting works (if undertaken)
- Provide greenbelt around the terminal to the extent possible for carbon sequestration.
- NSFTPL should undertake regular inspection at the reefer points to identify any refrigerant leaks. This shall be done by monitoring the readings of the refrigerants
- NSFTPL may check feasibility to deploy electric vehicles for commuting purpose of the project team at the terminal.

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude of Impact	Significance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Small**	Minor to Moderate
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Small**	**Minor**

7.4.3.2 Coastal Soil and Land Environment

During operation phase, the project will involve transportation and storage of containers from vessel to container yard and to the railway siding. Storage of IMDG code specific dangerous goods and explosives at the container may lead to soil and land contamination in case of leakage from containers and explosion of any container carrying explosives.

The O&M phase of the project will involve use of paints, oil and hydraulics at the workshop area. Furthermore, hazardous wastes such as contaminated rags, empty container of paints, used oil from DG sets at the substation will be stored on site. Any leakage or spills from oil and paint containers at the workshop or substation areas may seep into the ground and contaminate the land and soil at the project area. Other wastes generated at the terminal such as sewage from site office and solid waste including food wastes if not handled and disposed adequately, may have negative impact on the soil and marine water quality.

Furthermore, vessels arriving at the berth will generate garbage and hazardous oily sludge which will be handled, transported and disposed of from the vessels to authorized recyclers, only if requested by the vessel operator. Though, there will be no handling or transportation under the scope of the SPV, however, if Improper handling of such wastes is done by the recycler at the terminal, this may lead to spills causing marine water and/or land and soil contamination (depending on location of spillage).

Note: Dredging activity as part of annual maintenance and disposal of dredge material will remain under the scope of JNPA, and no dredging activity will be undertaken by the proposed project. Therefore, impact due to dredging activities has not been considered as part of the IESE.

7.4.3.2.1 Control Measures proposed for the Project

- A dedicated hazardous bund will be developed for JNPCT to avoid contamination of land and soil due to leaks or spills from containers containing hazardous material.
- All material and handling places will be adequately labelled and monitored
- Project will develop an STP of 5-10 KLD to treat sewage from JNPCT and reuse the treated water for landscaping activities and if feasible for flushing purpose in washrooms.
- Solid waste generated at site will be disposed at the common solid waste management facility developed by JNPA
- Disposal of oily waste and bulk noxious liquid substances from vessels is facilitated through MPCB authorized recyclers/ re-processors as per Annex-I of MARPOL 73/78. JNPA has identified 12 authorized vendors for disposal of oil waste from ships. The same vendors will be used by NSFTPL.
- NSFTPL will develop and implement SOPs for handling of hazardous material
- NSFTPL should check the procedures available with recycler for handling and disposal of sludge from vessel and inspect adequate procedures are being carried out during transportation of sludge from vessel.
- Emergency Response Plan will be developed to address any situation of chemical spill or explosion from the containers. Trainings will include measures to minimize the spread and extent of damage to coastal and land environment.

7.4.3.2.2 Impact Significance

Based on the above context, receptor vulnerability medium and impact magnitude has been classified as medium, considering the fact that the project will handle both containers carrying explosives and dangerous goods that may have long term impact on land and soil in case of leakage and blast.

As per ***Table 7-5***, the Impact significance is assessed to be Moderate.

7.4.3.2.3 Proposed Measures for the Project

- Demarcate dedicated storage area for hazardous and non-hazardous containers to avoid damage to non-hazardous containers in case of blast and spillage from hazardous containers
- Municipal wastes generated at site should be segregated and stored in designated color coded bins.
- Bio medical waste will be disposed as per bio medical waste rules 2016, as amended, through an authorized vendors
- Hazardous waste should be disposed to authorized MPCB/CPCB recycler only
- Oil spill kits should be maintained onsite to handle minor leaks and spillage
- Fuel/oil/ paint containers will be stored on impervious floor in the storage area having secondary containment and housekeeping/ concerned staff will be trained for safe handling of oil and lubricants etc.
- All waste should be stored in a shed that is protected from the elements (wind, rain, storms, etc.) and away from storm water drainage
- Unloading and loading protocols should be prepared for containers and onsite workers should be trained on handling of hazardous material and to prevent/contain spills and leaks.
- Storm water drains to have –il - water separator and it is to be ensured that contaminated water is not discharged into the sea. Oil-water separators to be regularly monitored.

- A collection and disposal system should be developed for ship-generated garbage for ships alongside and at anchor, consistent with the International Maritime Organization (IMO) Comprehensive Manual on Port Reception Facilities. Closable skips should be provided at the berths, to collect garbage from ships at anchor
- Oil spill contingency plan should be developed and implemented in line with JNPA's Oil Spill Response Contingency Plan
- Regular Inspection at the substation, workshop area and container yard area should be conducted to identify leaks or spills and cracks on the concrete flooring.

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Medium**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Medium**	Minor

7.4.3.3 Noise and Vibration

During operation phase, the following sources of noise emissions area envisaged:

- Noise emission due to increased traffic and movement of trucks and rakes for transportation of containers through road network and railway siding
- Gradual increase in noise emission due to increase in number of vessels
- Operation of RMQC, RMGC and RT Cranes, forklifts for loading and unloading of containers from vessels and stacking at the container yard
- Anthropogenic activities at the workshop area
- Operation of DG sets at the substation for power back up
- Underwater noise generation due to vessel traffic.

According to the noise monitoring results presented in ***Table 4-11***, the Leq day time and Leq night for all the locations were observed to be within permissible limits of 75 dB (A) and 70 dB(A) respectively as per CPCB and IFC EHS guidelines for industrial areas. However, there may be increase in noise level for initial 15-18 months since construction and operation activities will be undertaken simultaneously. Post completion of construction activities, the noise levels at the terminal is anticipated to be limited due to movement of ITVs and operation of cranes.

As per ***Section 2.2.8.1***, JN Port handles 16413 trucks per day at the port. Based on projections shared by JM Baxi and JNPA, JNPCT handles 2440 trucks per day to cater 1.5 million TEUs container traffic at the terminal which will be increased to 2961 trucks per day for proposed 1.8 million TEUs capacity.

As mentioned in ***Section 2.3.6.2***, JNPCT operated at a capacity of 0.4 million TEUs in FY 2021-22. However, the existing capacity of the terminal is 1.5 million TEUs. It is anticipated that there will not be immediate increase in the number of trucks due to the proposed project, however, as projected if the terminal runs at full capacity of 1.8 million TEUs by 2029, there will be addition of only 520 trucks to the existing 2440 number of trucks. Furthermore, since there is daily movement of 16,413 trucks at JN Port, 3% increase in the number of trucks may not have immediate impact on noise levels due to the proposed project. However, there may be increase in noise by 2029 when the terminal is expected to run at 100% proposed capacity of 1.8 million TEUs.

The proposed project will increase the vessel number to 520 for 1.8 million TEU capacity by 2029 (refer Section 2.3.6.1). It is anticipated that there will not be immediate increase in number of vessels to 520 in upcoming years, since the terminal is currently operating below its actual capacity of 1.5 million TEUs. Therefore, the terminal will be required to first attain its existing capacity by FY 2027 and then operate at the proposed capacity of 1.8 million TEU. It is anticipated that though there will not be immediate increase in noise levels due to increase in vessels, however, there will be an increase by 2029 (depending on the type of vessel and its offshore waiting period) when the terminal will operate at its proposed capacity of 1.8 million TEU.

As reported by JM Baxi, during loading and unloading of containers from vessels, the vessel engine remain switched on but with low speed. According to a study by Environmental Protection Agency (EPA)[184], ship which fulfils the IMO noise limits can have a diesel generator exhaust sound power of 107 dB(A). However, it is also stated in the study that if the sound power is 107 dB(A) and the noise limit is 40 dB(A), the ship should be berthed more than 600 m away from habitation in order not to exceed the noise limit. Since the terminal is located within industrial area and nearest settlement is located 1.5 km away from the terminal, therefore, JNPCT fulfills the criteria of ship berthing 600 m away from the settlements. Hence, limited to negligible impact is anticipated on community due to the vessel. However, impact on terminal workers are envisaged due to the noise emission from the vessels.

It is expected that with operation of DFC, the frequency of trains including for the proposed project will increase to start with 20 trains per day which will gradually increase to 25 trains per day. Furthermore, the rail traffic increase is expected to be between 5 % to 6 % year on year from October 2024 post completion of DFC construction.

Currently JNPCT currently handles 4 rakes per day and it will continue to handle 4 rakes per day of 90 TEU capacity. Therefore, it is expected that there may not be immediate increase in noise level due to the proposed project, as JNPCT will handle 4 rakes per day after the upgradation which is similar to what it is handling at present. However, there may be increase in noise levels in future due to increase in number of trains due to DFC construction.

Since there are no settlements located within 500 m of the proposed project, noise impact during operation phase at the terminal on community is not anticipated. However, there will be workers working at the proposed project and other terminals located adjacent to the project, who area anticipated to be impacted due to high noise levels due to operation of machineries, cranes and vehicles.

Impact on occupational health and safety due to operational activities have been detailed in ***Section 7.6.2.6***

Note: There may be no vibration impact due to the proposed project on port workers, or nearby community. However, as per the conditions of environmental clearance dated 16.09.1988, to protect the elephanta caves from vibrations, implementation of adequate measures falls under the purview of JNPA. As reported by JNPA, it is complying to the conditions of the environmental clearance. Furthermore, JNPA is in the process of constructing protection wall of ~3.2 km at the Gharipura island, so that the world heritage site (elephanta caves) shall be protected from any unforeseen event.

7.4.3.3.1 Control Measures planned for the Project

- The DG sets to be used for power back up will be installed with acoustic enclosure.
- NSFTPL has plans to convert all diesel RT cranes used within JNPCT to electrical driven RT Cranes. Furthermore, NSFTPL also plans to outsource electric Internal Terminal Vehicles (ITVs). Deployment of electric cranes and vehicles will reduce the noise levels from the engines of the vehicles and cranes.
- As per JNPA's sustainability report 2021-22, JNPA shall mandate and adopt current SOPs of providing shore power to all vessels up to 150 KW. For other vessels rated above 150 KW or working on 60 Hz power supply, ports shall adopt a 3-phase targeted approach

7.4.3.3.2 Impact Significance

During operation phase, there will be no impact on the community, since there are no settlements located within 500 m of the project, however, workers working at the terminal may have impact due to gradual increase in number of vehicles, cranes, vessels etc.at the proposed project. Furthermore, there may be marginal increase in noise levels at the terminal from FY 2027 (1.5 million TEUs) to FY 2029 (1.8 million TEUs) due to increase in vessel and road traffic due to the proposed project. Based on the above context, receptor vulnerability and impact magnitude has been classified as ***medium***.

As per ***Table 7-5*** the Impact significance is assessed to be **Moderate.**

7.4.3.3.3 Proposed Measures

- Periodic inspection of the project equipment and cranes should be conducted
- Strict adherence to maintenance schedule of generators, as specified by vendors
- Vehicle drivers should be instructed not to blow horns until necessary.
- Equipment and cranes should be shut down when not in use
- Regular maintenance of NSFTPL vehicles and ITVs should be conducted

[184] https://mst.dk/media/mst/66165/978-87-92668-35-6.pdf

- NSFTPL shall discuss with JNPA to provide onshore power supply to all the vessels arriving at the terminal
- Since JNPA conducts noise monitoring once in every six months, noise monitoring should be conducted at JNPCT by NSFTPL on monthly basis and reports should be shared at the corporate level and to the lenders.
- NSFTPL may check feasibility to deploy electric vehicles for commuting purpose of the project team at the terminal.

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	Medium	Small	Minor
With Mitigation Measures	Negative	Adverse	Local	Short Term	Low	Small	Negligible

7.4.3.4 Water Environment

7.4.3.4.1 Water Availability

Water during operation phase will be required for firefighting system, landscaping and domestic purpose. Approximately 2.5 lakh kiloliters of water will be required during operation phase at the project site. Source of water at JNPCT is through pipeline water supply from Maharashtra Jeevan Pradhikarn (MJP) and City and Industrial Development Corporation of Maharashtra Limited (CIDCO).

Potable water requirement will be met through packaged drinking water in line with WHO drinking water standards.

The connection for water supply at JNPCT has been already provided by JNPA, and no additional water supply connection will be required by NSFTPL. Currently, JNPA has a water supply scheme of 15 MLD water combined at the port area and township area. However, there has been constant use of 8 MLD water at the port area.

Since no groundwater will be used for construction activities, no impact on groundwater availability has been envisaged for the project.

7.4.3.4.1.1 Control Measures Proposed for the Project

NSFTPL will develop a STP of 5-10 KLD to treat sewage generated at the terminal (excluding wastewater from vessels). The treated water will be used for landscaping and if feasible for flushing purpose at the toilet blocks in line with the conditions provided in consent to operate (CTO). Measures will be taken to control water consumption and save freshwater requirement. Water audit will be undertaken and necessary actions on recommendations will be implemented by the NSFTPL management

7.4.3.4.1.2 Impact Significance

Since the project will develop STP and reuse the treated water for landscaping, there will be reduction in water usage sourced from MJP pipeline. Furthermore, water conservation measures will be undertaken to reduce water consumption. Therefore, based on the above context, the receptor vulnerability has been classified as ***low***, however, since pipeline water is the only source for water supply at the JN Port and township area and no other alternative has been considered, the impact magnitude has been considered as ***medium***.

As per ***Table 7-5*** the Impact significance is assessed to be **Minor.**

7.4.3.4.1.3 Proposed Measures

- Explore feasibility of rainwater harvesting system within the terminal
- Records of marine water quality monitoring conducted by JNPA shall be maintained and shared at the corporate level and with the lender.
- The treated water from STP shall be in compliance to treated sanitary sewage discharge standard as per IFC EHS guidelines and as per CPCB standards for water quality.
- The treated water from STP should be recycled and reused as per the conditions specified in Consent to Operate.

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact

Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Small**	**Minor**
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Small**	**Negligible**

7.4.3.4.2 Marine Water Quality

Stormwater runoff without treatment from the terminal which may contain heavy metals, toxic organics, oil and grease can have potential impact on the marine environment.

The loading and unloading of containers from the vessel to the berth may lead to accidental leaks and spillage of hazardous material and oil which may have adverse impact on the marine water quality. Furthermore, there may be accidental spill while disposing sludge from the vessel which may increase turbidity in the sea. Disposal of garbage from vessels if not handled properly, may also impact the marine water quality.

According to the secondary data for annual marine water quality (April 2021 – March 2022) presented in ***Table 4-13,*** shows that all the parameters are well within the prescribed standard limits for Primary Water Quality Criteria for Class IV Waters [for Harbour Waters] by CPCB for physico-chemical parameters and bio-chemical parameters. As per National Sanitation Foundation - Water Quality Index (NSFWQI) estimation, the overall quality of marine water is in good category.

Since no vessel cleaning will be conducted at JNPCT and no ballast water and/or bilge water handling and disposal falls within the purview of JNPCT and *JNPA*. However, there is a potential of pollution of marine water from ships/ vessels. The ballast and bilge water from vessels should be handled by vessel operator in compliance to Annex I of MARPOL guidelines and Hazardous And Other Wastes (Management and Transboundary Movement) Rules 2016.

7.4.3.4.2.1 Control Measures Proposed for the Project

NSFTPL will develop a STP of 5-10 KLD to treat sewage generated at the terminal (excluding wastewater from vessels). JNPA facilitates disposal of solid waste/ garbage from vessels on request, terminal will continue facilitation and will collect the garbage (on request) through authorized third party and sent to the solid waste management facility of JNPA.

Disposal of oily waste and bulk noxious liquid substances from vessels is facilitated through MPCB authorized recyclers/ re-processors as per Annex-I of MARPOL 73/78. JNPA has identified 12 authorized vendors for disposal of oil waste from ships. The same vendors will be used by NSFTPL.

7.4.3.4.2.2 Impact Significance

Based on the above, the receptor vulnerability and impact significance has been classified as **medium.**

As per ***Table 7-5*** the Impact significance is assessed to be **small.**

7.4.3.4.2.3 Proposed Measures

- Adequate instructions should be provided to the vendors arriving for disposal of sludge and garbage from vessels to avoid littering of garbage and accidental leakage of sludge into the sea
- NSFTPL should ensure that vendor collects oily sludge from the vessel in vehicles, or central collection systems and storage tanks. The capacity of oily waste collection should be established based on applicable MARPOL provisions
- Verify the adequacy of SOP on handling of garbage (on request) and sludge from the vessels developed by the vendor. In case such SOP is not available with the vendor, NSFTPL shall develop SOP for supervision of garbage and sludge disposal from vessel by third party from the terminal (in case this service is facilitated by terminal on request) ,in compliance with MARPOL to prevent pollution from Ships/ Vessels.
- A communication procedure should be developed for vessels operations incidents (air emissions, ballast, bilge water, discharge of oil, noxious liquid substances in bulk, harmful substances in packaged form, sewage, and terminal and vessels garbage and sewage)
- Storm water drains to have –il - water separator and it is to be ensured that contaminated water is not discharged into the sea. Oil-water separators to be regularly monitored.

- Marine water quality to be monitored during operation phase and it is to be ensured that water quality is not compromised, and all the parameters are well within the prescribed standards. The parameters for the monitoring should be in line with CPCB as well as water and sediment quality monitoring as per IFC/WB EHS guidelines for ports, terminals and harbours.

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Medium**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Small**	Negligible

7.5 Impacts on Biological Environment

7.5.1 Construction Phase: Impact Assessment

7.5.1.1 Impacts on Marine Ecology

7.5.1.1.1 Project Activities and Potential Impacts

The proposed project involves the upgradation of existing JNPCT berth. The construction activities involved in this upgradation may generate construction waste such as debris, sand, silt, wastewater, waste oil (if not handled properly) as well as surface water runoff discharge into the sea if not properly managed. These may cumulatively contribute towards the degradation of marine water quality and ultimately impact the marine ecology (phytoplankton, zooplanktons, benthos, fishes, and aquatic mammals).

The project i.e. terminal is a part of Jawaharlal Nehru Port and the study area to be dredged is a part of Mumbai and Jawaharlal Nehru Port, which already has significant ship movement. Due to this continuous ship movement, the marine flora (phytoplanktons) and fauna (zooplanktons, benthos, fishes, and aquatic mammals) are not well developed in the area. Therefore, no significant impacts on the marine flora and fauna are anticipated. Similarly, at the disposal sites, at present large-scale marine faunal diversity has not been recorded. The existing faunal species would avoid the area during dumping operations, due to high turbidity and are expected to return only after the cessation of dumping/disposal activities. This phenomenon has been observed at many sites and the same scenario is expected at the proposed site as well. Thus, no significant impact on fish fauna is expected. There will also be increased noise and vibration levels because of the construction activities and increased anthropogenic movement. The increased noise and vibration levels underwater is also envisaged due to piling work, which may impact the marine ecology.

Although, two Endangered (IUCN Red List) species- Indian Humpback Dolphin (*Sousa plumbea*) and Fourfinger Threadfin (*Eleutheronema tetradactylum*) have been recorded from the area. Only one observation of Khaire's Black Shieldtail (*Melanophidium khairei*) was reported from the Vikhroli area towards the Thane creek[185]. The consultation with the fishermen as well as the secondary data[186, 187] indicates the movement of the Indian Humpback Dolphin (*Sousa plumbea*) in the study area for foraging/feeding, but no nesting/breeding site was reported from the study area. National Institute of Oceanography (NIO) also conducted several studies between 1996-2016 and no threatened marine species was observed in the study area during their survey(s)[188]. However, in the last month (Nov. 2022), Maharashtra government announced its first Dolphin and Porpoise study along the coastline of Mumbai[189].Thus, no significant impacts on above-mentioned species are anticipated in the study area due to the project activities during construction phase.

[185] https://www.inaturalist.org/observations/32106533
[186] https://www.inaturalist.org/observations/124927845; https://www.inaturalist.org/observations/120857383
[187] https://www.inaturalist.org/observations?iconic_taxa=Actinopterygii,Mammalia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species
[188] Studies on the impact of dredging on marine ecology at Jawaharlal Nehru Port, Navi Mumbai. CSIR-National Institute of Oceanography, Mumbai, India.
[189] https://www.deccanherald.com/national/west/mou-for-dolphin-porpoise-study-around-mumbai-1162516.html

7.5.1.1.2 Significance of Impact

Based on the above, receptor vulnerability has been classified as ***High*** (due to the record of two IUCN Endangered species); while the impact magnitude has been classified as ***small*** (due to the unlikelihood of nesting/breeding site in the study area and the construction activities will be restricted to the berth expansion).

As per ***Table 7-5*** the Impact significance is assessed to be **Moderate.**

7.5.1.1.3 Proposed Measures

- Construction workers will be instructed about no disposal or dumping of any kind of waste into or in the vicinity of sea water
- Construction area will be bunded and provided with adequate drainage with silt traps to prevent runoff from construction area into the sea water
- The project shall ensure that the identified dredger type will result in minimizing the amount of silt and sediments
- A silt curtain will be installed around the dredge site
- The excavated material will not be disposed of at any other location than DS-3
- It shall be made sure that no spillage occurs while transporting the dredged material
- Acoustic enclosure for D.G. set as required in the Power Generator MoEFCC's notification
- Implementing noise mitigation techniques for offshore pile driving, including bubble curtains, pile caps, and cofferdams (where practicable) to absorb/scatter pile driving energy
- Vibration dampers and sheet barriers will be used to effectively mitigate vibration during construction phase
- Storm water at the construction site should be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea
- Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP
- Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, (2016)
- Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, (2016)
- Oil spill kits should be maintained to avoid oil spills and leakage into the sea
- Mopping system shall be deployed for cleaning of the oil from the surface waters
- An oil spill contingency plan should be developed in line with JNPA's Oil Spill Response Contingency Plan
- Marine water quality to be monitored during construction phase and it is to be ensured that water quality is not compromised, and all the parameters are well within the prescribed standards

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**High**	**Small**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Short Term	**High**	**Negligible to Small**	Minor

7.5.1.2 Impacts on Terrestrial (Mangrove) Ecology

7.5.1.2.1 Project Activities and Potential Impacts

During construction phase, construction wastes will be generated onsite in the form of construction debris, scrap materials, concrete, wooden pallets, cement, sand, silt, etc. Wastewater in the form of sewage and municipal wastes including food waste will be generated from site office and labour shed. The project will also generate hazardous waste in the form of used oil from diesel generators and construction machineries, empty containers of paints, contaminated cotton rags, hydraulic fluids etc. If such wastes are not handled adequately, it may adversely impact the mangrove vegetation after reaching in the soil. Any leaks or spills of oil and lubricants from heavy equipment during drilling activities at site or at workshop area and/or improper discharge of wastewater at site may also lead to long term negative impact on soil quality and ultimately the mangrove vegetation. Spillage from various construction vehicles and equipment if not handled properly, may result in chemical desegregation, and may reach to the mangroves resulting in stunted growth as well as death of the floral species.

Although, no threatened (IUCN Red List) terrestrial species have been recorded from the area. But these mangroves have their own values as discussed in the baseline.

7.5.1.2.2 Significance of Impact

Based on the above, receptor (mangrove) vulnerability has been classified as ***Medium***; and the impact magnitude has been classified as ***Substantial.***

As per ***Table 7-5*** the Impact significance is assessed to be **Moderate.**

7.5.1.2.3 Proposed Measures

- Construction workers will be instructed about no disposal or dumping of any kind of waste into or in the vicinity of sea water
- Construction area will be bunded and provided with adequate drainage with silt traps to prevent runoff from construction area into the sea water
- Storm water at the construction site should be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea
- Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP
- Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, (2016)
- Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, (2016)
- During servicing/repair of equipment or vehicles, a suitable drip tray shall be used to prevent oil/grease spills onto the soil, especially in case of emergency repairs
- Oil spill kits should be maintained onsite to handle minor leaks and spillage
- Mopping system shall be deployed for cleaning of the oil from the surface waters
- Unloading and loading protocols should be prepared for diesel, oil and used oil respectively and onsite workers should be trained to prevent/contain spills and leaks

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Substantial**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Small**	Minor

7.5.1.3 Impacts on Migratory Birds

7.5.1.3.1 Project Activities and Potential Impacts

During the construction phase, the migratory birds are adversely impacted by noise & vibrations. The primary sources of noise & vibrations will be the various construction equipment and construction / transportation vehicles. The sources of noise in the construction phase also include civil work, operation of construction machineries, D.G. sets and movement of vehicles at project site. There will also be increased noise levels because of increased anthropogenic movement and increased traffic at the terminal. Furthermore, increase in noise and vibration levels in underwater is also predicted due to piling work which may impact the activities of migratory birds in the area.

As per the baseline, 118 migratory birds were recorded from the area. Out of which, Indian Skimmer (*Rynchops albicollis*), Black-tailed Godwit (*Limosa limosa*), Greater Flamingo (*Phoenicopterus roseus*), and Lesser Flamingo (*Phoeniconaias minor*) are the species of conservation significance (***Table 4-26***). One observation of Indian Skimmer (*Rynchops albicollis*) was reported near Panje

wetland in 2018[190];–30 - 278 Black-tailed Godwit (*Limosa limosa*) were also reported from the same location[191];–15 - 1500 Greater Flamingo (*Phoenicopterus roseus*) – 1 - 432 Lesser Flamingo (*Phoeniconaias minor*) were also reported from the Panje wetland in 2018[192], but no roosting site was confirmed within the study area[193]; while the Steppe Eagle (*Aquila nipalensis*) was reported away from the study area[194].

7.5.1.3.2 Significance of Impact

Based on the above, receptor vulnerability has been classified as ***High*** (due to the record of migratory and/or congregatory species); while the impact magnitude has been classified as ***small*** (because there is no observation and report of significant breeding, and roosting areas in the study area and no major impact on the mentioned avifaunal species has been anticipated due to the limited project's construction activities - limited to the berth expansion).

As per ***Table 7-5*** the Impact significance is assessed to be **Moderate.**

7.5.1.3.3 Proposed Measures

- Acoustic enclosure for D.G. set as required in the Power Generator MoEFCC's notification
- Implementing noise mitigation techniques for offshore pile driving, including bubble curtains, pile caps, and cofferdams (where practicable) to absorb/scatter pile driving energy
- Maintenance of high noise machinery to be undertaken at regular intervals

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**High**	**Small**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Short Term	**High**	**Negligible to Small**	Minor

7.5.2 Operation Phase: Impact Assessment

7.5.2.1 Impacts on Marine Ecology

7.5.2.1.1 Project Activities and Potential Impacts

In the operational phase, the noise and vibration levels will be mainly from vessel traffic. Other impact on marine ecology will be mainly from the dredging activities and any direct discharge to sea or accidental spills or leaks.

The terminal has been in operations for many years, the modernization aspect will only bring efficiency into attending to vessels at a shorter turn-around, which will increase the existing capacity i.e. 1.5 million TEUs to 1.6 million TEUs in FY 2027-28 and further up to 1.8 million TEUs by 2029, however it will also reduce the waiting time for the vessels. There will be a gradual increase in cargo or vessel traffic from 220 vessels (for 0.4 million TEUs in FY 2021-22) to 520 vessels (for 1.8 million TEUs by 2029), but after upgradation, the same channel will be used which is being used currently. There might be slightly increase in the noise due to handling of more vessels, however the other adjacent terminals which are also using the same channel are already handling a significant number of vessels (2.1 Jawaharlal Nehru Port Authority (JNPA)) and the marine fauna and mammals are already adapted to the noise from the movement of the vessels. Hence it is understood that there will not be any significant addition to

[190] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.
[191] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.
[192] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.
[193] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.
[194] https://ebird.org/species/steeag1/IN-MH-MS

marine noise and vibration, also as mentioned earlier the marine fauna and mammals have adapted to vessel movement in the area.

Although, two Endangered (IUCN Red List) species- Indian Humpback Dolphin (*Sousa plumbea*) and Fourfinger Threadfin (*Eleutheronema tetradactylum*) have been recorded from the area. Although, no nesting/breeding site for the above-mentioned species have been recorded in the study area[195, 196, 197] and the vessels will utilize the existing JNPA approach channel for their movement; but due to the increased traffic (from 0.4 million TEUs in current to 1.4 million TEUs in FY 2027 and further up to 1.8 million TEUs by 2029); substantial impacts on these species have been anticipated due to the project activities during operation phase.

7.5.2.1.2 Significance of Impact

Based on the above, receptor vulnerability has been classified as ***High***; while the impact magnitude has been classified as ***Small*** to ***Substantial.***

As per ***Table 7-5*** and considering that it is an operational port since long time and utilizing the same channel for vessel's movment the Impact significance is assessed to be **Moderate.**

7.5.2.1.3 Proposed Measures

- Storm water drains to have oil - water separator and it is to be ensured that contaminated water is not discharged into the sea
- Oil-water separators to be regularly monitored
- Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP
- Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, (2016)
- Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, (2016)
- NSFTPL should ensure that vendor collects oily sludge from the vessel in vehicles, or central collection systems and storage tanks
- The capacity of oily waste collection should be established based on applicable MARPOL provisions
- Develop SOP on handling of garbage (on request) and sludge from the vessels
- Oil spill kits should be maintained to avoid oil spills and leakage into the sea
- Mopping system shall be deployed for cleaning of the oil from the surface waters
- An oil spill contingency plan should be developed in line with JNPA's Oil Spill Response Contingency Plan

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude of Impact	Significance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Permanent	**High**	**Small to Substantial**	**Moderate**
With Mitigation Measures	Negative	Adverse	Local	Permanent	**High**	**Negligible to Small**	**Minor**

7.5.2.2 Impacts on Terrestrial (Mangrove) Ecology

7.5.2.2.1 Project Activities and Potential Impacts

During operation phase, the loading and unloading of containers from the vessel to the berth may lead to accidental leaks and spillage of hazardous material and oil which may reach to the mangroves and cause the adverse impacts. The O&M phase of the project will involve use of paints, oil and hydraulics at the workshop area. Any leakage or spills from oil and paint containers at the

[195] https://www.inaturalist.org/observations/32106533
[196] https://www.inaturalist.org/observations/124927845; https://www.inaturalist.org/observations/120857383
[197] https://www.inaturalist.org/observations?iconic_taxa=Actinopterygii,Mammalia&nelat=19.18619137385496&nelng=73.16207891935177&place_id=any&subview=map&swlat=18.84651261245172&swlng=72.90424343634369&view=species

workshop or substation areas may reach to the coasts and impact the mangroves. Any leaks or spills of oil and lubricants from heavy equipment during operational activities at site or at workshop area and/or improper discharge of wastewater at site may also lead to long term negative impact on soil quality and ultimately the mangrove vegetation. Spillage from various construction vehicles and equipment if not handled properly, may result in chemical desegregation, and may reach to the mangroves resulting in stunted growth as well as death of the floral species.

Although, no threatened (IUCN Red List) species have been recorded from the area. But these mangroves have their own values as discussed in the baseline.

7.5.2.2.2 Significance of Impact

Based on the above, receptor vulnerability has been classified as ***Medium***; and the impact magnitude has been classified as ***Substantial.***

As per ***Table 7-5*** the Impact significance is assessed to be **Moderate.**

7.5.2.2.3 Proposed Measures

- Adequate instructions should be provided to the vendors arriving for disposal of sludge and garbage from vessels to avoid littering of garbage and accidental leakage of sludge into the sea and or coast
- Storm water at the construction site should be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea
- Oil-water separators to be regularly monitored
- NSFTPL should ensure that vendor collects oily sludge from the vessel in vehicles, or central collection systems and storage tanks
- The capacity of oily waste collection should be established based on applicable MARPOL provisions
- Develop SOP on handling of garbage (on request) and sludge from the vessels
- Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP
- Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, (2016)
- Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, (2016)
- During servicing/repair of equipment or vehicles, a suitable drip tray shall be used to prevent oil/grease spills onto the soil, especially in case of emergency repairs
- Oil spill kits should be maintained onsite to handle minor leaks and spillage
- Mopping system shall be deployed for cleaning of the oil from the surface waters
- Unloading and loading protocols should be prepared for diesel, oil and used oil respectively and onsite workers should be trained to prevent/contain spills and leaks

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Permanent	**Medium**	**Substantial**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Permanent	**Medium**	**Small**	Minor

7.5.2.3 Impacts on Migratory Birds

7.5.2.3.1 Project Activities and Potential Impacts

In the operational phase, the migratory birds will be adversely impacted by noise, vibrations, marine ecology, and status of mangroves in that area. The noise & vibrations levels will be increased due to the increased traffic and movement of ITVs and other vehicles for transportation of containers through road and railway siding. Operation of RMQC, RMGC and RT Cranes for loading and unloading of containers from vessels and stacking at the container yard will also contribute to the noise pollution. The

vessel traffic will also generate the underwater noise. Operation of DG sets and anthropogenic activities at the terminal area will also generate nose.

The loading and unloading of containers from the vessel to the berth may lead to accidental leaks and spillage of hazardous material and oil which may have adversely impact the marine ecology. Disposal of garbage from vessels if not handled properly, may also impact the quality of sea water and ultimately impact the aquatic flora (phytoplanktons) and fauna (zooplanktons, benthos, fishes, and aquatic mammals). Any adverse impact on the marine and/or terrestrial (mangrove) ecology as well as aquatic flora (phytoplanktons) and fauna (zooplanktons, benthos, fishes) will disturb the foraging and roosting areas of the migratory and/or congregatory species.

As per the baseline, 118 migratory birds were recorded from the area. Out of which, Indian Skimmer (*Rynchops albicollis*), Black-tailed Godwit (*Limosa limosa*), Greater Flamingo (*Phoenicopterus roseus*), and Lesser Flamingo (*Phoeniconaias minor*) are the species of conservation significance (***Table 4-26***). One observation of Indian Skimmer (*Rynchops albicollis*) was reported near Panje wetland in 2018[198];–30 - 278 Black-tailed Godwit (*Limosa limosa*) were also reported from the same location[199];–15 - 1500 Greater Flamingo (*Phoenicopterus roseus*) – 1 - 432 Lesser Flamingo (*Phoeniconaias minor*) were also reported from the Panje wetland in 2018[200], but no roosting site was confirmed within the study area[201]; while the Steppe Eagle (*Aquila nipalensis*) was reported away from the study area[202].

7.5.2.3.2 Significance of Impact

Based on the above, receptor vulnerability has been classified as ***High*** (due to the record of migratory and/or congregatory species); while the impact magnitude has been classified as ***small*** (because there is no observation and report of significant breeding, and roosting areas in the study area and no additional major impact on the mentioned avifaunal species has been anticipated due to the project activities, because the same activities have been continuously performing by the port in the study area since a long time).

As per ***Table 7-5*** the Impact significance is assessed to be Moderate.

7.5.2.3.3 Proposed Measures

- The project shall ensure that the identified dredger type will result in minimizing the amount of silt and sediments
- A silt curtain will be installed around the dredge site
- It shall be made sure that no spillage will be occurs while transporting the dredged material
- Adequate instructions should be provided to the vendors arriving for disposal of sludge and garbage from vessels to avoid littering of garbage and accidental leakage of sludge into the sea and or coast
- Acoustic enclosure for D.G. set as required in the Power Generator MoEFCC's notification
- Periodic inspection of the project equipment and cranes should be conducted
- Strict adherence to maintenance schedule of generators, as specified by vendors
- Vehicle drivers should be instructed not to blow horns until necessary.
- Equipment and cranes should be shut down when not in use
- Storm water drains to have oil - water separator and it is to be ensured that contaminated water is not discharged into the sea
- Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP
- STP discharges should also comply with WB/IFC EHS Guidelines
- Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, (2016)

[198] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.
[199] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.
[200] Apte, D., R. Khot, S. Bajaru, M. Prabhu, R. Pitale, S. Jain, A. Lokhande, S. Sankapal, P. Noronha, T. Mundra, P. Chogale, K. Chandel, and P. Sail (2018): Monitoring and mitigating the impacts of Mumbai Trans-Harbour Link on flamingos and other avifauna and formulating a conservation blueprint for the Sewri–Nhava seascape. First year report. Submitted to Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra, pp. 1–47.
[201] Vijayan L, Prasad SS, Muralidharan S, et al. (2008) Project: Study of Flamingos and Migratory Birds. Salim Ali Centre for Ornithology and Natural History, Coimbatore, India.
[202] https://ebird.org/species/steeag1/IN-MH-MS

- An oil spill contingency plan should be developed in line with JNPA's Oil Spill Response Contingency Plan
- Unloading and loading protocols should be prepared for diesel, oil and used oil respectively and onsite workers should be trained to prevent/contain spills and leaks.

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Permanent	**High**	**Small**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Permanent	**High**	**Negligible to Small**	Minor

7.6 Impacts on Socio- Economics

7.6.1 Construction Phase: Impact Assessment

7.6.1.1 Impact Due to Influx of Migrant Workers

7.6.1.1.1 Context

As reported by NSFTPL, during the construction phase of the project, ~200 migrant construction workers will be employed at the project. The project and its contractor shall provide preferential employment or recruitment to local labour, vulnerable group and ex-employee of JNPA (provided equal qualification), if they apply in compliance with local intent policy. However, the Project will need migrant workers to overcome shortfalls in the local labour supply – as observed most of the local labour work are related to the transportation activities (truck drivers or helpers), loading and unloading activities, fishing activities and other local businesses and have limited knowledge of construction activities.

Labour influx for the purposes of this report refers to people who move to a project area for the purpose of project-related employment, economic opportunities and related reasons during project construction. The specific definition of labour influx for this report are as follows:

- *Direct labour influx:* non-local people induced to the project area by employment just before or during the construction stage, who are hired or contracted directly by the Project or the main contractors
- *Indirect labour influx:* non-local people who have been induced to the project area by the prospect of employment just before or during the construction stage and who are hired by sub-contractors and local businesses who provide goods and services to the main contractors or to the mobile workforce
- *Labour-associated influx:* non-local people induced to the project area just before or during construction who have or are seeking association with the direct or indirect project workforce in some way such as workers' families, refugees and/or noneconomic migrants.

It is envisaged that the Project-induced in-migration most commonly will occur in response to direct and indirect employment and economic opportunities. Project development and operation will offer an array of economic opportunities, including:

- Employment with the Project
- Benefits offered by the Project's compensation and community development activities
- Opportunities for local communities to provide support services to migrant labour
- Opportunities for local communities to supply goods and services that may capture the substantial increases of disposable cash incomes in the local area
- New business opportunities catalyzed by the influx of migrant labor (e.g., small restaurants & eateries, guest houses, grocery shops).

While project-induced labour influx can **benefit** the project, the project area and host communities (e.g., by increasing business opportunities, improving the availability goods and services, and offering employment to local people), it can also commonly lead to **social impacts.** If not carefully managed, labour influx can negatively affect public infrastructure, utilities, public services, housing, health outcomes, food security and social dynamics in the Project area.

Additionally, Labor influx for construction works can lead to a variety of adverse social and environmental risks and impacts. The list below provides a summary of typical adverse social and environmental impacts, but is not exhaustive[203]:

Social Impacts

- Risk of social conflict
- Increased risk of illicit behavior and crime
- Influx of additional population
- Impact on community dynamics
- Increased burden on and competition for public service provision
- Increase risk of communicable diseases and burden on local health services
- Gender based violence
- Local inflation of prices
- Increased pressure on accommodation and rents
- Increase in traffic and related accidents

Environmental Impacts

- Inadequate waste disposal and illegal waste disposal sites
- Wastewater discharge
- Increased demand for freshwater resources
- Increased use of/demand for natural resources

As reported by NSFTPL, during the construction phase of the project, ~200 migrant construction workers will be employed at the project.

Note: the construction and operation phase of the project will be undertaken simultaneously for a period of 14 to 18 months, thus, the influx of workers is higher during this phase, as the migrant workers involved in construction and operation will be migrated and work concurrently.

7.6.1.1.2 Control Measure Planned for the Project

The project as part of its contractor agreement, will require each contractor to have an Environmental, Health and Safety, and Social (EHS&S) plan (including government mandated COVID-19 guidelines) in place, as well as procedures for monitoring the EHS&S performance of contractors and their migrant workers

7.6.1.1.3 Significance of Impact

The potential negative impacts include:

- The social consequences of influx can significantly impact the economy and livelihood strategies of people resident within the project area. As increased in increased population lead to increase in demand for food, fuel, housing, short-term shortfalls in supply can lead to medium-to-longer-term inflationary pressures on prices in the Project area
- Rapid influx may significantly alter existing levels of communicable diseases, including respiratory problems diarrheal diseases, vector-borne disease such as malaria, and sexually transmitted infection, by introducing “new infectives” and increasing the number of people who might spread illness. For example, one case of malaria will typically produce five additional cases
- Influx migration may hasten the introduction and/or increased expression of vices such as prostitution, alcoholism, and drug use, which can have significant negative social impacts and consequences. Increased criminality, conflict, and violence may also present additional social challenges for both local communities and the project

Considering the above mentioned above impacts, the receptor sensitivity is assessed to **moderate** since the local community has past experience of terminals, construction. The infrastructure in the vicinity of the terminal was observed to be sufficient for

203 https://thedocs.worldbank.org/en/doc/497851495202591233-0290022017/original/ManagingRiskofAdverseimpactfromprojectlaborinflux.pdf (Accessed on October 31, 2022)

managing the influx of migrant workers. Further, as reported, the project will construct the labour colony (workers' accommodation) so that there will be minimum interaction of migrant workers to the local community.

7.6.1.1.4 Additional Mitigation Measures Planned for the Project

The following additional mitigation measures are suggested in order to mitigate or minimize the impact on local community's resources and utilities:

- Employment of local vulnerable labour: The project and its contractor shall provide preferential employment or recruitment to vulnerable group (provided equal qualification), if they apply in compliance with local intent policy
- Managing Project Induced in-migration

Table 7-6: Proposed approach for managing project induced in-migration

Approach	Category of Intervention	Interventions
Management plans	• Prepare management plans • Safeguard Mechanisms	• Prepare a local content and influx management plan • Implementation of appropriate mitigation and monitoring programs, which includes development and implementation of an influx labour and local community stakeholder engagement program • Establishment of Grievance Redressal Mechanism (GRM) and Stakeholder Engagement Plan (SEP) for workers and local (host) community
Policies	• Social and Labour policies	• Development and adoption of social and labour policies or commitment to adhere to the NSFTPL EHS&S systems, as necessary - should include passing them onto their subcontractors
Management of project-induced in-migration induced immigration	• Minimizing in-migration into the Project area • Staging the inflow of migrants • Managing the migrant physical and social footprint	• Planning Access routes • Spatial planning, administration and resource allocation (including identification of appropriate workers' accommodation sites) • Infrastructure, service and utilities • Access control • Planning material transportation • Planning worker transportation • Planning workers' renting procedure (for those who do not want to stay in project provided accommodation) • Planning procurement of goods and services and development of supply centers
Managing environmental impact	• Waste management • Water management	• Measure to be adopted for adequate waste disposal and restriction of illegal waste disposal site • Maintain an adequate waste water discharge methods, so that the waste discharged from workers' accommodation shall not pollute the existing nearby water resources • Adequate timely monitoring by project for waste and water management shall be undertaken. The

Approach	Category of Intervention	Interventions
		monitoring shall be in compliance with the EBRD and IFC – workers' accommodation: processes and standards, 2009
Managing social impacts	• Managing social conflicts • Managing risk of communicable diseases • Gender based violence	• Prepare a SOP for contractors and influx labour related to manage social conflicts related to religious, cultural or ethnic differences in between influx labour and local (host) community • Pre- medical checkup of workers should be conducted prior to appointment of any migrant worker • Regular medical check-up (quarterly) should be conducted during the construction phase of the project • Manage the gender biased violence (refer to section 7.6.1.5.3)
Monitoring and auditing of contractor(s) with relation to migrant workers' accommodation and resources	• Regular monitoring and auditing • Approval and withholding of invoices	• NSFTPL shall undertake the regular monitoring and auditing of contractor(s) to ensure the compliance with applicable rules and regulation, workers; terms of employment and working condition, workers' accommodation compliance with EBRD/IFC guidelines on workers' accommodation • Temporary withholding shall be done in case of repeated minor violation of EHS&S requirement that are not leading to significant impacts on workers, external parties or resources; minor violations that are not corrected after repeated warnings of first-time major violation that can be corrected easily and that have not led to permanent EHS&S impacts. The withheld amounts shall be paid upon sub-contractor(s) correction of the defiance to the NSFTPL's satisfaction • Permanent withholding will be done for minor violations that are not corrected after repeated warnings and that could result in significant impacts. Some portion of such withholding may be released upon satisfactory resolution of the issues, but some significant portion will be permanently withheld as a penalty to discourage repeated incidents • Payment that are withheld either temporarily or permanently will be all or part of the payment specified for a line time in the bill or quantities, which in turn will be the payment due for a separate portion of the total workers. NSFTPL and its contractor EHS&S personnel will work with the project managed and others as need to arrive at the amount to be withheld This amount will not base directly on the cost of compliance but rather will be somewhat higher than this amount, and based on a specific percentage of the line item in question • Contractor(s) will be notified of the specific amount that must be taken in order to receive further payments for

Approach	Category of Intervention	Interventions
		the works in question or to receive payment that has been temporarily withheld

Labour Assessment – A labour assessment shall be carried out at different levels, depending on the initial assessment of the project risk posed by labour practices. It may take place as part of a regular monitoring and auditing of on-roll workers and contractual workers. The labour assessment should include a review of the employment policies, the adequacy of existing policies, and management's capacity to implement

Table 7-7: Proposed approach for labour assessment

Approach	Category of Intervention	Responsibility	Interventions
Labour assessment	• Description of the workforce • Description of working conditions and terms of employment • Description of types of employment relationships • Description of the working environment and identification of any work place health and safety issues • Compliance with national employment and labour law	• The description of all the workforce engaged in construction phase shall be collected by contractor and submitted to Project. The project shall on random basis verify the information shared by contractors. Furthermore, the Project shall maintain information related to workers who are on-roll basis • The assessment of workers condition and terms of employment shall be undertaken by Project through its internal EHS&S team on monthly basis prior to clearing of monthly bill of contractors. Furthermore, the project shall undertake assessment of occupational health and safety of workers (refer to section 7.6.1.6) • The project shall undertake the assessment on status of **compliance of appointed contractors with national employment and labour law** on monthly basis prior to clearing of monthly bill of contractors	• Description of the workforce includes number of workers. Types of jobs and skills, and composition of the workforce (gender, age, minority status, etc.) and numbers employed through contractors and other third parties and number of local labors and previously employed by JNPCT • Working conditions and terms of employment – a copy of the policies and procedures covering labour relations and human resources management should be maintained at the project site. The Project should indicate whether the workers are organized and to which workers' organization(s) they belong. All collective bargaining agreements that apply to the project should be included • Health and safety issues includes mitigation measures to protect the welfare of the workforce or address identified risks. Both risks that arise from normal functions and operations as well as less common circumstances and accidents that are known to be a risk within the industry or locality should be covered. The assessment should identify work areas, equipment and processes that may require redesign, risk reduction or hazard control measures • Compliance with national employment and labour law- An explanation of the nature of any violations of applicable labour laws, copies of reports from national inspectorates or other

Approach	Category of Intervention	Responsibility	Interventions
			enforcement bodies and a description of remediation steps taken

Stakeholder engagement and Grievance Redressal – development and use of appropriate communication media and messaging beyond the immediate project area of influence

Table 7-8: Proposed approach for stakeholder engagement

Approach	Category of Intervention	Interventions
Stakeholder Engagement and Grievance Redressal	• Stakeholder Engagement and Grievance Redressal Mechanism	• Ensure all the migrant workers are informed on stakeholder engagement plan and trained on grievance redressal mechanism
	• Monitoring and evaluation	• The project shall regularly monitor engagement process and grievance received from workers and external stakeholders • Further, shall also monitor the effective redressal of grievances and open grievances

- Further, as a mitigation measures, as part of the assignment, the Project has developed the workers' accommodation management plan (***Annexure E***), and stakeholder engagement plan (SEP) and grievance redressal mechanism (GRM) (***Annexure H***)

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Small**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Small**	Minor

7.6.1.2 Impact due to Stress on Local Resources

7.6.1.2.1 Context

The project is located in combination of urban and peri-urban settings, a migrant workers may reside in rental accommodation and moving into existing, or project provided workers' accommodation facilities. While the influx of migrant workers may not have significant impact on the usage of local resources as they will be absorbed within the city, there may still be impacts, including an increased demand on municipal services and transport system, inflationary effects on housing renting markets, food and fuel, development of slums (far and few chances), increase in social conflict and potential increase in criminal activity.

7.6.1.2.2 Control Measure Planned for the Project

The project as part of its contractor agreement, will require each contractor to have an Environmental, Health and Safety, and Social (EHS&S) plan (including government mandated COVID-19 guidelines) in place, as well as procedures for monitoring the EHS&S performance of contractors and their migrant workers

7.6.1.2.3 Significance of Impact

Potential negative impact related to stress on local resources, includes:

- Increase usage of existing roads and transportation system

- Increase pressure on education and health services
- Increase pressure on waste management system
- Increase demand for electricity, water supplies and sanitation
- Unplanned and uncontrolled development of squatters' settlements
- Increase demand for housing
- Increase se of/demand for community and religious facilities
- May reduce availability and increase cost of house-renting market, food and fuel
- Increase economic vulnerability of disadvantaged groups (women, elderly, minorities, etc.)
- Increase of population may increase the risk of increase in level of communicable diseases. Thus, community and regional-level disease control program for illnesses such as malaria, tuberculosis, COVID-19 and HIV/AIDS, may be overwhelmed by increasing cases, while demand on maternal and reproductive health services may significantly OutSpace existing local services and infrastructure
- In addition to changes in disease patterns, increase accidents and injuries due to changes in road traffic may significantly and adversely affect levels of trauma and accidents, placing a severe strain on local health care infrastructure. Increase social problems, such as alcohol and drug abuse or domestic violence, may also contribute to increasing health problems in the area. Finally, the return of migrant workers to their home communities may lead to further spread of communicable diseases, such as sexually transmitted infections, tuberculosis, malaria and COVID-19

Considering the above mentioned impacts, the receptor sensitivity is assessed to **moderate** since the local community have past experience of terminals, construction. The infrastructure in the vicinity of the terminal was observed to be sufficient for managing the influx of migrant workers. Further, as reported, the project will construct the labour colony (workers' accommodation) so that there will be minimum interaction of migrant workers to the local community.

7.6.1.2.4 Proposed Measures Planned for the Project

The following additional mitigation measures are suggested in order to mitigate or minimize the impact on local community's resources and utilities:

- Managing Project Induced in-migration

Table 7-9: Proposed mitigation measures for managing project induced in-migration

Approach	Category of Intervention	Interventions
Management of project-induced in-migration	• Minimizing in-migration into the Project area • Staging the inflow of migrants • Managing the migrant physical and social footprint	• Promoting regional growth • Planning Access routes • Spatial planning, administration and resource allocation (including identification of appropriate workers' accommodation sites) • Infrastructure, service and utilities • Planning workforce recruitment policy and management • Access control • Planning material transportation • Planning worker transportation • Planning workers' renting procedure (for those who do not want to stay in project provided accommodation) • Planning procurement of goods and services and development of supply centers
	• Addressing negative social impacts	• Governance • Managing social change • Retrieval of negative social dynamics • Spatial planning, housing, water and sanitation, and other resources

Approach	Category of Intervention	Interventions
		• Health facilities

- Stakeholder engagement and grievance redressal

Table 7-10: Proposed approach for labour engagement and monitoring

Approach	Category of Intervention	Interventions
Stakeholder Engagement and Grievance Redressal Mechanism	• Stakeholder Engagement and Grievance Redressal Mechanism	• Ensure all the workers are informed on stakeholder engagement plan and trained on grievance redressal mechanism
	• Monitoring and evaluation	• The project shall regularly monitor engagement process and grievance received from workers and external stakeholders • Further, shall also monitor the effective redressal of grievances and open grievances

- Further, as a mitigation measures, as part of the assignment, the Project has developed the workers' accommodation management plan (***Annexure E***), and stakeholder engagement plan (SEP) and grievance redressal mechanism (GRM) (***Annexure H***)

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Small**	**Moderate**
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Small**	**Negligible**

7.6.1.3 Labour Rights and Welfare – on-roll employees and contractual workers

7.6.1.3.1 Context

The Project will employee skilled, semi-skilled and unskilled workers, across the Project lifecycle, which will include contractual and regular (on-roll) employees. The contractual and on-roll employee may consist of local and migrant workers. As reported by NSFTPL, ~200 contractual workers will be employed by the Project.

The labour rights and welfare consist of human rights and labour rights in the workplace. For the Project, the workforce will be a valuable asset, and a sound worker-managed relationship is a key ingredient to the sustainability of the Project. Failure to establish and foster a sound worker-manger relationship can undermine worker commitment and retention, which can jeopardize the Project. Conversely, through a constructive worker-manager relationship and by treating workers fairly and providing them with safe and healthy working conditions, project may see tangible benefits, such as the enhancement of efficiency and productivity.

7.6.1.3.2 Control Measure Planned for the Project

As reported by NSFTPL, the project will establish and develop human resource policies or SOPs in compliance with applicable reference framework (ARF) of this report, regular monitor and audit of the workers' working conditions & terms of employment and provide safe working place.

7.6.1.3.3 Significance of Impact

The overall impact significance of the labour rights and welfare impact is **Major**. The significant of the impact is on the basis of (but not limited to):

- *Working conditions and management of worker relationship* – Human resource policy, working relationship, working conditions and terms of employment, workers' organization, non-discrimination, retrenchment and Grievance Mechanism
- *Protecting the work force* – Migrant workers, Child Labour, and Forced and Bonded Labour
- *Occupational health and safety* – providing workers with a safe and healthy work environment

7.6.1.3.4 Proposed Measures for the Project

The following additional mitigation measures are suggested in order to ensure compliance with labour laws/provisions as per the industry best practices:

For On-roll Workers

- HR policy and management system for NSFTPL satisfactory to ADB. HR MS to include the following:
  - Organizational chart and clear description of responsibilities between HR/Admin functions at the terminal and at the JM Baxi/CMA level
  - HR policy and HR procedures covering aspects required by law and the ADB's Social Protection Strategy (i.e., ILO's core labor standards-CLS) and gender-related safeguards, such policies against gender-based violence and sexual harassment (POSH), equal opportunity, etc.
  - Code of conduct
  - Tools, a set of forms and registers, labor contracts, supporting the implementation of HR policy and procedures
  - Worker GRM to cover permanent staff and non-employees (agency workers and contractors)
  - HR and labor training plan and materials
  - Monitoring, auditing reporting arrangement.
  - Policy on retrenchment and layoff of staff with a commitment to develop retrenchment plan if required at least 3 months prior to retrenchment
  - Recruitment schedule for key staff.
  - Continually review and update HR MS
- The project shall establish a formal policy or commitment to support the collective bargaining for all on-roll and contractual employees
- Establish workers engagement plan and grievance redressal mechanism – to showcase the engagement mode and model of the project with workers and to allows the workers to report any concern or grievance related to work activity.

<u>For contractual workers</u>

- The labour accommodation facility for contractual workers and as well as for regular employees should meet the requirement of the applicable reference framework, and EBRD and IFC's guidelines on workers' accommodation – in terms of space per workers, water and sanitation facilities, first aid, lighting and ventilation, etc. Further, the project shall undertake regular (basis of fixed timeline) monitoring to ensure compliance through the Project lifecycle
- Project should also ensure a monthly and regular auditing mechanism for monitoring he sub-contractors and suppliers with respect to compliance with the applicable national regulations (refer to section 3 for more details on applicable national regulations on workers and ***Annexure G*** for Subcontractor and Supplier Management Plan) and applicable reference framework of this report. The compliance shall be in terms of (but not limited to) resources, workers' working conditions, migrant workers, child labour and forced labor, GBVH (Gender-based violence and harassment), health and safety, etc.
- Project shall also establish provisions related to non-employment and abolition of any form of child labour and forced and bonder labour in the contractual agreement with Human Resource contractors. Further, the Project publicly shall showcase its commitment toward non-employment of child labour, and forced and bonded labour (refer to ***Annexure J*** for Worker Code of Conduct)
- Establish workers engagement plan and grievance redressal mechanism – to showcase the engagement mode and model of the project with workers and to allows the workers to report any concern or grievance related to work activity.

- The project shall establish a formal policy or commitment to support the collective bargaining for all on-roll and contractual employees.
- Project shall ensure the labour rights and welfare in compliance with the ILO's eleven (11) fundamental instruments:
  - Freedom of Association and Protection of the Right to Organize Convention
  - Right to Organize and Collective Bargaining Convention
  - Forced Labour Convention
  - Abolition of Forced Labour Convention
  - Minimum age convention
  - Worst Form of Child Labour Convention
  - Equal Remuneration Convention
  - Discrimination (Employment and Occupation) Convention
  - Occupational Safety and Health Convention

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**High**	**Large**	**Major**
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Small**	**Minor**

7.6.1.4 Contractor and Supplier Management

7.6.1.4.1 Context

As reported by NSFTPL, the Project, will appoint contractors (project management consultant (PMC), EPC and other minor sub-contractors which will be ~15 subcontractors) to undertake the construction work of the terminal. If not managed effectively, appointment of contractors will raise EHSS risks for the Project. Further, it is also challenging to ensure appointed contractors implement the necessary environmental and social (E&S) requirements in compliance with the commitment of the Project. Thus, it is critical for the Project to adopt and implement sound, consistent, and effective approaches in compliance with the Applicable Reference Framework (ARF) of this report – to manage the E&S performance of contractors, subcontractors, suppliers and any other third-parties working for the Project.

As discussed in above sections, the operation and construction phase of the project will be taken simultaneously for the 18 months and the nature of suppliers and contractors engaged in construction activity is different. Suppliers and contractors engaged in construction phase will be for a short period of time (~18 months), similarly, the human resource engaged by these contractors will also be for a short period of time.

Additionally, the workers engaged during the construction activity will predominantly from the other states such as Uttar Pradesh and Bihar (migrant workers). As reported by NSFTPL, during the construction phase of the project, ~200 migrant construction workers will be employed at the project . The project shall provide preference to the local workers (refer to ***Table 7-13***). Further, for this short period of construction activity, it will not be feasible for the Project to undertake the activity to uplift the skill sets as per the requirement of construction activity of the local community. The uplifting of skillset shall be considered for the operation phase of the project, which will be a longer-term engagement and have a scope of engaging local community.

7.6.1.4.2 Control Measure Planned for the Project

As reported by NSFTPL, the Project will include the E&S consideration into the contractual agreement with contractors and regular monitoring of their E&S performance.

7.6.1.4.3 Significance of Impact

The potential E&S opportunities and issues of concerns with contractors and suppliers include all aspects of Applicable Reference Framework of this report, which include (but are not limited to):

- Occupational Health and safety

- Contractor and sub-contract workers engaged in construction activity is anticipated predominantly migrant male workers and will be paid well in the local context. These circumstances elevate the risk of sexual exploitation and abuse (SEA) and gender-based violence (GBV)
- Non-compliance with regulatory requirement on overtime work period and overtime payment
- Non-compliance of workers' term of employment and working conditions with respects of applicable reference framework (refer to section 3)
- The workers' accommodation shall be temporary in nature and for a shorter period of time, thus, a risk where the provided accommodation may not be in compliance with the requirement of EBRD and IFC workers' accommodation guideline
- Labour working conditions and terms of employment – specific to discrimination, child labour, forced and bonded labour
- Safety and security related risks
- Stakeholder engagement – limited stakeholder engagement with workers and local community
- Grievance Redressal Mechanism – limited to not availability of GRM
- Other potential risks in supply chain include:
  - Employment of child Labour
  - Forced and bonded labour
  - Significant safety issues related to supply chain workers
  - Human Rights abuses
  - Non-compliance with applicable regulatory requirements

The overall impact of contractor and supplier management is considered as of **major** risk (considering the number of contractors and risk involved with contractors)

7.6.1.4.4 Proposed Measures for the Project

The Project shall balance local with regional concerns can help project by:

Table 7-11: Proposed Approach for Contactor Management

Approach	Interventions
Contractor and sub-contractor Management	
Contractor Selection	• As part of screening process, the contractor(s) shall be asked to provide details including (but not limited to): o Past E&S performance o Provisions of E&S policies and management systems o Numbers and qualification of EHS&S personnel o Occupational health and safety procedure and controls o Code of conduct o Supply chain management as criteria for inclusion (specific consideration for child and forced labour) o Provide details of any accreditations such as (but not limited to) ISO 26000, and other social responsibility standards/guidelines/formal initiatives o Provide details of the contractor(s) HR policies and grievance mechanism, and describe how there will be communicated to all workers on-site o Provide details on how the contract(s) shall comply with national labour and employment laws o Provided information on past social and labour performance. The information required from contractor(s) include (but not limited) to past violation of labour regulations, reports of sexual harassment or discrimination, training provided on applicable laws and regulations and labour inspection report o Provide details how the contractor(s) will manage equal opportunities and non-discrimination, sexual harassment issues, migrant labour and retrenchment among its workforces

Approach	Interventions
	• Environmental and Social (E&S) professionals need to be part of the contractor selection • Allow for early consideration and proper integration of E&S issues • Allows for alignment/agreement on the Process • Qualifications, experience and interpersonal skills • The development of Contractor and Supplier Management plans and their incorporation into the RFP, which shall allow for: • Consolidation of what is included in several separate documents into concise and specific E&S commitments/requirements • A more thorough understanding of E&S requirements by the bidding contractor • Bids can more effectively integrate all needed Environment, Health & Safety and Social (ESHS) requirements (financial/human resources/technical) • Equal comparison of proposal by contractors
Pre-Qualification	• It involves "filtering" of contractors that initially meet established criteria • Identify (and filter out) contractors with red flags that could become risk to the Project, such as poor commitment on EHSS, high fatality rates, negative reputational issues (and risks) or poor historical E&S performance • Number of documents and level of information requested shall be commensurate for which the contractors are being pre-qualified against • Response should sever as indicators of the contractors' and suppliers' understanding of ESHS aspects and their capacity
Solicitation – typically happens through the preparation and issuing of a Request For Proposal (RFP)	• The RFP should include the specific requirements for the Project including the EHSS requirements • Other information in the RFP should include corporate E&S policies • RFPs and other solicitations should require prospective contractors' and suppliers' bid to include: o Information on their Environment and Social Management System (ESM), certification, etc. o Organizational capacity around E&S (including labour, safety, biodiversity) o Information on past E&S performance o Information on existing company policies o Information on past projects highlighting E&S performance/challenges o Initial assessment of contractors' evaluation of the main E&S challenges for the Project o Affirmative statement on their control over subcontractors o Cost, timelines and organization
Proposal Evaluation	• Evaluation criteria should be established and included in the bid package • Key evaluation criteria, weighing of ESHS versus technical and financial • Evaluation can be on a pass-fail, quantitative and / or semi-quantitative basis • Process might involve interviews with bidders and their E&S staff • Grounds for disqualification could include failure to provide information or unacceptable past E&S (OHS) performance, material labor issues, poor security management records, fines and sanctions imposed by regulators, material community grievances and high-profile adverse press reports on E&S matters, etc.
Contracting	• General terms and conditions as part of contracting for contractor(s):

Approach	Interventions
	o Explicit commitment to compliance with applicable EHS&S rules and regulations, conditions of approval and acquisition of all required permits, license, consent and approval prior to undertaking the activities being permitted or otherwise approved o Commitment on creation and maintenance of records on EHS&S performance o Inclusion of Penalties or incentives for EHS&S performance o Clear contract statement that the contractor(s) is responsible for the EHS&S performance of their appointed sub-contractor(s) o Statement that invoices of contractor(s) will be approved based on the EHS&S performance of contractor(s), and NSFTPL have authority to temporary or permanently withhold the payment of contractor(s) o Commitment on development and adoption of social and labour policies or commitment to adhere to the NSFTPL EHS&S systems, as necessary o Commitment on induction and training programs for workforce, including training on applicable HR policy provisions, grievance mechanism, and occupational health and safety
Management of contractors	Contract should include: • Project-specific E&S requirements • Allocation of E&S personnel • E&S management/implementation plans to be developed by contractor • E&S training requirements • E&S monitoring requirements • Reporting requirements • Explicit commitments for compliance with project requirements for sub-contractors • Bill of quantitates with adequate costs and timeline for E&S • Penalties, incentives to motivate good E&S performance • Statement regarding failure of compliance with E&S • Development and adoption of social and labour policies or commitment to adhere to the NSFTPL EHS&S systems, as necessary ' - should include passing them onto their subcontractors
Monitoring and reporting	• NSFTPL shall undertake spot check and inspection of appointed contractors • A monthly E&S reporting shall be submitted by contractor to NSFTPL. The terms of the report shall include (but not limited to): o Compliance status with applicable laws and rules o A brief note on working condition204 and terms of employment205 o Details of grievances raised by workers and other external stakeholders o Status of grievances received to the contractor o Details of stakeholder engagement activities undertaken by contractor(s) • Based on the spot check, inspection and review of monthly reporting by contractor, gap analysis of deficiency or observations shall be made

[204] Working condition is defined as the conditions in the workplace and tereatment of workers. Condition in workplace includes the physical environment, health and safety precautions, and access to sanitary facilities. Treatment of workers includes discplinary practices, reason and process for termination of workers and respect for workers personal dignity

[205] Terms of employment includes wages and benefits, wage deduction, hours of work, rest days, overtime arrangements, overtime compensation, medical insurance, leave for illness, maternity and so on.

Approach	Interventions
	• Further, based on deficiency and observation provisions of temporary and permanent withholding of invoices shall be undertaken (refer to next step on deficiency and performance management of contractors)
Deficiency and performance management of contractors	• Actions taken in response to previous notices of deficiency or observations regarding E&S performance and/or plans for actions to be taken—these should continue to be reported until the client determines the issue is resolved satisfactorily • Ttemporary withholdings should be recommended in case of repeated minor violations of E&S requirements that are not leading to significant impacts on workers, external parties, or environmental resources; minor violations that are not corrected after repeated warnings; or first-time major violations that can be corrected easily and that have not led to permanent E&S impacts. The withheld amounts should be paid upon contractor correction of the deficiency to the client's satisfaction • Permanent withholdings should be recommended for minor violations that are not corrected after repeated warnings and that could result in significant impacts; or for any violations that have resulted in significant impacts, including permanent impacts. Some portion of such withholdings may be released upon satisfactory resolution of the issue, but some significant portion must be permanently withheld as a penalty to discourage repeated incidents • Payment that are withheld either temporarily or permanently will be all or part of the payment specified for a line time in the bill or quantities. NSFTPL and its contractor EHS&S personnel will work with the project managed and others as need to arrive at the amount to be withheld This amount will not base directly on the cost of compliance but rather will be somewhat higher than this amount, and based on a specific percentage of the line item in question • sub-contractor(s) will be notified of the specific amount that must be taken in order to receive further payments for the works in question or to receive payment that has been temporarily withheld
Labour rights and welfare of engaged construction workers – for contractual workers (refer to section 7.6.1.3)	

Table 7-12 Proposed Approach for Supplier Management

Approach	Interventions
Supplier(s) Selection	• As part of initial screening process, the supplier(s) shall be asked to provide details including (but not limited to): o Provisions of E&S policies and management systems o Occupational health and safety procedure and controls o Provide details of any accreditations such as (but not limited to) ISO 26000, ISO 9000 and other social responsibility standards/guidelines/formal initiatives o Provide details of the supplier(s) HR policies and grievance mechanism o Provided information on past social and labour performance. The information required from supplier(s) include (but not limited) to past violation of labour regulations, reports of sexual harassment or discrimination or any other environmental and social non-compliances

<table>
<tr><th>Approach</th><th>Interventions</th></tr>
<tr><td></td><td>o Supplier(s)' E&S organizational capacity</td></tr>
<tr><td>Supplier(s)' selection audit</td><td>
• After initial screening, NSFTPL shall undertake the audit of potential suppliers. The list of audit topics that need to be covered as part of the audit shall include (but not limited to):
o Management system and code implementation
o Freely chosen employment – no forces and bonded labour
o Freedom of association
o Health and safety of workers
o No recruitment of child labour
o Wages and benefits paid for a standard working week meet, at a minimum, national legal standards or industry benchmark standards, whichever is higher
o Information sharing on wages and other labour rights with workers
o Working hours must comply with national laws
o No discrimination in procedure of hiring, compensation, access to training, promotion, termination or retirement based on race, caste, national origin, religion, age, disability, gender, marital status, sexual orientation or union membership.
o Regular employment – to ever extent possible, work performed must be on the basis of recognised employment relationship established through national law and practice
o Prohibition of physical abuse or discipline, the threat of physical abuse, sexual or other harassment and verbal abuse or other forms of intimidation shall be prohibited
o Access to a confidential grievance mechanism for all workers
o Supplier must comply with the requirement of local and national laws related to environmental standards
• Based on the observations or gaps of the audit, NSFTPL shall categorise its suppliers into High, Medium and Low-risk categories[206]. Following methodology can be used for supplier(s) categorisation:
<table>
<tr><th>Risk Categorization</th><th>Number of Gaps</th><th>Nature of Gaps</th></tr>
<tr><td>High</td><td>Major gaps [207]in between the range of 100-50% of the total gaps</td><td>If the suppliers have a legal non-compliance gap (irrespective of numbers) then the high risk category shall be provided to the supplier</td></tr>
<tr><td>Medium</td><td>Major gaps in between the range of 49-0% of the total gaps</td><td>No legal non-compliance shall be there in the total gaps identified</td></tr>
<tr><td>Low</td><td>No major gaps</td><td>No legal non-compliance shall be there in the total gaps identified</td></tr>
</table>
• Based on the risk categorisation of suppliers, high-risk suppliers cannot be selected as part of NSFTPL's supply chain. However, if any critical supplier falls under the high-risk category, then NSFTPL shall ask the supplier to close, at minimum, the legal non-compliances gaps before initiating the contract.
• Furthermore, other gaps identified as part of the audit shall be closed as per the timeline mentioned in the corrective action plan.
</td></tr>
</table>

[206] High, Medium and Low category shall be based on the number of nature and number of gaps identified during the audit.

207 Major gaps with a significant impacts on workers, external parties, or environmental resources

Approach	Interventions
Monitoring and reporting of newly selected suppliers	• Following timeline of monitoring and reporting shall be adopted for suppliers: **Different risk category suppliers** — **Timeline** High Risk suppliers — Quarterly Medium Risk Suppliers — Half-early Low Risk Suppliers — Yearly
Contracting	Specific EHS&S terms and condition for supplier contracting shall be updated into the existing contract framework. The terms and conditions are provided below (but not limited to): • Action items finalised during the audit with a fixed timeline • Suppliers will adhere to national/ state level labour laws/ practices and shall not engage any Child labour, forced labour and Bonded labour as defined in national/ international standards • Suppliers are expected to conduct their business legally and transparently and not to practice or tolerate any form of corruption, extortion or embezzlement • Suppliers are expected to provide a safe and healthy working environment based on identifying significant safety hazards associated with supply chain operations. Suppliers should also comply with all applicable relevant legislation • Working hours for suppliers' employees will not exceed the maximum set by the applicable national law. Compensation paid to employees will comply with applicable national wage laws and ensure an adequate standard of living • Equal treatment of employees will be a fundamental principle of suppliers' corporate policy. There should be no discrimination based on race, origin, caste, gender, age, physical appearance, sexual orientation, disability, union membership or any other irrelevant characteristic that may not have any bearing on the employees' performance within the organization • Suppliers will be committed to open and constructive dialogue with their employees and workers' association
Monitoring and reporting of existing suppliers	Once all the selection process audit gaps are closed, NSFTPL shall undertake the regular audit of existing long-term suppliers. The frequency shall be finalised based on the nature of the suppliers (critical and non-critical) and past experience of closing the selection audit identified gaps.
Deficiency and performance management of supplier(s)	• Actions taken in response to previous gaps identified as part of selection or regular audit—these should continue to be reported until the project determines the issue is resolved satisfactorily • Temporary withholdings should be recommended in case of repeated violations or gaps of E&S requirements that are not leading to significant impacts on workers, external parties, or environmental resources; minor violations that are not corrected after repeated warnings; or first-time major violations that can be corrected easily and that have not led to permanent E&S impacts. The withheld amounts should be paid upon contractor correction of the deficiency to the client's satisfaction

Approach	Interventions
	• Permanent withholdings should be recommended for violations or gaps that are not corrected after repeated warnings and that could result in significant impacts; or for any violations that have resulted in significant impacts, including permanent impacts. Some portion of such withholdings may be released upon satisfactory resolution of the issue, but some significant portion must be permanently withheld as a penalty to discourage repeated incidents

Further, information related to contractors and supplier management is provided in the contractors' s and suppliers' management plan (refer to ***Annexure G*** for more details)

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Large**	**Major**
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Small**	**Minor**

7.6.1.5 Gender-based violation and harassment (GBVH)

7.6.1.5.1 Context

The migration of male workers may have a potential high-risk of GBVH affecting community members, workers and service users. Risk factors that increase the potential for GBVH include:

- Large-scale influx of transient male workers into small and often host communities with low capacity to absorb the sudden increase of workers
- Remote locations where people have limited access to resources to report GBVH and receive support
- Male workers transporting goods (e.g. truck drivers), who can perpetrate GBVH on routes (from terminal to container depot) and at truck stops associated with the project, even if not on the project site
- Poorly designed or maintained physical spaces on project sites and in worker accommodation for example bad lighting in and around grounds and access routes
- Informal workers, whose informality means they may either be more vulnerable to GBVH due to lack of contracts or that potential perpetrators may go unidentified due to lack of background checks
- While income-earning opportunities for women through direct or indirect employment in construction or operations represents a desirable increase in access to compensation and experience, it may in some cultural and social contexts lead to an increase in household tension and create community backlash against women in the area where the perception is that they should not work outside the home

7.6.1.5.2 Significance

The overall significance of the GBVH is **Minor**, considering the terminal is in an operation phase and the local community have past experience of construction and operation of port. Further, as reported, the workers' accommodation for female workers (if not part of a family) will be constructed away from the male workers, and the workers' accommodation will also minimize the interaction of workers with the local community.

7.6.1.5.3 Proposed Measures for the Project

Project shall incorporate following procedure to address the potential risks of GBVH in construction and operation phases:

- Appoint senior focal points in both Project and contractors with responsibility for ensuring that commitments and policies to prevent GBVH

- Put in place monitoring systems at the highest levels for regular reporting on GBVH
- Include requirements around GBVH in codes of conduct, policies and protocols for contractors, including training on policies and procedures once developed
- Ensure codes of conduct are publicly disclosed in local languages and are widely accessible to all workers and all groups of people in project areas - visual campaigns (on billboards or other communication platforms available) are strongly suggested due to their effectiveness
- Establish safe, confidential and accessible grievance mechanisms for local communities
- Include options to report anonymously if preferred
- Assess and revise HR policies, materials and training to encourage male and female applicants and improve female retention and promotion
- Ensure all security guards' background checks including references from most recent employers.
- Use robust recruitment processes to select, train, manage and monitor security companies and personnel
- Deliver periodic mandatory training on GBVH to all workers, including contractors, subcontractors and core suppliers
- Consider engaging expertise (e.g. from local women's rights organizations or NGOs working on GBVH) to conduct awareness campaigns to provide information to local communities, such as what is unacceptable behavior and how to report an incident of GBVH
- Contractor to conduct effective awareness campaigns that might include perspective taking and role playing exercises as part of training
- Include assessment of gender and safety risks in bidding process for contractors
- Vet contractors for prior efforts to address GBVH through prevention and response
- Ensure contracts include clauses on GBVH (for example all workers and staff sign codes of conduct)
- Provide safe, secure and separate living spaces for male and female construction and operation workers
- Provide lighting around project sites, including around latrines and access routes
- Install separate, lockable latrines for female construction workers
- Further, as part of the assignment the project has developed the Gender Management Plan (refer to ***Annexure I*** for more details)

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Small**	**Minor**
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Negligible**	**Negligible**

7.6.1.6 Occupational Health and Safety

During construction phase the following potential occupational health and safety risks are envisaged due to construction activities:

- Fall from height during installation of watch tower
- Risk while working at confined spaces at excavated areas
- Slip, trip and fall due to slippery floor and objects kept in pedestrian way
- Fire hazards and accidents while handling chemicals and oils and operating construction machineries including cranes and mechanical lifting equipment
- Exposure to hazardous corrosive chemicals
- Electrocution while working with live electrical components like electrical parts
- Diseases due to unhygienic conditions at site including contaminated drinking water for workers
- Hearing problems due to noise generation from construction machineries
- Respiratory problems due to dust emissions from construction site.
- Exposure to extreme heat while working at site during summers
- Risk of accidents from being struck in machinery or moving equipment or parts
- Accidents due to hit by construction vehicles or trucks used for container transportation

- Exposed to faulty electrical devices, such as cables, cords, hand tools etc.
- Drowning of workers working at the berth area and near marine water and during underwater piling work

Since construction work will be undertaken simultaneously with operation phase, workers may be also exposed to the following

- Exposure to containers carrying hazardous material and explosives
- Exposure to container carrying radioactive material
- Accidents from ITVs and other vehicles used for transportation of containers
- Fire and explosion from containers carrying hazardous material
- Accident near rail siding area
- Exposure to pathogens from ship garbage

7.6.1.6.1 Control Measures Planned for the Project

- NSFTPL will conduct hazard identification and risk assessment (HIRA) to identify OHS hazards associated with the project
- Trainings on OHS will be provided to the workers. However, activity specific list of trainings will be identified prior to start of construction phase
- Adequate Personal Protective Equipment (PPE) will be provided to the workers
- NSFTPL will deploy 24 x7 paramedical male nurse during both construction and operation phase for health surveillance of workers

7.6.1.6.2 Impact Significance

Based on the above, the receptor vulnerability and impact magnitude has been assessed to be ***medium***,

As per ***Table 7-5***, the impact significance has been assessed to be **moderate.**

7.6.1.6.3 Proposed Measures

- NSFTPL should develop and display HSE Policy at dedicated locations and communicate the same to the workers
- Develop occupational health & safety manual and procedures, in line with ADB's requirements and applicable WB EHS guidelines. Establish a safety committee on workplace safety for construction phase
- Occupational health and safety plan (refer ***Appendix M***) should be implemented at the proposed project
- Develop and implement a COVID -19 and communicable disease prevention and response plan
- All workers (regular and contracted) should be provided with training on Health and Safety policies in place with appropriate refresher courses throughout the life cycle of the Project
- The training courses should be also aligned to IMO conventions including the International Convention for the Safety of Life at Sea (SOLAS)
- Permit to work system should be implemented to ensure that work at confined space, work at height and cranes and lifting equipment is operated by trained and authorized persons only
- Adequate firefighting system should be installed at the project site including fire extinguishers, fire hydrants, sprinklers, sand buckets etc.
- Training of the workers on climbing techniques, and rescue of fall- arrested workers should be provided
- Training on hazardous chemical and material handling should be provided to the workers and PPEs such as rubber gloves, respirator, approved eye protection etc. should be issued
- Appropriate safety harnesses should be provided for working at heights
- Safe drinking water as per IS 10500:2012 should be provided to the workers
- Signs of "no smoking" should be provided at designated locations.
- Workers should be provided with 1 hour break in every 8-hour shift.
- Notice boards with all safety measures to be taken at construction site and accident-prone areas should be displayed at designated locations within the construction site.
- Driver safety trainings should be provided to the workers involved in transportation of construction material
- An incident investigation system shall be developed and records on occupational incidents, accidents, contraction of diseases shall be maintained and shared at the corporate level and to the lenders as per agreed frequency
- First aid kit with sufficient quantity of medicines to meet requirement of labors during construction activity should be maintained at site.

- The assembly area, nearest hospital, ambulance, fire station and police station should be identified in the implemented emergency management plan.
- Project should tie up with nearby hospitals for treatment of workers in case of emergency
- Pre- medical checkup of workers should be conducted prior to appointment at construction site
- Vehicle movement and parking within the premises will be manned to avoid accidents
- Route for vehicle movement shall be marked and pedestrian shall be restricted on the vehicle route.
- Cranes and other lifting equipment are operated by trained and authorized persons
- Excavated areas should be temporarily fenced to avoid access to outsiders
- Workers who are engaged in welding works will be provided with welder's protective eye shields
- The use of any toxic chemical will be strictly in accordance with the manufacturer's instructions
- Electrical and maintenance work should not be carried out during poor weather and during lightning strikes.
- Appropriate sign boards should be displayed with life-saving equipment giving clear instructions for raising the alarm in the event of an emergency and for the resuscitation of a person rescued from drowning.
- Adequate and suitable life-saving equipment should be provided and maintained for the rescue of anyone in danger of drowning. These should include lifebuoys, throwing buoys or lines, boathooks/poles of sufficient length or other suitable equipment.
- Life-saving equipment should be located at suitable places at intervals of not more than 50 m. The locations should be kept free of obstructions so as to be easily visible at all times.
- Adequate illumination, lighting and reflectors should be provided at the construction site for work during nigh time
- All permanent or temporary obstructions should be clearly marked to be visible by day and night.
- Work near the sea should be avoided at night to the extent possible.
- Visual sign boards should be displayed on wet and slippery floors. Pedestrian path should be clear of any unwanted objects that may lead to trip and fall.
- Workers should be provided with earplugs to work at areas with high noise levels i.e., areas where machineries are being operated.
- Working hours should be rotated and no worker should be allowed to work at high noise areas i.e., areas where machineries and vehicles are being operated for the entire shift
- Emergency Response Plan (refer ***Annexure O***) developed for the Project should be implemented at the terminal and communicated to the JNPCT workers and nearby terminals.
- Develop and implement standard E&S covenants for the EPC contractor and other contractors to ensure that all NSFTPL E&S requirements of the project (e.g. ESMP, ESMS, labor) are cascaded and implemented. It should include requirements to provide workers' accommodation aligned with IFC/EBRD guidelines.
- Refer measures provided in Occupational health and safety during operation phase provided in Section 7.6.2.6.

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Medium**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Medium**	Minor

7.6.1.7 Community Health and Safety

JNPCT terminal is located within JN Port and surrounded by other terminals. The nearest habitation to the port is Nhava village located at an aerial distance of ~ 1.5 km in north-east direction. The construction phase activities such as use of heavy machinery, construction of facilities will lead to noise and dust emission. However, since there are no community located within 500 m of the proposed project, there will be limited impact on the community. The project will involve transportation of construction material through state highway and national highway which may result in injuries to people due to accidents. Furthermore, project might deploy migrant workers and rent workers accommodation outside the port. The community may be exposed to communicable diseases such as Typhoid, malaria, HIV, Tuberculosis, COVID-19, Influenzas etc., due to migrant worker influx and interaction with local population.

JNPCT has a dedicated gate for entry exit, however, the terminal is not fenced to restrict entry of other terminal workers at JNPCT terminal due to which the other terminal workers may be exposed to health and safety risks during construction phase of the project such as accidents due to movement of construction vehicles, exposure to hazardous chemicals and oils in case of leaks and spill, fire and explosion hazards etc.

7.6.1.7.1 Impact Significance

Since there are no community located within 500 m of the project, the impact on community due to the proposed project is limited, furthermore since the construction phase will last for only limited period of time i.e. 15-18 months, the receptor vulnerability has been classified as **Low** impact magnitude has been classified as **small to medium.**

As per ***Table 7-5*** the Impact significance is assessed to be **Minor.**

7.6.1.7.2 Proposed Measures

- Traffic management plan (refer ***Annexure C***) should be implemented at site
- The traffic movement for the project in the area will be regulated to ensure road and pedestrian safety.
- Dedicated route for deployment of heavy-duty vehicles should be defined
- A quantitative risk assessment (QRA) should be conducted for potential hazards, explosions, access control and a security plan should be developed based on the outcome of the QRA.
- Emergency Response Plan (refer ***Annexure O***) developed for the Project should be implemented at JNPCT and communicated to the JNPCT workers and nearby terminals.
- Trucks/ dumpers should be covered by tarpaulin sheets during off site transportation
- Community health and safety management plan (refer ***Annexure N***) should be implemented at the site
- Signs of "no smoking" should be provided at designated locations.
- Entry of workers or vehicles of other terminals should be restricted at the proposed project
- Put in place a grievance mechanism to allow for the workers and community members to report any concern or grievance related to project activities
- Dedicated safety sign boards in local language should be provided around the project site
- Vehicles used for transportation of construction material should be covered to avoid dust emission.
- Pre medical checkup of all the workers should be carried out before hiring
- Regular medical camps should be conducted amongst the workers and the community to aware them on diseases like Typhoid, malaria, tuberculosis, STD's, COVID-19, HIV Aids etc.

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Long Term	**Medium**	**Small to Medium**	**Minor**
With Mitigation Measures	Negative	Adverse	Local	Long Term	**Low**	**Small**	**Negligible**

7.6.2 Operation Phase: Impact Assessment

7.6.2.1 Impact due to Influx of Migrant Workers

7.6.2.1.1 Context

The project and its contractor shall provide preferential employment or recruitment to local labour, vulnerable group and ex-employee of JNPA (provided equal qualification), if they apply in compliance with local intent policy. However, the project will need migrant workers to overcome shortfalls in the local labour supply – as observed most of the local labour work are related to the transportation activities (truck drivers or helpers), loading and unloading activities, fishing activities and other local businesses and have limited knowledge of operation activities such as crane operations and other operation related activities.

It is envisaged that the Project-induced in-migration most commonly will occur in response to direct and indirect employment and economic opportunities. Project development and operation will offer an array of economic opportunities, including:

- Employment with the Project
- Benefits offered by the Project's compensation and community development activities
- Opportunities for local communities to provide support services to migrant labour
- Opportunities for local communities to supply goods and services that may capture the substantial increases of disposable cash incomes in the local area

Additionally, Labor influx for construction works can lead to a variety of adverse social and environmental risks and impacts. The list below provides a summary of typical adverse social and environmental impacts, but is not exhaustive[208]:

Social Impacts

- Risk of social conflict
- Increased risk of illicit behavior and crime
- Influx of additional population
- Impact on community dynamics
- Increased burden on and competition for public service provision
- Increase risk of communicable diseases and burden on local health services
- Gender based violence
- Local inflation of prices
- Increased pressure on accommodation and rents
- Increase in traffic and related accidents

Environmental Impacts

- Inadequate waste disposal and illegal waste disposal sites
- Wastewater discharge
- Increased demand for freshwater resources
- Increased use of/demand for natural resources

Note: As stated above, the construction and operation phase for the project will be undertaken simultaneously for a period of 14 to 18 months, thus, the influx of workers is higher during this phase, as the migrant workers involved in construction and operation will be migrated and work concurrently. However, as the construction phase will get over the number of migrant workers will reduce, therefore, the proposed mitigation measures are limited to operation phase induced in-migration.

7.6.2.1.2 Control Measure Planned for the Project

The project as part of its contractor agreement, will require each contractor to have an Environmental, Health and Safety, and Social (EHS&S) plan (including government mandated COVID-19 guidelines) in place, as well as procedures for monitoring the EHS&S performance of contractors and their migrant workers

7.6.2.1.3 Significance of Impact

The potential negative impacts include:

- The social consequences of influx can significantly impact the economy and livelihood strategies of people resident within the project area. As increased in population lead to increase in demand for food, fuel, housing, short-term shortfalls in supply can lead to medium-to-longer-term inflationary pressures on prices in the Project area
- Rapid influx may significantly alter existing levels of communicable diseases, including respiratory problems diarrheal diseases, vector-borne disease such as malaria, and sexually transmitted infection, by introducing "new infectives" and increasing the number of people who might spread illness. For example, once case of malaria will typically produce five additional cases

208 https://thedocs.worldbank.org/en/doc/497851495202591233-0290022017/original/ManagingRiskofAdverseimpactfromprojectlaborinflux.pdf (Accessed on October 31, 2022)

- Influx migration may hasten the introduction and/or increased expression of vices such as prostitution, alcoholism, and drug use, which can have significant negative social impacts and consequences. Increased criminality, conflict, and violence may also present additional social challenges for both local communities and the project

Considering the above mentioned impacts, the receptor sensitivity is assessed to **moderate** since the local community have past experience of terminals, construction. The infrastructure in the vicinity of the terminal was observed to be sufficient for managing the influx of migrant workers. Further, as reported, the project will construct the labour colony (workers' accommodation) so that there will be minimum interaction of migrant workers to the local community

7.6.2.1.4 Proposed Measures for the Project

The following additional mitigation measures are suggested in order to mitigate or minimize the impact on local community's resources and utilities:

- *The project and its contractor shall provide preferential employment or recruitment to local labour, vulnerable group and ex-employee of JNPA (provided equal qualification), if they apply in compliance with local intent policy. The table below presents the approach and intervention for employment of local labour:*

Table 7-13: Proposed mitigation measures for employment of labour

Approach	Category of Intervention	Interventions
Preferential recruitment	• Commitment/policy on preferential recruitment (provided equal qualifications) to the project-affected persons • Employment of local labour • Preference provided to vulnerable groups	• NSFTPL shall develop a formal commitment/policy to provide preferential recruitment opportunity to the project-affected persons if they apply. The Preferential opportunity shall be based on required qualifications or skill set • employment of local labour shall be based on the availability of skillset and available knowledge • Preference shall be provided to vulnerable groups. Identification of skilled vulnerable groups can be identified through the CSR activities and stakeholder engagement of local community
Skills assessment and preferential engagement plan for contractors and their workforce currently contracted by JNPCT to service the terminal	• Skill assessment of local labour market • Engagement plan for currently contracted contractors by JNPCT • Preferential engagement of contractual workers currently employed by JNPCT	• The project shall undertake a skill assessment of the local labour market based on the skill requirement by the workers to be employed with the project • NSFTPL shall develop a formal commitment/policy to provide preferential recruitment opportunity to the ex-employees of JNPCT if they apply. • During contracting work to contractor(s), the project shall provide preference to currently contracted contractors by JNPCT

- *Managing Project Induced in-migration*

Table 7-14: Proposed mitigation measures for managing project induced in-migration

Approach	Category of Intervention	Interventions
Management plans	• Prepare management plans • Safeguard Mechanisms	• Prepare a local content and influx management plan • Implementation of appropriate mitigation and monitoring programs, which includes development and implementation of an influx labour and local community stakeholder engagement program

Approach	Category of Intervention	Interventions
		• Establishment of Stakeholder Engagement Plan (SEP) and Grievance Redressal Mechanism (GRM) for workers and local (host) community
Policies	• Social and Labour policies	• Development and adoption of social and labour policies or commitment to adhere to the NSFTPL EHS&S systems, as necessary - should include passing them onto their subcontractors
Management of project-induced immigration	• Minimizing immigration into the Project area • Staging the inflow of migrants • Managing the migrant physical and social footprint	• Promoting regional growth • Planning Access routes • Spatial planning, administration and resource allocation (including identification of appropriate workers' accommodation sites) • Infrastructure, service and utilities • Planning workforce recruitment policy and management • Access control • Planning worker transportation • Planning workers' renting procedure (for those who do not want to stay in project provided accommodation) • Planning procurement of goods and services and development of supply centers
Managing environmental impact	• Waste management • Water management	• Measure to adopted for adequate waste disposal and restriction of illegal waste disposal site • Maintain an adequate waste water discharge methods, so that the waste discharged from workers' accommodation shall not pollute the existing nearby water resources • Adequate timely monitoring by project for waste and water management shall be undertaken. The monitoring shall be in compliance with the EBRD and IFC – workers' accommodation: processes and standards, 2009
Managing social impacts	• Managing social conflicts • Managing risk of communicable diseases • Gender based violence	• Prepare a SOP for contractors and influx labour related to the managing social conflicts related to religious, cultural or ethnic differences in between influx labour and local (host) community • Pre- medical checkup of workers should be conducted prior to appointment of any migrant worker • Regular medical check-up (quarterly) should be conducted during the construction phase of the project • Manage the gender biased violence (refer to section 7.6.1.5.3)
Monitoring and auditing of contractor(s)	• Regular monitoring and auditing • Approval and withholding of invoices	• NSFTPL shall undertake the regular monitoring and auditing of contractor(s) to ensure the compliance with applicable rules and regulation, workers; terms of employment and working condition, workers' accommodation compliance with EBRD/IFC guidelines on workers' accommodation

Approach	Category of Intervention	Interventions
		• Temporary withholding shall be done in case of repeated minor violation of EHS&S requirement that are not leading to significant impacts on workers, external parties or resources; minor violations that are not corrected after repeated warnings of first-time major violation that can be corrected easily and that have not led to permanent EHS&S impacts. The withheld amounts shall be paid upon sub-contractor(s) correction of the defiance to the NSFTPL's satisfaction • Permanent withholding will be done for minor violations that are not corrected after repeated warnings and that could result in significant impacts. Some portion of such withholding may be released upon satisfactory resolution of the issues, but some significant portion will be permanently withheld as a penalty to discourage repeated incidents • Payment that is withheld either temporarily or permanently will be all or part of the payment specified for a line time in the bill or quantities, which in turn will be the payment due for a separate portion of the total workers. NSFTPL and its contractor EHS&S personnel will work with the project managed and others as need to arrive at the amount to be withheld This amount will not base directly on the cost of compliance but rather will be somewhat higher than this amount, and based on a specific percentage of the line item in question • Contractor(s) will be notified of the specific amount that must be taken in order to receive further payments for the works in question or to receive payment that has been temporarily withheld

- *Labour Assessment* – A labour assessment shall be carried out at different levels, depending on the initial assessment of the project risk posed by labour practices. It may take place as part of a regular monitoring and auditing of on-roll workers and contractual workers. The labour assessment should include a review of the employment policies, the adequacy of existing policies, and management's capacity to implement

Table 7-15 Proposed Measures for Labour Assessment

Approach	Category of Intervention	Responsibility	Interventions
Labour assessment	• Description of the workforce • Description of working conditions and terms of employment • Description of types of employment relationships • Description of the working environment and identification of any	• The description of all the workforce engaged in construction phase shall be collected by contractor and submitted to Project. The project shall on random basis verify the information shared by contractors. Furthermore, the Project shall maintain information	• Description of the workforce includes number of workers. Types of jobs and skills, and composition of the workforce (gender, age, minority status, etc.) and numbers employed through contractors and other third parties and number of local labours and previously employed by JNPCT

Approach	Category of Intervention	Responsibility	Interventions
	workplace health and safety issues • Compliance with national employment and labour law	related to workers who are on-roll basis • The assessment of Workers condition and terms of employment shall be undertaken by Project through its internal EHS&S team on monthly basis prior to clearing of monthly bill of contractors. Furthermore, the project shall undertake assessment of occupational health and safety of workers (refer to section 7.6.2.6) • The project shall undertake the assessment on status of compliance of appointed contractors with national employment and labour law on monthly basis prior to clearing of monthly bill of contractors	• Working conditions and terms of employment – a copy of the policies and procedures covering labour relations and human resources management should be maintained at the project site. The Project should indicate whether the workers are organized and to which workers' organization(s) they belong. All collective arranging agreements that apply to the project should be included • Employment relations – a descripting of the structure of the Project's supply chain shall be included and an assessment of the likely labour risks in the supply chan. Descripting of the way in which terms and conditions are determined, including an assessment of the degree to which wages and other conditions are determined, including an assessment of the degree to which wages and other conditions compare to other comparable employers in the sector • Health and safety issues include mitigation measures to protect the welfare of the workforce or address identified risks. Both risks that arise from normal functions and operations as well as less common circumstances and accidents that are known to be a risk within the industry or locality should be covered. The assessment should identify work areas, equipment and processes that may require redesigning, risk reduction or hazard control measures • Compliance with national employment and labour law-

Approach	Category of Intervention	Responsibility	Interventions
			An explanation of the nature of any violations of applicable labour laws, copies of reports from national inspectorates or other enforcement bodies and a description of remediation steps taken

- *Stakeholder engagement*

Table 7-16 Proposed approach for labour engagement

Approach	Category of Intervention	Interventions
Stakeholder Engagement and Grievance Redressal	• Stakeholder Engagement and Grievance Redressal Mechanism	• Ensure all the migrant workers are informed on stakeholder engagement plan and trained on grievance redressal mechanism
	• Monitoring and evaluation	• the project shall regularly monitor engagement process and grievance received from workers and external stakeholders • Further, shall also monitor the effective redressal of grievances and open grievances

- Further, as a mitigation measures, as part of the assignment, the Project has developed the workers' accommodation management plan (***Annexure E***), and stakeholder engagement plan (SEP) and grievance redressal mechanism (GRM) (***Annexure H***)

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Small**	**Moderate**
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Small**	**Minor**

7.6.2.2 Stress on Local Resources

7.6.2.2.1 Context

The project is located in combination of urban and peri-urban settings, a migrant workers may reside in rental accommodation and moving into existing, or project provided workers' accommodation facilities. While the influx of migrant workers may not have significant impact on the usage of local resources as they will be absorbed within the city, there may still be impacts, including an increased demand on municipal services and transport system, inflationary effects on housing renting markets, food and fuel, development of slums (far and few chances), increase in social conflict and potential increase in criminal activity.

7.6.2.2.2 Control Measure Planned for the Project

The project as part of its contractor agreement, will require each contractor to have an Environmental, Health and Safety, and Social (EHS&S) plan (including government mandated COVID-19 guidelines) in place, as well as procedures for monitoring the EHS&S performance of contractors and their migrant workers

7.6.2.2.3 Significance of Impact

Potential negative impact related to stress on local resources, includes:

- Increase usage of existing roads and transportation system
- Increase pressure on education and health services
- Increase pressure on waste management system
- Increase demand for electricity, water supplies and sanitation
- Unplanned and uncontrolled development of squatters' settlements
- Increase demand for housing
- Increase se of/demand for community and religious facilities
- May reduce availability and increase cost of house-renting market, food and fuel
- Increase economic vulnerability of disadvantaged groups (women, elderly, minorities, etc.)
- Increase of population may increase the risk of increase in level of communicable diseases. Thus, community and regional-level disease control program for illnesses such as malaria, tuberculosis, COVID-19 and HIV/AIDS, may be overwhelmed by increasing cases, while demand on maternal and reproductive health services may significantly OutSpace existing local services and infrastructure
- In addition to changes in disease patterns, increase accidents and injuries due to changes in road traffic may significantly and adversely affect levels of trauma and accidents, placing a severe strain on local health care infrastructure. Increase social problems, such as alcohol and drug abuse or domestic violence, may also contribute to increasing health problems in the area. Finally, the return of migrant workers to their home communities may lead to further spread of communicable diseases, such as sexually transmitted infections, tuberculosis, malaria and COVID-19

Considering the above mentioned impacts, the receptor sensitivity is assessed to **moderate** since the local community have past experience of terminals, construction. The infrastructure in the vicinity of the terminal was observed to be sufficient for managing the influx of migrant workers. Further, as reported, the project will construct the labour colony (workers' accommodation) so that there will be minimum interaction of migrant workers to the local community.

7.6.2.2.4 Proposed Measures for the Project

The following additional mitigation measures are suggested in order to mitigate or minimize the impact on local community's resources and utilities:

- *Managing Project Induced in-migration*

Table 7-17: Proposed approach for managing project induced in-migration

Approach	Category of Intervention	Interventions
Management of project-induced in-migration	• Minimizing in-migration into the Project area • Staging the inflow of migrants • Managing the migrant physical and social footprint	• Promoting regional growth • Planning Access routes • Spatial planning, administration and resource allocation (including identification of appropriate workers' accommodation sites) • Infrastructure, service and utilities • Planning workforce recruitment policy and management • Access control • Planning material transportation • Planning worker transportation • Planning workers' renting procedure (for those who do not want to stay in project provided accommodation)

Approach	Category of Intervention	Interventions
		• Planning procurement of goods and services and development of supply centers
	• Addressing negative social impacts	• Governance • Managing social change • Retrieval of negative social dynamics • Spatial planning, housing, water and sanitation, and other resources • Health facilities

- *Stakeholder engagement and grievance redressal*

Table 7-18: Proposed approach for labour engagement

Approach	Category of Intervention	Interventions
Stakeholder Engagement and monitoring	• Stakeholder Engagement and Grievance Redressal Mechanism	• Ensure all the workers are informed on stakeholder engagement plan and trained grievance redressal mechanism
	• Monitoring and evaluation	• the project shall regularly monitor engagement process and grievance received from workers and external stakeholders • Further, shall also monitor the effective redressal of grievances and open grievances

- Further, as a mitigation measures, as part of the assignment, the Project has developed the workers' accommodation management plan (***Annexure E***), and stakeholder engagement plan (SEP) and grievance redressal mechanism (GRM) (***Annexure H***)

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Small**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Small**	**Negligible**

7.6.2.3 Labour Rights and Welfare – on-roll employees and contractual workers

7.6.2.3.1 Context

The Project will employee skilled, semi-skilled and unskilled workers, across the Project lifecycle, which will include contractual and regular (on-roll) employees. The contractual and on-roll employee may consist of local and migrant workers. As reported by NSFTPL, ~2,300 contractual workers209 will be employed by the Project during operation phase.

The labour rights and welfare consist of human rights and labour rights in the workplace. For the Project, the workforce will be a valuable asset, and a sound worker-managed relationship is a key ingredient to the sustainability of the Project. Failure to establish and foster a sound worker-manger relationship can undermine worker commitment and retention, which can jeopardize the Project. Conversely, through a constructive worker-manager relationship and by treating workers fairly and providing them with safe and healthy working conditions, project may see tangible benefits, such as the enhancement of efficiency and productivity.

7.6.2.3.2 Significance of Impact

The overall impact significance of the labour rights and welfare impact is Major. The significant of the impact is on the basis of (but not limited to):

- *Working conditions and management of worker relationship* – Human resource policy, working relationship, working conditions and terms of employment, workers' organization, non-discrimination, retrenchment and Grievance Mechanism
- *Protecting the work force* – Migrant workers, Child Labour, and Forced and Bonded Labour
- *Occupational health and safety* – providing workers with a safe and healthy work environment

7.6.2.3.3 Proposed Measures for the Project

The following additional mitigation measures are suggested in order to ensure compliance with labour laws/provisions as per the industry best practices:

For On-roll Workers

- HR policy and management system for NSFTPL satisfactory to ADB. HR MS to include the following:
  - Organizational chart and clear description of responsibilities between HR/Admin functions at the terminal and at the JM Baxi/CMA level
  - HR policy and HR procedures covering aspects required by law and the ADB's Social Protection Strategy (i.e., ILO's core labor standards-CLS) and gender-related safeguards, such policies against gender-based violence and sexual harassment (POSH), equal opportunity, etc.
  - Code of conduct
  - Tools, a set of forms and registers, labor contracts, supporting the implementation of HR policy and procedures
  - Worker GRM to cover permanent staff and non-employees (agency workers and contractors)
  - HR and labor training plan and materials
  - Monitoring, auditing reporting arrangement.
  - Policy on retrenchment and layoff of staff with a commitment to develop retrenchment plan if required at least 3 months prior to retrenchment
  - Recruitment schedule for key staff.
  - Continually review and update HR MS
- The project shall establish a formal policy or commitment to support the collective bargaining for all on-roll and contractual employees
- Establish workers engagement plan and grievance redressal mechanism – to showcase the engagement mode and model of the project with workers and to allows the workers to report any concern or grievance related to work activity.

209 As reported, the contractual workers will be a mix of local labour and migrant labour. However, the preferences shall be provided to local labour based on their skillset and available knowledge. Further, at this stage of assessment, the project has not identified the strategy for employment of these contractual workers. The same will be defined in consultation with contractors during their contracting with the Project.

For Contractual workers

- The labour accommodation facility for contractual workers and as well as for regular employees should meet the requirement of the applicable reference framework, and EBRD and IFC's guidelines on workers' accommodation – in terms of space per workers, water and sanitation facilities, first aid, lighting and ventilation, etc. Further, the project shall undertake regular (basis of fixed timeline) monitoring to ensure compliance through the Project lifecycle
- Project should also ensure a monthly and regular auditing mechanism for monitoring he sub-contractors with respect to compliance with the applicable national regulations (refer to section 3 for more details on applicable national regulations on workers) and applicable reference framework of this report. The compliance shall be in terms of (but not limited to) resources, workers' working conditions, migrant workers, child labour and forced labor, GBVH (Gender-based violence and harassment), health and safety, etc.
- Project shall also establish provisions related to non-employment and abolition of any form of child labour and forced and bonder labour in the contractual agreement with Human Resource contractors. Further, the Project publicly shall showcase its commitment toward non-employment of child labour, and forced and bonded labour
- Establish workers engagement plan and grievance redressal mechanism – to showcase the engagement mode and model of the project with workers and to allows the workers to report any concern or grievance related to work activity.
- The project shall establish a formal policy or commitment to support the collective bargaining for all on-roll and contractual employees.
- Project shall ensure the labour rights and welfare in compliance with the ILO's eleven (11) fundamental instruments:
  - Freedom of Association and Protection of the Right to Organize Convention
  - Right to Organize and Collective Bargaining Convention
  - Forced Labour Convention
  - Abolition of Forced Labour Convention
  - Minimum age convention
  - Worst Form of Child Labour Convention
  - Equal Remuneration Convention
  - Discrimination (Employment and Occupation) Convention
  - Occupational Safety and Health Convention

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**High**	**Large**	**Major**
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Small**	**Minor**

Further, information related to labour management is provided in the contractors' and suppliers' management plan (refer to ***Annexure G*** for more details)

7.6.2.4 Contractor and Supplier Management

7.6.2.4.1 Context

As informed by NSFTPL, the Project, will appoint contractors (employee representation consultant (ERC) and other minor sub-contractors) during the operational phase of the Project. If not managed effectively, appointment of contractors will raise Environmental, Health & Safety and Social (EHS&S) risks for the Project. Further, it is also challenging to ensure appointed contractors implement the necessary environmental and social (E&S) requirements in compliance with the commitment of the Project. Thus, it is critical for the Project to adopt and implement sound, consistent, and effective approaches in compliance with the Applicable Reference Framework (ARF) of this report – to manage the E&S performance of contractors, subcontractors, suppliers and any other third-parties working for the Project.

As reported and considering the precedent of JM Baxi operating other multi-purpose terminals in India, it is envisaged that ~2,400 employees (100 on-roll employees of NSFTPL and 2,300 contractual employees) will be employed in the full-fledged operation phase of the Project. Majority (~90% of all the contractual employees) of the contractual workers will be migrant workers. The proposed mitigation measures on management of project induced in-migration is provided in section 7.6.2.1.

Furthermore, as compared to the construction activity, the operational phase tends to be more longer-term engagement and have a scope of engagement of local workers. If the skillset of the available local workers does not match with the requirement of the skillset requirement of workers engaged in operation phase, then the project can undertake skillset uplifting activities and programs.

7.6.2.4.2 Control Measure Planned for the Project

As reported by NSFTPL, the Project will include the E&S consideration into the contractual agreement with contractors and regular monitoring of their E&S performance.

7.6.2.4.3 Significance of Impact

The potential E&S opportunities and issues of concerns with contractors and suppliers include all aspects of Applicable Reference Framework of this report, which include (but are not limited to):

- Occupational Health and safety
- Labour working conditions and terms of employment – specific to discrimination, child labour, forced and bonded labour
- Safety and security related risks
- Stakeholder engagement – limited stakeholder engagement with workers and local community
- Grievance Redressal Mechanism – limited to not availability of GRM
- Other potential risks in supply chain include:
  - Employment of child Labour
  - Forced and bonded labour
  - Significant safety issues related to supply chain workers
  - Human Rights abuses
  - Non-compliance with applicable regulatory requirements
  - Negative public image

The overall impact of contractor and supplier management is considered as of **major** risk (considering the number of contractors and risk involved with contractors)

7.6.2.4.4 Proposed Measures for the Project

The Project shall balance local with regional concerns can help project by:

Table 7-19: Proposed Approach for Contractor Management

Approach	Interventions
Contractor and sub-contractor Management	
Contractor Selection	• As part of screening process, the contractor(s) shall be asked to provide details including (but not limited to): o Past E&S performance o Provisions of E&S policies and management systems o Numbers and qualification of EHS&S personnel o Occupational health and safety procedure and controls o Code of conduct o Supply chain management as criteria for inclusion (specific consideration for child and forced labour) o Provide details of any accreditations such as (but not limited to) ISO 26000, and other social responsibility standards/guidelines/formal initiatives o Provide details of the contractor(s) HR policies and grievance mechanism, and describe how there will be communicated to all workers on-site o Provide details on how the contract(s) shall comply with national labour and employment laws

Approach	Interventions
	○ Provided information on past social and labour performance. The information required from contractor(s) include (but not limited) to past violation of labour regulations, reports of sexual harassment or discrimination, training provided on applicable laws and regulations and labour inspection report ○ Provide details how the contractor(s) will manage equal opportunities and non-discrimination, sexual harassment issues, migrant labour and retrenchment among its workforces • Environmental and Social (E&S) professionals need to be part of the contractor and supplier selection • Allow for early consideration and proper integration of E&S issues • Allows for alignment/agreement on the Process • Qualifications, experience and interpersonal skills • The development of Contractor and Supplier Management plans and their incorporation into the RFP, which shall allow for: • Consolidation of what is included in several separate documents into concise and specific E&S commitments/requirements • A more thorough understanding of E&S requirements by the bidding contractor • Bids can more effectively integrate all needed Environment, Health & Safety and Social (ESHS) requirements (financial/human resources/technical) • Equal comparison of proposal by contractors
Pre-Qualification	• It involves "filtering" of contractors that initially meet established criteria • Identify (and filter out) contractors with red flags that could become risk to the Project, such as poor commitment on EHSS, high fatality rates, negative reputational issues (and risks) or poor historical E&S performance • Number of documents and level of information requested shall be commensurate for which the contractors are being pre-qualified against • Response should sever as indicators of the contractors' and suppliers' understanding of ESHS aspects and their capacity
Solicitation – typically happens through the preparation and issuing of a Request For Proposal (RFP)	• The RFP should include the specific requirements for the Project including the EHSS requirements • Other information in the RFP should include corporate E&S policies • RFPs and other solicitations should require prospective contractors' and suppliers' bid to include: ○ Information on their Environment and Social Management System (ESM), certification, etc. ○ Organizational capacity around E&S (including labour, safety, biodiversity) ○ Information on past E&S performance ○ Information on existing company policies ○ Information on past projects highlighting E&S performance/challenges ○ Initial assessment of contractors' evaluation of the main E&S challenges for the Project ○ Affirmative statement on their control over subcontractors ○ Cost, timelines and organization
Proposal Evaluation	• Evaluation criteria should be established and included in the bid package • Key evaluation criteria, weighing of ESHS versus technical and financial • Evaluation can be on a pass-fail, quantitative and / or semi-quantitative basis • Process might involve interviews with bidders and their E&S staff

Approach	Interventions
	• Grounds for disqualification could include failure to provide information or unacceptable past E&S (OHS) performance, material labor issues, poor security management records, fines and sanctions imposed by regulators, material community grievances and high-profile adverse press reports on E&S matters, etc.
Contracting, and E&S Liabilities and claims	Contract should include: • Project-specific E&S requirements • Allocation of E&S personnel • E&S management/implementation plans to be developed by contractor • E&S training requirements • E&S monitoring requirements • Reporting requirements • Explicit commitments for compliance with project requirements for sub-contractors • Bill of quantitates with adequate costs and timeline for E&S • Penalties, incentives to motivate good E&S performance • Statement regarding failure of compliance with E&S

Monitoring and reporting	• NSFTPL shall undertake spot check and inspection of appointed contractors
	• A monthly E&S reporting shall be submitted by contractor to NSFTPL. The terms of the report shall include (but not limited to):
	  • Compliance status with applicable laws and rules
	  • A brief note on working condition[210] and terms of employment[211]
	  • Details of grievances raised by workers and other external stakeholders
	  • Status of grievances received to the contractor
	  • Details of stakeholder engagement activities undertaken by contractor(s)
	• Based on the spot check, inspection and review of monthly reporting by contractor, gap analysis of deficiency or observations shall be made
	• Further, based on deficiency and observation provisions of temporary and permanent withholding of invoices shall be undertaken (refer to next step on deficiency and performance management of contractors)

Deficiency and performance management of contractors	• Actions taken in response to previous notices of deficiency or observations regarding E&S performance and/or plans for actions to be taken—these should continue to be reported until the client determines the issue is resolved satisfactorily • Temporary withholdings should be recommended in case of repeated minor violations of E&S requirements that are not leading to significant impacts on workers, external parties, or environmental resources; minor violations that are not corrected after repeated warnings; or first-time major violations that can be corrected easily and that have not led to permanent E&S impacts. The withheld amounts should be paid upon contractor correction of the deficiency to the client's satisfaction • Permanent withholdings should be recommended for minor violations that are not corrected after repeated warnings and that could result in significant impacts; or for any violations that have resulted in significant impacts, including permanent impacts. Some portion of such withholdings may be released upon satisfactory resolution of the issue, but

[210] Working condition is defined as the conditions in the workplace and tereatment of workers. Condition in workplace includes the physical environment, health and safety precautions, and access to sanitary facilities. Treatment of workers includes discplinary practices, reason and process for termination of workers and respect for workers personal dignity

[211] Terms of employment includes wages and benefits, wage deduction, hours of work, rest days, overtime arrangements, overtime compensation, medical insurance, leave for illness, maternity and so on.

Approach	Interventions
	some significant portion must be permanently withheld as a penalty to discourage repeated incidents • Payment that are withheld either temporarily or permanently will be all or part of the payment specified for a line time in the bill or quantities. NSFTPL and its contractor EHS&S personnel will work with the project managed and others as need to arrive at the amount to be withheld This amount will not base directly on the cost of compliance but rather will be somewhat higher than this amount, and based on a specific percentage of the line item in question • sub-contractor(s) will be notified of the specific amount that must be taken in order to receive further payments for the works in question or to receive payment that has been temporarily withheld
Labour rights and welfare of engaged construction workers – for on-roll and contractual workers (refer to section 7.6.2.3)	
The project and its contractor shall provide preferential employment or recruitment to local labour, vulnerable group and ex-employee of JNPA (provided equal qualification), if they apply in compliance with local intent policy. The table below presents the approach and intervention for employment of local labour (refer to section 7.6.2.1)	

Table 7-20 Proposed Approach for Supplier Management

Approach	Interventions
Supplier(s) Selection	• As part of initial screening process, the supplier(s) shall be asked to provide details including (but not limited to): o Provisions of E&S policies and management systems o Occupational health and safety procedure and controls o Provide details of any accreditations such as (but not limited to) ISO 26000, ISO 9000 and other social responsibility standards/guidelines/formal initiatives o Provide details of the supplier(s) HR policies and grievance mechanism o Provided information on past social and labour performance. The information required from supplier(s) include (but not limited) to past violation of labour regulations, reports of sexual harassment or discrimination or any other environmental and social non-compliances o Supplier(s)' E&S organizational capacity
Supplier(s)' selection audit	• After initial screening, NSFTPL shall undertake the audit of potential suppliers. The list of audit topics that need to be covered as part of the audit shall include (but not limited to): - Management system and code implementation - Freely chosen employment – no forces and bonded labour - Freedom of association - Health and safety of workers - No recruitment of child labour - Wages and benefits paid for a standard working week meet, at a minimum, national legal standards or industry benchmark standards, whichever is higher - Information sharing on wages and other labour rights with workers

<table>
<tr><th>Approach</th><th>Interventions</th></tr>
<tr><td></td><td>
- Working hours must comply with national laws
- No discrimination in procedure of hiring, compensation, access to training, promotion, termination or retirement based on race, caste, national origin, religion, age, disability, gender, marital status, sexual orientation or union membership.
- Regular employment – to ever extent possible, work performed must be on the basis of recognised employment relationship established through national law and practice
- Prohibition of physical abuse or discipline, the threat of physical abuse, sexual or other harassment and verbal abuse or other forms of intimidation shall be prohibited
- Access to a confidential grievance mechanism for all workers
- Supplier must comply with the requirement of local and national laws related to environmental standards
• Based on the observations or gaps of the audit, NSFTPL shall categorise its suppliers into High, Medium and Low-risk categories[212]. Following methodology can be used for supplier(s) categorisation:
<table>
<tr><th>Risk Categorization</th><th>Number of Gaps</th><th>Nature of Gaps</th></tr>
<tr><td>High</td><td>Major gaps [213]in between the range of 100-50% of the total gaps</td><td>If the suppliers have a legal non-compliance gap (irrespective of numbers) then the high risk category shall be provided to the supplier</td></tr>
<tr><td>Medium</td><td>Major gaps in between the range of 49-0% of the total gaps</td><td>No legal non-compliance shall be there in the total gaps identified</td></tr>
<tr><td>Low</td><td>No major gaps</td><td>No legal non-compliance shall be there in the total gaps identified</td></tr>
</table>
• Based on the risk categorisation of suppliers, high-risk suppliers cannot be selected as part of NSFTPL's supply chain. However, if any critical supplier falls under the high-risk category, then NSFTPL shall ask the supplier to close, at minimum, the legal non-compliances gaps before initiating the contract.
• Furthermore, other gaps identified as part of the audit shall be closed as per the timeline mentioned in the corrective action plan.
</td></tr>
<tr><td>Monitoring and reporting of newly selected suppliers</td><td>
• Following timeline of monitoring and reporting shall be adopted for suppliers:
<table>
<tr><th>Different risk category suppliers</th><th>Timeline</th></tr>
<tr><td>High Risk suppliers</td><td>Quarterly</td></tr>
<tr><td>Medium Risk Suppliers</td><td>Half-early</td></tr>
<tr><td>Low Risk Suppliers</td><td>Yearly</td></tr>
</table>
</td></tr>
<tr><td>Contracting</td><td>Specific EHS&S terms and condition for supplier contracting shall be updated into the existing contract framework. The terms and conditions are provided below (but not limited to):
• Action items finalised during the audit with a fixed timeline</td></tr>
</table>

[212] High, Medium and Low category shall be based on the number of nature and number of gaps identified during the audit.

213 Major gaps with a significant impacts on workers, external parties, or environmental resources

Approach	Interventions
	• Suppliers will adhere to national/ state level labour laws/ practices and shall not engage any Child labour, forced labour and Bonded labour as defined in national/ international standards • Suppliers are expected to conduct their business legally and transparently and not to practice or tolerate any form of corruption, extortion or embezzlement • Suppliers are expected to provide a safe and healthy working environment based on identifying significant safety hazards associated with supply chain operations. Suppliers should also comply with all applicable relevant legislation • Working hours for suppliers' employees will not exceed the maximum set by the applicable national law. Compensation paid to employees will comply with applicable national wage laws and ensure an adequate standard of living • Equal treatment of employees will be a fundamental principle of suppliers' corporate policy. There should be no discrimination based on race, origin, caste, gender, age, physical appearance, sexual orientation, disability, union membership or any other irrelevant characteristic that may not have any bearing on the employees' performance within the organization • Suppliers will be committed to open and constructive dialogue with their employees and workers' association
Monitoring and reporting of existing suppliers	Once all the selection process audit gaps are closed, NSFTPL shall undertake the regular audit of existing long-term suppliers. The frequency shall be finalised based on the nature of the suppliers (critical and non-critical) and past experience of closing the selection audit identified gaps.
Deficiency and performance management of supplier(s)	• Actions taken in response to previous gaps identified as part of selection or regular audit—these should continue to be reported until the project determines the issue is resolved satisfactorily • Temporary withholdings should be recommended in case of repeated violations or gaps of E&S requirements that are not leading to significant impacts on workers, external parties, or environmental resources; minor violations that are not corrected after repeated warnings; or first-time major violations that can be corrected easily and that have not led to permanent E&S impacts. The withheld amounts should be paid upon contractor correction of the deficiency to the client's satisfaction • Permanent withholdings should be recommended for violations or gaps that are not corrected after repeated warnings and that could result in significant impacts; or for any violations that have resulted in significant impacts, including permanent impacts. Some portion of such withholdings may be released upon satisfactory resolution of the issue, but some significant portion must be permanently withheld as a penalty to discourage repeated incidents

Further, information related to contractors and supplier management is provided in the contractors' s and suppliers' management plan (refer to ***Annexure G*** for more details).

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact

Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Large**	**Major**
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Small**	**Minor**

7.6.2.5 Gender-Based Violation and Harassment (GBVH)

7.6.2.5.1 Context

The migration of male workers may have a potential high-risk of GBVH affecting community members, workers and service users. Risk factors that increase the potential for GBVH include:

- Large-scale influx of transient male workers into small and often host communities with low capacity to absorb the sudden increase of workers
- Remote locations where people have limited access to resources to report GBVH and receive support
- Male workers transporting goods (e.g. truck drivers), who can perpetrate GBVH on routes (from terminal to container depot) and at truck stops associated with the project, even if not on the project site
- Poorly designed or maintained physical spaces on project sites and in worker accommodation for example bad lighting in and around grounds and access routes
- Informal workers, whose informality means they may either be more vulnerable to GBVH due to lack of contracts or that potential perpetrators may go unidentified due to lack of background checks
- While income-earning opportunities for women through direct or indirect employment in construction or operations represents a desirable increase in access to compensation and experience, it may in some cultural and social contexts lead to an increase in household tension and create community backlash against women in the area where the perception is that they should not work outside the home

7.6.2.5.2 Significance

The overall significance of the GBVH is **Minor**, considering the terminal is in an operation phase and the local community have past experience of construction and operation of port. Further, as reported, the workers' accommodation for female workers (if not part of a family) will be constructed away from the male workers, and the workers' accommodation will also minimize the interaction of workers with the local community.

7.6.2.5.3 Proposed Measures for the Project

Project shall incorporate following procedure to address the potential risks of GBVH in construction and operation phases:

- Appoint senior focal points in both Project and contractors with responsibility for ensuring that commitments and policies to prevent GBVH
- Put in place monitoring systems at the highest levels for regular reporting on GBVH
- Include requirements around GBVH in codes of conduct, policies and protocols for contractors, including training on policies and procedures once developed
- Ensure codes of conduct are publicly disclosed in local languages and are widely accessible to all workers and all groups of people in project areas – visual campaigns (on billboards or other communication platforms available) are strongly suggested due to their effectiveness
- Establish safe, confidential and accessible grievance mechanisms for local communities
- Include options to report anonymously if preferred
- Assess and revise HR policies, materials and training to encourage male and female applicants and improve female retention and promotion
- Ensure all security guards' background checks including references from most recent employers.
- Use robust recruitment processes to select, train, manage and monitor security companies and personnel
- Deliver periodic mandatory training on GBVH to all workers, including contractors, subcontractors and core suppliers
- Consider engaging expertise (e.g. from local women's rights organizations or NGOs working on GBVH) to conduct awareness campaigns to provide information to local communities, such as what is unacceptable behavior and how to report an incident of GBVH
- Contractor to conduct effective awareness campaigns that might include perspective taking and role playing exercises as part of training

- Include assessment of gender and safety risks in bidding process for contractors
- Vet contractors for prior efforts to address GBVH through prevention and response
- Ensure contracts include clauses on GBVH (for example all workers and staff sign codes of conduct)
- Provide safe, secure and separate living spaces for male and female construction and operation workers
- Provide lighting around project sites, including around latrines and access routes
- Install separate, lockable latrines for female construction workers
- Further, as part of the assignment the project has developed the Gender Management Plan (refer to ***Annexure I*** for more details)

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Small**	**Minor**
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Negligible**	**Negligible**

7.6.2.6 Occupational Health and Safety

During operation phase, workers will be exposed to the following health and safety hazards:

- Accidents during cargo handling, operation and maintenance of equipment, machinery and vehicle
- Accidents from ITVs and other vehicles used for transportation of containers
- Chemical hazards such as skin exposure to chemicals, hazardous oils and fuels (if used) and VOC inhalation in case of spills or emission of fumes from containers carrying dangerous goods
- Fire and explosion hazards from containers carrying explosives
- Exposure to increased noise levels due to increase in vehicular traffic during cargo handling, operation of cranes for loading, unloading and stacking of containers.
- Accident near rail siding area
- Exposure to pathogens from ship garbage
- Drowning due to container handling and maintenance work at berth area or any other area located close to marine water

There have been no accidents recorded within JNPCT till date, however, as per JNPA sustainability report dated 2020-21, four fatal accidents were recorded in FY 2020-21. Two fatalities were recorded in BMCT terminal where one fatal accident was due to hit by forklift and another fatal accident was due to drowning in sea of terminal worker. Furthermore, one fatality was recorded in Centre Freight Station (CFS) due to major fire incident at the CFS. The location and reason for the fourth fatality recorded in FY 2020-21 was not shared. However, since the accidents were not recorded in JNPCT, such cases are not anticipated to affect JNPCT operations in future.

7.6.2.6.1 Control Measures Planned for the Project

- NSFTPL will conduct hazard identification and risk assessment (HIRA) to identify OHS hazards associated with the project
- Trainings on OHS will be provided to the workers. However, activity specific list of trainings will be identified prior to start of operation phase
- Adequate Personal Protective Equipment (PPE) will be provided to the workers.

7.6.2.6.2 Impact Significance

The workers will be exposed to physical and chemical hazards during operation phase. Since most of the activities will be conducted on regular basis, the workers will be exposed to hazards for long term. Therefore, the receptor vulnerability and impact magnitude has been classified as **medium.**

As per ***Table 7-5*** the Impact significance is assessed to be **Moderate.**

7.6.2.6.3 Proposed Measures

- NSFTPL should develop and display HSE Policy at dedicated locations and communicate the same to the workers

- Develop occupational health & safety manual and procedures, in line with ADB's requirements and applicable WB EHS guidelines and establish a safety committee on workplace safety.
- Occupational health and safety plan (refer Appendix M) should be implemented at the proposed project
- Develop and implement a COVID -19 and communicable disease prevention and response plan
- The training courses should be also aligned to IMO conventions including the International Convention for the Safety of Life at Sea
- SOPs to be developed for handling of different types of containers ((inclusive of hazardous, explosives, radioactive, flammable substances, poisonous or toxic substances, infectious substances, corrosive substances, and combustible substances) and staff (direct and indirect) to be adequately trained
- Protocol of government and JNPA to be followed for handling of explosives, radioactive & other hazardous /dangerous goods. Staff to be adequately trained on handling and storage of different types of cargos
- Appropriate sign boards should be displayed with life-saving equipment giving clear instructions for raising the alarm in the event of an emergency and for the resuscitation of a person rescued from drowning.
- Adequate and suitable life-saving equipment should be provided and maintained for the rescue of anyone in danger of drowning. These should include lifebuoys, throwing buoys or lines, boathooks/poles of sufficient length or other suitable equipment.
- Life-saving equipment should be located at suitable places at intervals of not more than 50 m. The locations should be kept free of obstructions so as to be easily visible at all times.
- Adequate illumination, lighting and reflectors should be provided for undertaking cargo handling work during night time
- Display emergency contact numbers and assembly area at dedicated locations
- Tie up with nearby hospitals for treatment in case of emergency
- Develop a training calendar with activity specific trainings to be provided to the workers including loading and unloading of cargo, handling of cargo containing explosives and hazardous material, disposal of contaminated rags, used oil, handling oil spills and leaks
- Separate movement of pedestrian workers from areas of vehicle traffic and make vehicle route one way to the extent possible
- Signs of "no smoking" should be provided at designated locations.
- Design materials handling operations to allow for a simple, linear layout and to eliminate the need for multiple transfer points, which can increase the possibility of accidents/injuries.
- Consider, when determining the method by which the goods are stacked, the maximum permissible loadings of quays or floors; the shape and mechanical strength of the goods and containers (including allowable stacking mass and stack height); the natural angle of repose of bulk material; and the possible effects of high winds
- Containers with radioactive materials should be handled as per Atomic Energy Regulatory Board (AERB) guidelines
- Provide permit to work prior to working at confined areas
- Workers should be provided with earplugs to work at areas with high noise levels i.e., areas where machineries and vehicles are being operated.
- An incident investigation system shall be developed and records on occupational incidents, accidents, contraction of diseases shall be maintained and shared at the corporate level and to the lenders as per agreed frequency
- Avoid placing cargo on, or allowing passage of vehicles over, any hatch cover that is not of adequate strength for that purpose;
- Provide dedicated container storage area within container yard for hazardous and non-hazardous containers
- Provide training on using spill kits to manage small leaks and spills from containers
- Communicating chemical hazards to workers through labeling and marking according to national and internationally recognized requirements and standards, including the International Chemical Safety Cards (ICSC), Materials Safety Data Sheets (MSDS), or equivalent. Any means of written communication should be in an easily understood language and be readily available to exposed workers and first-aid personnel
- Provide adequate firefighting system at hazardous and explosive container storage area
- Provide adequate PPEs such as masks, reflective vest, safety shoes etc. Provide adequate body suit for workers working at storage area of containers carrying explosives
- Providing specific worker training in handling of flammable materials, and in fire prevention or suppression.
- In case NSFTPL facilitate garbage and crude oil disposal from ships on request of ship operator, NSFTPL should check and validate that third party vendor appointed for collection of such wastes from ship has a dedicated SOP on handling of garbage and crude oil (on request) from the vessels to avoid exposure to hazardous, microbial, chemical or physical agents to workers.

- Emergency Response Plan (refer ***Annexure O***) developed for the Project should be implemented at the terminal and communicated to the JNPCT workers and nearby terminals.
- OHS manual should identify hazards/ risks associated with undertaking construction and operation activities in parallel and proposed control measures to eliminate, prevent and minimize the hazards/ risks. SOP to be developed in OHS manual to be incompliance with the following regulations
  - International Maritime Dangerous Goods Code (IMDG Code)
  - Code of Practice for the Safe Loading and Unloading of Bulk Carriers (BLU Code)
  - International Code for the Safe Carriage of Grain in Bulk (International Grain Code)
  - IMO Code of Practice for Solid Bulk Cargo (BC Code)
  - General Conference of the ILO Recommendation concerning Occupational Safety and Health in Dock Work, R-160
  - General Conference of the International ILO Convention concerning Occupational Safety and Health in Dock Work, C-152, (1979)
  - International Labour Organization (ILO) Code of Practice for Safety and Health in Ports (2005)
- Detailed SOPs should be developed to cover Handling of containers with explosives
- SOP on handling of all type of containers (inclusive of hazardous, explosives, flammable substances, poisonous or toxic substances, infectious substances, corrosive substance & combustible substances) to be developed. It is to be ensured that all the SOPs should be complaint with the reference framework.
- SOP on handling of spills from containers to be developed and JNPCT to be equipped with spill control kits
- NSFTPL shall abide to the safety standard, conventions and regulations mentioned in the concessionaire agreement. NSFTPL shall also comply with the international standards and conventions as per IFC EHS guidelines on ports, harbors and terminals including:
  - International Labour Organization (ILO) Code of Practice for Safety and Health in Ports (2005);
  - General Conference of the International ILO Convention concerning Occupational Safety and Health in Dock Work, C-152, (1979);
  - General Conference of the ILO Recommendation concerning Occupational Safety and Health in Dock Work, R-160;
  - IMO Code of Practice for Solid Bulk Cargo (BC Code);
  - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk (IBC Code);
  - International Code for the Safe Carriage of Grain in Bulk (International Grain Code);
  - Code of Practice for the Safe Loading and Unloading of Bulk Carriers (BLU Code);
  - International Maritime Dangerous Goods Code (IMDG Code);
  - International Convention for Safe Containers (CSC)

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Long Term	**Medium**	**Medium**	Moderate
With Mitigation Measures	Negative	Adverse	Local	Long Term	**Low**	**Medium**	Minor

7.6.2.7 Community Health and Safety

JNPCT terminal is located within JN Port and surrounded by other terminals. The nearest habitation to the port is Mora village located at an aerial distance of ~ 5 km in south-west direction. The project will use vehicles within the terminal for transportation of containers from vessels to container yard and rail siding. Furthermore, JNPCT has a dedicated railway siding which is located within the Port for transportation of containers. Additionally, a separate route is available to approach the terminal and there will be no use of village roads for approaching the terminal or for transportation of containers. Therefore, it is anticipated that local population will not be exposed to terminal vehicular traffic, high noise levels due to operation of machineries and vehicles, air emissions etc., due to operation of the terminal.

However, project deploy migrant workers and rent workers accommodation outside the port. The community may be exposed to communicable diseases such as typhoid, malaria, HIV, tuberculosis, COVID-19, influenza etc., due to migrant worker influx and interaction with local population.

There are fishing boats used fishermen for fishing purpose. The fishing boats are not allowed to move in the dedicated vessel channel/route and near the terminal berths. Furthermore, during vessel arrival and departure, patrolling boats of JNPA are deployed to navigate the vessel towards the berth and departure from the berth. A hooter is blown by JNPA during arrival or departure of vessel to aware the fishing boats.

7.6.2.7.1 Impact Significance

Since there are no community located within 500 m of the project and fishing boats are not allowed to move within the vessel route, the impact on community due to the proposed project is limited. Therefore, the receptor vulnerability has been classified as **low,** however, there may be interaction of migrant labors with community in case workers accommodation is rented in nearby areas which may expose community to communicable diseases, therefore, impact magnitude has been classified as **small to medium.**

As per ***Table 7-5*** the Impact significance is assessed to be **Minor to Moderate**

7.6.2.7.2 Proposed Measures

- EPRP developed as part of IESE (refer ***Annexure O***) should be followed at the site and communicated to the project workers and to the nearby terminals.
- Appoint local workers to the extent possible including skilled and unskilled workers
- NSFTPL should provide an orientation to the migrant workers on the local custom and tradition followed by the local population;
- Pre medical checkup of all the workers should be carried out for the workers before hiring
- Regular medical camps should be conducted amongst the workers and the community to aware them on diseases like Typhoid, malaria, tuberculosis, STD's, COVID-19, HIV Aids etc.

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude Impact	ofSignificance of Impact
Without Mitigation Measures	Negative	Adverse	Local	Long Term	**Medium**	**Small to Medium**	**Minor**
With Mitigation Measures	Negative	Adverse	Local	Long Term	**Low**	**Small**	**Negligible**

7.7 Cumulative Impact

As mentioned in ***Section 2.1.1***, there are three ongoing projects in addition to JNPCT within JN port. The construction work for the development of fourth container terminal, integrated common rail yard, infrastructural development project to enhance the existing road network connecting to the port for smooth container traffic management and additional liquid jetty is undertaken within 5 km of the proposed project (the exact location is not known).

The spatial boundary for project would include the entire port, the access roads, rail connectivity, approach channels and immediate surroundings, currently there are various activities proposed with Dedicated freight corridors, expansion and widening of approach roads, repair and maintenance of existing terminals etc. The temporal distribution of these activities are varied and may have some degree of overlap for next 2-3 years. Cumulative impacts on resources due to presence of other under construction projects within 5 km of the proposed project are discussed in sections below.

Central to the IFC approach is the concept of valued environmental and social components (VECs). Valued Environmental, Social and Ecosystem Components (VECs) are defined as fundamental elements of the physical, biological or socio-economic environment, (including the air, water, soil, terrain, vegetation, wildlife, fish, birds and land use) that are likely to be the most sensitive receptors to the impacts of a proposed project or the cumulative impacts of several projects. The IFC Good Practice Handbook (2013) defines VECs as "environmental and social attributes that are considered to be important in assessing risks which may be:

- Physical features, habitats, wildlife populations (e.g., biodiversity),
- Ecosystem services,
- Natural processes (e.g., water and nutrient cycles, microclimate),

- Social conditions (e.g., health, economics), or
- Cultural aspects (e.g., traditional spiritual ceremonies).

The VECs for the proposed project include the following:

- Marine Water Quality
- Marine Ecology
- Ambient Air and Noise Quality
- Onsite Port Working Population
- Local communities

7.7.1 Anticipated Cumulative Impacts

The following cumulative impacts are envisaged due to the proposed project:

- Overall development of capacity and increase in trade capacity will result is more vessels waiting offshore, as the approach to terminals will be limited by the capacity of channel. More vessels waiting offshore will may have greater potential for pollution to marine water due to their discharges and emissions from long waiting time. Over a period time there could be need for additional approach channels which may induce new impacts on the marine ecology. However such a situation is totally dependent on the future projections and currently not under consideration.
- Construction works in the port and adjoining access roads, rail etc. will generate fugitive dust which will be dispersed locally affecting mainly the labour and working staff. This can cause respiratory issues for vulnerable individuals. With so many construction activities there is potential for accidents and other health and safety incidents for the working population.
- The ambient air and noise quality will be affected by simultaneous operations of machinery, excavations works, handling of rail materials etc. The impact would be local and affect the immediate vicinity of the Port.
- Additional requirement of water for construction and operation activities through MJP and CIDCO may impact existing water supply at the port.
- Labour influx due to the project activities will be addition to the existing workforce of existing terminal operators' workforce. Further, the labour influx due to the project will put pressure on the existing local resources
- Large-scale influx of transient male workers with existing male workers (of existing terminal operators) into small and often host communities with low capacity to absorb the sudden increase of workers may increase the risk of gender-based violation and harassment

It is assumed that the other terminals and railyard work will be following the SOPs of JNPA along with their own policies and procedure to address EHS&S risks impacts associated with the construction activities. Furthermore, environmental impact assessment (EIA)[214] has been conducted for the other mentioned projects. Therefore, measures suggested in the environmental management plan (EMP) developed as part of the EIA is anticipated to be implemented at the other projects.

7.7.1.1 Significance of Impact

Due to the various activities proposed with Dedicated freight corridors, expansion and widening of approach roads, repair and maintenance of existing terminals along with the proposed project may have certain degree of overlap for next 2-3 years. Therefore, the vulnerability of the VECs are anticipated to be medium, however, since the projects will individually implement SOPs and measures suggested in their respective EIA/ESIA reports and there are certain activities such as decision on additional approach channels for smooth movement of vessels to reduce impact on marine pollution falls under the purview of JNPA and other relevant authorities and terminal operators have no role to play under this aspect. Therefore, the impact magnitude has been classified as small to medium.

Therefore, the overall significance of impact has been classified as **Minor to Moderate.**

	Classification of Impact	Nature of Impact	Range of Impact	Period & Scale	Vulnerability of Receptors	Magnitude of Impact	Significance of Impact

[214],The executive summary of the EIA reports of some of the above mentioned projects are available on public domain, however, full EIA reports of these projects are not publically available. Therefore, it could not be ascertained if cumulative impacts has been included in the EIA/ESIA reports of these projects.

Without Mitigation Measures	Negative	Adverse	Local	Short Term	**Medium**	**Small to Medium**	**Minor to Moderate**
With Mitigation Measures	Negative	Adverse	Local	Short Term	**Low**	**Small to Medium**	**Negligible to Minor**

7.7.1.2 Proposed Measures

- In case of excessive fugitive dust, work should be phase down until source of dust is identified and suppression measures have been implemented
- Periodic water sprinkling at construction site such as concrete or unpaved areas should be done to avoid dust emission
- Periodic inspection of construction equipment and DG sets should be conducted
- Soil heaps and other dust emitting sources shall be kept covered and away from marine water to avoid sand, silt, cement flow in water causing increase in turbidity of marine water
- Ambient air and noise quality monitoring should be conducted at JNPCT (at the berth area and other under construction location) and reports to be shared at the corporate level and to the lenders
- Substitute less volatile solvents such as aqueous solvents in furnishing materials
- Construction material will be transported in covered vehicles to prevent any dust emission along the transportation route
- Select equipment with lower sound power levels
- Use noise barriers at the construction area and muffling devices for combustion engines
- Provide acoustic enclosures for equipment causing radiating noise.
- Periodic inspection of machineries and vehicles should be done and appropriate lubrication and tightening of moving parts should be done in case of increased noise levels during operation
- Machine emitting high noise during operations should be inspected and regular lubrication of machine parts should be carried out to reduce noise levels
- Marine water quality to be monitored and it is to be ensured that water quality is not compromised, and all the parameters are well within the prescribed standards
- Display HSE Policy at dedicated locations and communicate the same to the workers
- Develop and implement Occupational health and safety plan
- All workers (regular and contracted) should be provided with training on Health and Safety policies in place with appropriate refresher courses throughout the life cycle of the Project
- First aid kit with sufficient quantity of medicines to meet requirement of labors should be maintained at site.
- Notice boards with all safety measures to be taken at site and accident-prone areas should be displayed at designated locations
- The assembly area, nearest hospital, ambulance, fire station and police station should be identified and displayed at designated area
- Provide adequate PPEs such as masks, reflective vest, safety shoes etc. Provide adequate body suit for workers working at storage area of containers carrying explosives
- Driver safety trainings should be provided to the workers involved in transportation
- Sensitize workers on water conservation and encourage optimal use of water
- Managing Project Induced in-migration (Refer ***Section 7.6.1.1.4***)
- Labour Assessment (Refer ***Section 7.6.1.1.4***)
- Stakeholder engagement (Refer ***Section 7.6.1.1.4***)
- Appoint senior focal points in both Project and contractors with responsibility for ensuring that commitments and policies to prevent GBVH
- Put in place monitoring systems at the highest levels for regular reporting on GBVH
- Include requirements around GBVH in codes of conduct, policies and protocols for contractors, including training on policies and procedures once developed
- Establish safe, confidential and accessible grievance mechanisms for local communities
- Include options to report anonymously if preferred
- Vet contractors for prior efforts to address GBVH through prevention and response
- Ensure contracts include clauses on GBVH (for example all workers and staff sign codes of conduct)
- Provide safe, secure and separate living spaces for male and female construction and operation workers

8 Environment & Social Management and Monitoring Plan

8.1 Project Organisational Structure

To ensure the efficacy of environmental and social management plan, certain institutional mechanism with well-defined roles and responsibilities is essential for effective implementation of identified mitigation measures both during construction and operation phases.

NSFTPL will have ultimate responsibility for implementing the provisions of the ESMP. This role will include the on-going management of environmental and social impacts, monitoring of contractor's performance as well as development of mechanisms for dealing with environmental and social problems. NSFTPL will also ensure that the activities of its contractors are conducted in accordance with good practice measures, implementation of which will be required through contractual documentation.

The organization structure of NSFTPL with clear roles and responsibilities is yet to be established. As understood, NSFTPL will have a dedicated QHSE Manager supported by QHSE assistant manager, HSE officers, environment officer and fire safety officer to manage day-to-day HSE functions

8.2 Review and Reporting

NSFTPL will develop and implement a programme of regular reporting through the stages of the project lifecycle. The personnel delegated EHS roles shall be required to fully comply with the monitoring programme in terms of timely submissions of reports as per acceptable level of detail. Reporting will be done in form of environmental checklist, incident record register, training records, and environmental and social performance reports (weekly, monthly, quarterly, half-yearly, yearly etc.) for example environmental check list, incident record register, training records etc.

8.3 Environmental and Social Management Plan

This section outlines the potential impacts, mitigation measures, monitoring and management responsibilities during construction and operation phases of the Project. The purpose of ESMP is to:

- Provide an institutional mechanism with well-defined roles and responsibilities for ensuring that measures identified in IESE designated to mitigate potential impacts are implemented
- List all suggested mitigation measures and control techniques, safeguards identified through the IESE process
- Provide project monitoring program to effective implementation of the mitigation measures and ascertain efficacy of the environmental & social management and risk control system in place
- Assist in ensuring compliance with all relevant legislations at local, state and national level for the Project.

The ESMP also includes the following detailed management plans provided in *Annexure from A to N*

A. Water quality and wastewater Management Plan
B. Hazardous Materials Management Plan
C. Traffic Management Plan
D. Waste management Plan
E. Workers' Accommodation Management Plan
F. Construction Labour and Working Conditions Management Plan
G. Sub-contractors and suppliers' management plan
H. Stakeholder Engagement Plan (SEP) and Grievance Redressal Mechanism (GRM)
I. Gender Development and Management Plan[215]
J. Workers' Code of Conduct

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K. Chance Find Procedure[216]
L. Pollution Prevention Plan
M. Occupational Health and Safety Management Plan.
N. Community Health and Safety and Security Management Plan
O. Emergency Preparedness and Response Plan

[216] As informed by JNPA, the port is under operation since 1989 and multiple construction activities has been undertaken since then. During this period no cases of any chance find as been observed during the construction phase of the Port and other activities. However, as a good international industry practices, the Project has developed the Chance Find Procedure to be implemented during the construction phase of the Project.

Table 8-1: Environmental and Social Management and Monitoring Plan

Sr. No.	Environmental/Social Resources	Impact/Issues	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
Physical Environment										
1.	Mobilization	• Impact due to transportation and installation of construction equipment, batching plant etc	Pre construction/Mobilization	• NSFTPL to develop Mobilization E&S Plan (MESP) to manage E&S risks during mobilization phase.	Appointed contractors and EHS&S professional of NSFTPL	EHS Inspection	Prior to mobilization phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director
2.	Ambient Air	• Fugitive dust emissions from piling work, handling of construction materials at project site • Vehicular emissions due to increased traffic movement at terminal and transportation route for transportation of construction material and machinery • Dust emission due to loading, unloading and storage of construction material like cement, sand, silt • Exhaust emissions from construction machinery and other equipment, if any; and • Emissions from diesel generators used for power back up	Construction Phase	• Excavated soil and waste at the construction site should be carefully handled and soil heaps should be appropriately covered to minimize dust generation • Batching plant should be set up away from marine water or drainage lines. Periodic sprinkling should be done in the batching plant area to suppress dust emissions. • Speed of vehicles on site will be limited to 10-15km/h which will help in minimizing fugitive dust emissions due to vehicular movement. • Unloading from cement delivery trucks would be done on pallets which would be covered with tarpaulin sheets during non-working periods • Vehicles entering site should be Pollution Under Control (PUC) certified • In case of excessive fugitive dust, work should be phase down until source of dust is identified and suppression measures have been implemented • Periodic water sprinkling at construction site such as concrete or unpaved areas at toilet blocks, watch tower area, reefer platform, workshop area, yard work areas etc. should be done to avoid dust emission • Periodic inspection of construction equipment and DG sets should be conducted. • DG sets should be provided with adequate stack height based on capacity as per CPCB norms. The stack height of the DG sets should be compliant to CPCB as well as IFC EHS Guidelines. Stack emission monitoring of new DG sets should be conducted • Soil heaps and other dust emitting sources shall be kept covered and away from marine water to avoid sand, silt, cement flow in water causing increase in turbidity of marine water • Ambient air quality monitoring during construction phase should be conducted at JNPCT (at the berth area and other under construction location) and reports to be shared at the corporate level and to the lenders • Substitute fewer volatile solvents such as aqueous solvents in furnishing materials • Construction material will be transported in covered vehicles to prevent any dust emission along the transportation route. • NSFTPL to calculate its GHG emissions (Scope 1 and Scope 2) during construction phase share report at the corporate level and to the lenders ***Note:*** the construction and operation phase of the proposed project will be carried out simultaneously by NSFTPL. Therefore, the following mitigation measures are proposed. • Separate route for movement of construction vehicle and ITVs should be defined • Separate area for storage of construction material and containers should be defined • Separate workers should be appointed for construction and operation activities.	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the construction phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director
		• Increased movement of ITVs for transportation of containers from vessel to container yard, at rail siding and road network.	Operation Phase	• Vehicles owned by NSFTPL shall use manufacturer recommended engine maintenance program regardless of the size of the vehicle • Drivers should be instructed on driving practices to reduce fuel consumption including measures acceleration and safe driving limits	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the Operation phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to

Sr. No.	Environmental/Social Resources	Impact/Issues	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
		• Exhaust Emission from diesel generators used at the RMQC, RMGC and RT cranes and DGs used at substations for power back up • Emission due to accidental leakage from containers carrying dangerous goods of IMDG class explosives of classification 2 to 9 and explosives of IMDG class 1.1 and 1.2		• Implement regular vehicle maintenance and repair program • Implement pollution prevention management plan at site as provided in ***Annexure L*** • Diesel Generators (in case new installed) at site should be provided with adequate stack height as per CPCB guidelines. DG sets which are already installed should be maintained at regular intervals and stack emission should be within CPCB limits. • Passenger Vehicles (excluding the ITVs) used by the SPV or contractors for inspection and O&M purpose should be Pollution Under Control (PUC) certified • Separate route for movement of ITVs and construction vehicles should be provided during the first initial 15-18 months till the construction phase is completed • Regular inspection of containers carrying dangerous goods should be conducted and a separate container storage area should be demarcated for storage of dangerous goods and explosives. • Monthly ambient air quality monitoring shall be conducted at JNPCT and report to be shared at the corporate level as well as to the lenders • Validate ship engine performance documentation and certification while arriving at the berth to ensure compliance with MARPOL Annex VI guidelines, combustion emissions specifications (including NOx, SOx, and PM), within the limits established by international regulations • Avoid restorage and reshuffling of containers to the extent possible • Maintain container transfer equipment in good condition such as forklifts, ITVs, cranes • Reduce and avoid engine idling to the extent possible during loading and unloading of containers • NSFTPL to calculate its annual GHG emissions (Scope 1 and Scope 2) from operational activities and share report at the corporate level and to the lenders • Use of machines, DG, equipment and vehicles only with appropriate pollution fitness certificates. Also carry out periodic maintenance of equipment and vehicles • Substitute less volatile solvents such as aqueous solvents for painting works (if undertaken) • Provide greenbelt around the terminal to the extent possible for carbon sequestration. • NSFTPL should contact the container owner of refrigerated containers and obtain details on the type of coolant used in the refrigeration system • NSFTPL should undertake regular inspection at the reefer points to identify any refrigerant leaks. This shall be done by monitoring the readings of the refrigerants • NSFTPL may check feasibility to deploy electric vehicles for commuting purpose of the project team at the terminal.						Project director
3.	Noise and Vibration	Impact due to increase in construction vehicles and operation of construction machineries at site	Construction Phase	• Select equipment with lower sound power levels • Use noise barriers at the construction area and muffling devices for combustion engines • Ambient noise quality monitoring should be conducted onsite quarterly. • Provide acoustic enclosures for equipment causing radiating noise. • Periodic inspection of machineries and vehicles should be done and appropriate lubrication and tightening of moving parts should be done in case of increased noise levels during operation • All vehicles entering the project site will be instructed to obey speed limits and not to blow horns unless absolutely necessary. • Anti-honking sign boards to be placed in the parking areas and at entry / exit points • Acoustic enclosure for D.G. set as required in the Power Generator MoEFCC's notification • Machine emitting high noise i.e., areas where machineries and vehicles are being operated during operations should be inspected and regular lubrication of machine parts should be carried out to reduce noise levels. • Implementing noise mitigation techniques for offshore pile driving, such as bubble curtains, pile caps, and cofferdams (where practicable) to absorb/scatter pile driving energy	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the Construction phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director

Sr. No.	Environmental/Social Resources	Impact/Issues	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
				• Since JNPA conducts noise monitoring once in every six months, noise monitoring should be conducted at the under-construction site by NSFTPL on quarterly basis and reports should be shared at the corporate level and to the lenders. ***Note:*** the construction and operation phase of the proposed project will be carried out simultaneously by NSFTPL. Therefore, the following mitigation measures are proposed. • Construction equipment should be kept away from equipment used for operational activities • Route of construction vehicles and operation vehicles should be separated to the extent possible						
		• Noise emission due to increased traffic and movement of ITVs and other vehicles for transportation of containers through road network and railway siding • Operation of RMQC, RMGC and RT Cranes for loading and unloading of containers from vessels and stacking at the container yard • Anthropogenic activities at the workshop area • Operation of DG sets at the substation for power back up • Underwater noise generation due to vessel traffic.	Operation Phase	• Periodic inspection of the project equipment and cranes should be conducted • Strict adherence to maintenance schedule of generators, as specified by vendors • Vehicle drivers should be instructed not to blow horns until necessary. • Equipment and cranes should be shut down when not in use • Regular maintenance of NSFTPL vehicles and ITVs should be conducted • NSFTPL shall discuss with JNPA to provide onshore power supply to all the vessels arriving at the terminal • Since JNPA conducts noise monitoring once in every six months, noise monitoring should be conducted at JNPCT by NSFTPL on monthly basis and reports should be shared at the corporate level and to the lenders • NSFTPL may check feasibility to deploy electric vehicles for commuting purpose of the project team at the terminal.	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the Operation phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director
4.	Soil and Sediment Environment	Impact on resource due to improper handling of waste at site	Construction Phase	• Measures suggested in water and wastewater quality management plan (refer ***Annexure A***) should be implemented at site. • Silt traps should be constructed to control onsite surface runoff • Install sediment traps to control sediments and particulates from reaching marine water • Storm water at the construction site should have oil water separator or stormwater be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea. Storm water drains to have oil - water separator and it is to be ensured that contaminated water is not discharged into the sea. Oil-water separators to be regularly monitored. • Silt curtains / silt screens shall be provided to contain fine particles of silt discharged into the water from construction activities • Dedicated waste storage areas should be developed at site • Onsite workers should be provided with adequate trainings on waste management • Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP. • Construction waste generated at the site should be reused to the extent possible and remaining waste such as scraps, metals etc. should be disposed through authorized vendor. • Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, 2016 • Municipal waste generated onsite should be segregated and proper collection and handover to vendor appointed by JNPA. • Records on waste generated at site should be maintained and monthly/quarterly waste generation data should be shared at the corporate and with lenders • During servicing/repair of equipment or vehicles, a suitable drip tray shall be used to prevent oil/grease spills onto the soil, especially in case of emergency repairs • Oil spill kits should be maintained onsite to handle minor leaks and spillage • Unloading and loading protocols should be prepared for diesel, oil and used oil respectively and onsite workers should be trained to prevent/contain spills and leaks. • NSFTPL should ensure that no waste (hazardous or nonhazardous) is disposed into the sea without prior treatment in compliance to CPCB limit and IFC EHS Guidelines. • Spoil piles, if generated shall be reused to the extent possible and the remaining spoil which cannot be reused shall be disposed through authorized vendor.	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the Construction phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director

Sr. No.	Environmental/Social Resources	Impact/Issues	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
		Impact on resource due to improper handling of equipment and wastes generated at site	Operation Phase	• Demarcate dedicated storage area for hazardous and non-hazardous containers to avoid damage to non-hazardous containers in case of blast and spillage from hazardous containers • Municipal wastes generated at site should be segregated and stored in designated color coded bins. • Bio medical waste will be disposed as per bio medical waste rules 2016, as amended, through an authorized vendors • Hazardous waste should be disposed to authorized MPCB/CPCB recycler only • Oil spill kits should be maintained onsite to handle minor leaks and spillage • Fuel/oil/ paint containers will be stored on impervious floor in the storage area having secondary containment and housekeeping/ concerned staff will be trained for safe handling of oil and lubricants etc. • All waste should be stored in a shed that is protected from the elements (wind, rain, storms, etc.) and away from storm water drainage • Unloading and loading protocols should be prepared for containers and onsite workers should be trained on handling of hazardous material and to prevent/contain spills and leaks. • Storm water drains to have oil - water separator and it is to be ensured that contaminated water is not discharged into the sea. Oil-water separators to be regularly monitored. • A collection and disposal system should be developed for ship-generated garbage for ships alongside and at anchor, consistent with the International Maritime Organization (IMO) Comprehensive Manual on Port Reception Facilities. Closable skips should be provided at the berths, to collect garbage from ships at anchor • Oil spill contingency plan should be developed and implemented in line with JNPA's Oil Spill Response Contingency Plan • Regular Inspection at the substation, workshop area and container yard area should be conducted to identify leaks or spills and cracks on the concrete flooring	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the O&M phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director
5.	Water Availability	Stress on water resource due to abstraction of water for project construction	Construction Phase	• Explore feasibility of rainwater harvesting system at project site • Sensitize workers on water conservation and encourage optimal use of water • Regular inspection should be carried out for identifying water leaks and preventing water wastage from water supply tankers in order to use water efficiently. • Optimum use of water during sprinkling on roads for dust settlement, washing of vehicles, concrete mixing for foundation etc. • Water consumption records should be maintained, and monthly/quarterly water consumption data should be shared from site to corporate and to the lenders.	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the Construction phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director
		Stress on water resource due to abstraction of water for project construction	Operation Phase	• Explore feasibility of rainwater harvesting system within the terminal • Records of marine water quality monitoring conducted by JNPA shall be maintained and shared at the corporate level and with the lender. • The treated water from STP shall be in compliance to treated sanitary sewage discharge standard as per IFC EHS guidelines and as per CPCB standards for water quality. The treated water from STP should be recycled and reused as per the conditions specified in Consent to Operate.	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the Operation phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director
6.	Marine Water Quality	Impact on marine water quality due to construction activities such as piling work, civil work, improper disposal of wastes	Construction Phase	• Silt traps should be constructed to control onsite surface runoff • Storm water at the construction site should be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea. • The mobile mixing plants to be set up away from any drain inlet and a perimeter bund should erected all around the mixing plant. • Marine water quality to be monitored during construction phase and it is to be ensured that water quality is not compromised, and all the parameters are well within the prescribed standards • Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, 2016 • Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP.	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the Construction phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director

Sr. No.	Environmental/Social Resources	Impact/Issues	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
				• Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, 2016 • Oil spill kits should be maintained to avoid oil spills and leakage into the sea. An oil spill contingency plan should be developed in line with JNPA's Oil Spill Response Contingency Plan. • Records of marine water quality monitoring conducted by JNPA shall be maintained and share at the corporate level and with the lender.						
		Impact on marine water quality due to accidental spillage of hazardous material	Operation Phase	• Adequate instructions should be provided to the vendors arriving for disposal of sludge and garbage from vessels to avoid littering of garbage and accidental leakage of sludge into the sea • NSFTPL should ensure that vendor collects oily sludge from the vessel in vehicles, or central collection systems and storage tanks. The capacity of oily waste collection should be established based on applicable MARPOL provisions • Verify the adequacy of SOP on handling of garbage (on request) and sludge from the vessels developed by the vendor. In case such SOP is not available with the vendor, NSFTPL shall develop SOP for supervision of garbage and sludge disposal from vessel by third party from the terminal (in case this service is facilitated by terminal on request) in compliance with MARPOL to prevent pollution from Ships/ Vessels. • A communication procedure should be developed for vessels operations incidents (air emissions, ballast, bilge water, discharge of oil, noxious liquid substances in bulk, harmful substances in packaged form, sewage, and terminal and vessels garbage and sewage) • Storm water drains to have oil - water separator and it is to be ensured that contaminated water is not discharged into the sea. Oil-water separators to be regularly monitored. Μαρινε ωατερ θυαλιτψ το βε μονιτορεδ δυρινγ οπερατιον πηασε ανδ ιτ ισ το βε ενσυρε δ τηατ ωατερ θυαλιτψ ισ νοτ χομπρομισεδ, ανδ αλλ τηε παραμετερσ αρε ωελλ ωιτηιν τ ηε πρεσχριβεδ στανδαρδσ. Τηε παραμετερσ φορ τηε μονιτορινγ σηουλδ βε ιν λινε ωιτη ΧΠΧΒ ασ ωελλ ασ ωατερ ανδ σεδιμεντ θυαλιτψ μονιτορινγ ασ περ ΙΦΧ/ΩΒ ΕΗΣ γυιδε λινεσ φορ πορτσ, τερμιναλσ ανδ ηαρβουρσ.	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the Operation phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director
Socioeconomics/ Labour Management Plan										
7.	Influx of Migrant Workers	The potential negative impacts include: • The social consequences of influx can significantly impact the economy and livelihood strategies of people resident within the project area. As increased in population lead to increase in demand for food, fuel, housing, short-term shortfalls in supply can lead to medium-to-longer-term inflationary pressures on prices in the Project area. • Rapid influx may significantly alter existing levels of communicable diseases, including respiratory problems diarrheal diseases, vector-borne disease such as malaria, and sexually transmitted infection, by introducing "new infectives" and increasing the number of people who might spread illness. For example, once case of malaria will typically produce five additional cases. • Influx migration may hasten the introduction and/or increased expression of vices such as prostitution, alcoholism, and drug use, which can have significant negative social impacts and consequences. Increased criminality, conflict, and violence may also present additional social challenges for both local communities and the project.	Construction	• Minimizing in-migration into the Project area • Staging the inflow of migrants • Managing the migrant physical and social footprint • Addressing negative social impacts • Stakeholder Engagement • Monitoring and evaluation	Appointed contractors and EHS&S professional of NSFTPL	Consultation with labour and local community	Quarterly during the construction phase and half yearly during operation phase	NSFTPL – project manager	NSFTPL – Project director	Reporting from contractors to EHS&S professional, and then to Project manager and director

Sr. No.	Environmental/Social Resources	Impact/Issues	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
8.	Influx of migrant labour	The potential negative impacts include: • The social consequences of influx can significantly impact the economy and livelihood strategies of people resident within the project area. As increased in population lead to increase in demand for food, fuel, housing, short-term shortfalls in supply can lead to medium-to-longer-term inflationary pressures on prices in the Project area. • Rapid influx may significantly alter existing levels of communicable diseases, including respiratory problems diarrheal diseases, vector-borne disease such as malaria, and sexually transmitted infection, by introducing "new infectives" and increasing the number of people who might spread illness. For example, once case of malaria will typically produce five additional cases. • Influx migration may hasten the introduction and/or increased expression of vices such as prostitution, alcoholism, and drug use, which can have significant negative social impacts and consequences. Increased criminality, conflict, and violence may also present additional social challenges for both local communities and the project.	Operation phase	• Preferential recruitment (provided equal qualifications) to the project affected persons and ex-employees of JNPA, if they apply • Contractor(s)'s selection and induction • Monitoring and auditing of contractor(s) • Labour Assessment • Stakeholder Engagement	Appointed contractors and EHS&S professional of NSFTPL	Consultation with labour and local community	Quarterly during the construction phase and half yearly during operation phase	NSFTPL – project manager	NSFTPL – Project director	Reporting from contractors to EHS&S professional, and then to Project manager and director
9.	Stress on Local Resources	Potential negative impact related to stress on local resources, includes: • Increase usage of existing roads and transportation system • Increase pressure on education and health services • Increase pressure on waste management system • Increase demand for electricity, water supplies and sanitation • Unplanned and uncontrolled development of squatters' settlements • Increase demand for housing • Increase se of/demand for community and religious facilities • May reduce availability and increase cost of house-renting market, food and fuel • Increase economic vulnerability of disadvantaged groups (women, elderly, minorities, etc.) • Sudden increase in local population • Changes in disease patterns	Construction and Operation phase	• Minimizing in-migration into the Project area • Staging the inflow of migrants • Managing the migrant physical and social footprint • Addressing Negative social impacts • Stakeholder Engagement • Monitoring and evaluation	Appointed contractors and EHS&S professional of NSFTPL	Consultation with labour and local community	Quarterly during the construction phase and half yearly during operation phase	NSFTPL – project manager	NSFTPL – Project director	Reporting from contractors to EHS&S professional, and then to Project manager and director
10.	Labour rights and welfare	• Working conditions and management of worker relationship – Human resource policy, working relationship, working conditions and terms of employment, workers' organization, non-discrimination, retrenchment and Grievance Mechanism • Protecting the work force – Migrant workers, Child Labour, and Forced and Bonded Labour		• The labour accommodation facility for contractual workers and as well as for regular employees should meet the requirement of the applicable reference framework, and EBRD and IFC's guidelines on workers' accommodation – in terms of space per workers, water and sanitation facilities, first aid, lighting and ventilation, etc. Further, the project shall undertake regular (basis of fixed timeline) monitoring to ensure compliance through the Project lifecycle • Project should also ensure a monthly and regular auditing mechanism for monitoring he sub-contractors and suppliers with respect to compliance with the applicable national regulations) and applicable reference framework of this report. The compliance shall be in terms of (but not limited to) resources,	Appointed contractors, EHS&S professional, and Human resource department	monitoring reports, and consultation with labour	Quarterly during the construction phase and half yearly during operation phase	NSFTPL – project manager	NSFTPL – Project director	Reporting from contractors to EHS&S professional/HR department, and then

Sr. No.	Environmental/Social Resources	Impact/Issues	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
		• Occupational health and safety – providing workers with a safe and healthy work environment		workers' work conditions, migrant workers, child labour and forced labor, GBVH (Gender-based violence and harassment), health and safety, etc. • Project shall also establish provisions related to non-employment and abolition of any form of child labour and forced and bonder labour in the contractual agreement with Human Resource contractors. Further, the Project publicly shall showcase its commitment toward non-employment of child labour, and forced and bonded labour • Establish workers engagement plan and grievance redressal mechanism – to showcase the engagement mode and model of the project with workers and to allows the workers to report any concern or grievance related to work activity. • Project shall ensure the labour rights and welfare in compliance with the ILO's eleven (11) fundamental instruments						to Project manager and director
11.	Contractor and Supplier Management	Framework of this report, which include (but are not limited to): • Occupational Health and safety • Community health and safety including sexual exploitation and abuse (SEA) and gender-based violence – through the appointed contractual workers • Labour working conditions and terms of employment – specific to discrimination, child labour, forced and bonded labour • Safety and security related risks • Stakeholder engagement – limited stakeholder engagement with workers and local community • Grievance Redressal Mechanism – limited to not availability of GRM	Construction and Operation phase	• Contractors and suppliers' selection process shall include E&S consideration • Pre-qualification of contractors and suppliers based on E&S performance • Solicitation of contractors and suppliers based on E&S consideration • Proposal evaluation of each contractor and supplier • Contracting should include project specific E&S requirements	EHS&S, procurement, HR and contractor/supplier management departments	Screening checklist of contractors and suppliers Solicitation provisions E&S provision included into RFPs and contractual agreements Audit and monitoring reports	Quarterly during the construction phase and half yearly during operation phase	NSFTPL – project manager	NSFTPL – Project director	Reporting from relevant department to Project manager and director
12.	Gender-based violation and harassment (GBVH)	The migration of male workers may have a potential high-risk of GBVH affecting community members, workers and service users. Risk factors that increase the potential for GBVH include: • Large-scale influx of transient male workers into small and often host communities with low capacity to absorb the sudden increase of workers • Remote locations where people have limited access to resources to report GBVH and receive support • Male workers transporting goods (e.g. truck drivers), who can perpetrate GBVH on routes (from terminal to container depot) and at truck stops associated with the project, even if not on the project site • Poorly designed or maintained physical spaces on project sites and in worker accommodation for example bad lighting in and around grounds and access routes • Informal workers, whose informality means they may either be more vulnerable to GBVH due to lack of contracts or that potential perpetrators may go unidentified due to lack of background checks • Income-earning opportunities for women through direct employment in construction or operations, or indirect employment which may also increase household tension and create community backlash	Construction and operation phase	• Project shall incorporate following procedure to address the potential risks of GBVH in construction and operation phases: • Appoint senior focal points in both Project and contractors with responsibility for ensuring that commitments and policies to prevent GBVH • Put in place monitoring systems at the highest levels for regular reporting on GBVH • Include requirements around GBVH in codes of conduct, policies and protocols for contractors, including training on policies and procedures once developed • Ensure codes of conduct are publicly disclosed in local languages and are widely accessible to all workers and all groups of people in project areas • Establish safe, confidential and accessible grievance mechanisms for local communities • Include options to report anonymously if preferred • Assess and revise HR policies, materials and training to encourage male and female applicants and improve female retention and promotion • Ensure all security guards' background checks including references from most recent employers. • Use robust recruitment processes to select, train, manage and monitor security companies and personnel • Deliver periodic mandatory training on GBVH to all workers, including contractors, subcontractors and core suppliers • Consider engaging expertise (e.g. from local women's rights organizations or NGOs working on GBVH) to conduct awareness campaigns to provide information to local communities, such as what is unacceptable behavior and how to report an incident of GBVH • Include assessment of gender and safety risks in bidding process for contractors • Vet contractors for prior efforts to address GBVH through prevention and response • Ensure contracts include clauses on GBVH (for example all workers and staff sign codes of conduct) • Provide safe, secure and separate living spaces for male and female construction and operation workers • Provide lighting around project sites, including around latrines and access routes • Install separate, lockable latrines for female construction workers • Further, as part of the assignment the project has developed the Gender Management Plan	Contractors and HR department	Internal Audits/documents verification	Quarterly during the construction phase and half yearly during operation phase	NSFTPL – project manager	NSFTPL – Project director	Report on GBVH related issues or compliant raised from HR department to Project manager and director

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		against women in area where the perception is that they should not work outside the home								
13.	Occupational Health and Safety	• Fall from height during installation of watch tower • Risk while working at confined spaces at excavated areas • Fire hazards and accidents while handling chemicals and oils and operating construction machineries including cranes and mechanical lifting equipment • Electrocution while working with live electrical components like electrical parts • Diseases due to unhygienic conditions at site including contaminated drinking water for workers • Hearing problems due to noise generation from construction machineries • Respiratory problems due to dust emissions from construction site. • Exposure to extreme heat while working at site during summers • Risk of accidents from being struck in machinery or moving equipment or parts • Exposed to faulty electrical devices, such as cables, cords, hand tools etc. • Accidents during underwater piling work	Construction Phase	• NSFTPL should develop and display HSE Policy at dedicated locations and communicate the same to the workers • Occupational health and safety plan (refer Appendix M) should be implemented at the proposed project • Develop and implement a COVID -19 and communicable disease prevention and response plan • All workers (regular and contracted) should be provided with training on Health and Safety policies in place with appropriate refresher courses throughout the life cycle of the Project • The training courses should be also aligned to IMO conventions including the International Convention for the Safety of Life at Sea (SOLAS) • Permit to work system should be implemented to ensure that work at confined space, work at height and cranes and lifting equipment is operated by trained and authorized persons only • Adequate firefighting system should be installed at the project site including fire extinguishers, fire hydrants, sprinklers, sand buckets etc. • Training of the workers on climbing techniques, and rescue of fall- arrested workers should be provided • Training on hazardous chemical and material handling should be provided to the workers and PPEs such as rubber gloves, respirator, approved eye protection etc. should be issued • Appropriate safety harnesses should be provided for working at heights • Safe drinking water as per IS 10500:2012 should be provided to the workers • Signs of “no smoking” should be provided at designated locations. • Workers should be provided with 1 hour break in every 8-hour shift. • Notice boards with all safety measures to be taken at construction site and accident-prone areas should be displayed at designated locations within the construction site. • Driver safety trainings should be provided to the workers involved in transportation of construction material • An incident investigation system shall be developed and records on occupational incidents, accidents, contraction of diseases shall be maintained and shared at the corporate level and to the lenders as per agreed frequency • First aid kit with sufficient quantity of medicines to meet requirement of labors during construction activity should be maintained at site. • The assembly area, nearest hospital, ambulance, fire station and police station should be identified in the implemented emergency management plan. • Project should tie up with nearby hospitals for treatment of workers in case of emergency • Pre- medical checkup of workers should be conducted prior to appointment at construction site • Vehicle movement and parking within the premises will be manned to avoid accidents • Route for vehicle movement shall be marked and pedestrian shall be restricted on the vehicle route. • Cranes and other lifting equipment are operated by trained and authorized persons • Excavated areas should be temporarily fenced to avoid access to outsiders • Workers who are engaged in welding works will be provided with welder’s protective eye shields • The use of any toxic chemical will be strictly in accordance with the manufacturer’s instructions • Electrical and maintenance work should not be carried out during poor weather and during lightning strikes. • Appropriate sign boards should be displayed with life-saving equipment giving clear instructions for raising the alarm in the event of an emergency and for the resuscitation of a person rescued from drowning. • Adequate and suitable life-saving equipment should be provided and maintained for the rescue of anyone in danger of drowning. These should include lifebuoys, throwing buoys or lines, boathooks/poles of sufficient length or other suitable equipment. • Life-saving equipment should be located at suitable places at intervals of not more than 50 m. The locations should be kept free of obstructions so as to be easily visible at all times. • Adequate illumination, lighting and reflectors should be provided at the construction site for work during nigh time • All permanent or temporary obstructions should be clearly marked to be visible by day and night. • Work near the sea should be avoided at night to the extent possible. • Workers should be provided with earplugs to work at areas with high noise levels i.e., areas where machineries and vehicles are being operated.	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the Operation phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director

Sr. No.	Environmental/Social Resources	Impact/Issues	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
				• Working hours should be rotated and no worker should be allowed to work at high noise areas i.e., areas where machineries are being operated for the entire shift • Visual sign boards should be displayed on wet and slippery floors. Pedestrian path should be clear of any unwanted objects that may lead to trip and fall. • Develop and implement standard E&S covenants for the EPC contractor and other contractors to ensure that all NSFTPL E&S requirements of the project (e.g. ESMP, ESMS, labor) are cascaded and implemented. It should include requirements to provide workers' accommodation aligned with IFC/EBRD guidelines.						
		• Accidents during cargo handling, operation and maintenance of equipment, machinery and vehicle • Accidents from ITVs and other vehicles used for transportation of containers • Chemical hazards such as skin exposure to chemicals, hazardous oils and fuels (if used) and VOC inhalation in case of spills or emission of fumes from containers carrying dangerous goods • Fire and explosion hazards from containers carrying explosives • Exposure to fine particles associated e.g., coal and grain causing respiratory disorder, in case dry cargo are not handled properly causing container imbalance • Exposure to high noise levels due to increase in vehicular traffic during cargo handling, operation of cranes for loading, unloading and stacking of containers. • Accident near rail siding area • Exposure to pathogens from ship garbage • Drowning due to container handling and maintenance work at berth area	Operation Phase	• NSFTPL should develop and display HSE Policy at dedicated locations and communicate the same to the workers • Occupational health and safety plan (refer ***Appendix M***) should be implemented at the proposed project • Develop and implement a COVID -19 and communicable disease prevention and response plan • The training courses should be also aligned to IMO conventions including the International Convention for the Safety of Life at Sea • Appropriate sign boards should be displayed with life-saving equipment giving clear instructions for raising the alarm in the event of an emergency and for the resuscitation of a person rescued from drowning. • Workers should be provided with earplugs to work at areas with high noise levels i.e., areas where machineries are being operated. • Protocol of government and JNPA to be followed for handling of explosives, radioactive & other hazardous /dangerous goods. Staff to be adequately trained on handling and storage of different types of cargo • Adequate and suitable life-saving equipment should be provided and maintained for the rescue of anyone in danger of drowning. These should include lifebuoys, throwing buoys or lines, boathooks/poles of sufficient length or other suitable equipment. • Life-saving equipment should be located at suitable places at intervals of not more than 50 m. The locations should be kept free of obstructions so as to be easily visible at all times. • Adequate illumination, lighting and reflectors should be provided for undertaking cargo handling work during night time • Display emergency contact numbers and assembly area at dedicated locations • Tie up with nearby hospitals for treatment in case of emergency • Develop a training calendar with activity specific trainings to be provided to the workers including loading and unloading of cargo, handling of cargo containing explosives and hazardous material, disposal of contaminated rags, used oil, handling oil spills and leaks • Separate movement of pedestrian workers from areas of vehicle traffic and make vehicle route one way to the extent possible • Signs of "no smoking" should be provided at designated locations. • Design materials handling operations to allow for a simple, linear layout and to eliminate the need for multiple transfer points, which can increase the possibility of accidents/injuries. • Consider, when determining the method by which the goods are stacked, the maximum permissible loadings of quays or floors; the shape and mechanical strength of the goods and containers (including allowable stacking mass and stack height); the natural angle of repose of bulk material; and the possible effects of high winds • Containers with radioactive materials should be handled as per Atomic Energy Regulatory Board (AERB) guidelines • Provide permit to work prior to working at confined areas • An incident investigation system shall be developed and records on occupational incidents, accidents, contraction of diseases shall be maintained and shared at the corporate level and to the lenders as per agreed frequency • Avoid placing cargo on, or allowing passage of vehicles over, any hatch cover that is not of adequate strength for that purpose; • Provide dedicated container storage area within container yard for hazardous and non-hazardous containers • Provide training on using spill kits to manage small leaks and spills from containers	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the Operation phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director

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				• Communicating chemical hazards to workers through labeling and marking according to national and internationally recognized requirements and standards, including the International Chemical Safety Cards (ICSC), Materials Safety Data Sheets (MSDS), or equivalent. Any means of written communication should be in an easily understood language and be readily available to exposed workers and first-aid personnel • Provide adequate firefighting system at hazardous and explosive container storage area • Provide adequate PPEs such as masks, reflective vest, safety shoes etc. Provide adequate body suit for workers working at storage area of containers carrying explosives • Providing specific worker training in handling of flammable materials, and in fire prevention or suppression. • In case NSFTPL facilitate garbage and crude oil disposal from ships on request of ship operator, NSFTPL shall develop SOP for supervision of garbage and sludge disposal from vessel by third party from the terminal (in case this service is facilitated by terminal on request. • Detailed SOPs should be developed to cover Handling of containers with explosives • SOP on handling of all type of containers (inclusive of hazardous, explosives, flammable substances, poisonous or toxic substances, infectious substances, corrosive substance & combustible substances) to be developed. It is to be ensured that all the SOPs should be complaint with the reference framework. • SOP on handling of spills from containers to be developed and JNPCT to be equipped with spill control kits • OHS manual should identify hazards/ risks associated with undertaking construction and operation activities in parallel and proposed control measures to eliminate, prevent and minimize the hazards/ risks. SOP to be developed in OHS manual to be incompliance with the following regulations o International Maritime Dangerous Goods Code (IMDG Code) o Code of Practice for the Safe Loading and Unloading of Bulk Carriers (BLU Code) o International Code for the Safe Carriage of Grain in Bulk (International Grain Code) o IMO Code of Practice for Solid Bulk Cargo (BC Code) o General Conference of the ILO Recommendation concerning Occupational Safety and Health in Dock Work, R-160 o General Conference of the International ILO Convention concerning Occupational Safety and Health in Dock Work, C-152, (1979) o International Labour Organization (ILO) Code of Practice for Safety and Health in Ports (2005) • NSFTPL shall abide to the safety standard, conventions and regulations mentioned in the concessionaire agreement. NSFTPL shall also comply with the international standards and conventions as per IFC EHS guidelines on ports, harbours and terminals including: • International Labour Organization (ILO) Code of Practice for Safety and Health in Ports (2005); • General Conference of the International ILO Convention concerning Occupational Safety and Health in Dock Work, C-152, (1979); • General Conference of the ILO Recommendation concerning Occupational Safety and Health in Dock Work, R-160; • IMO Code of Practice for Solid Bulk Cargo (BC Code); • International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk (IBC Code); • International Code for the Safe Carriage of Grain in Bulk (International Grain Code); • Code of Practice for the Safe Loading and Unloading of Bulk Carriers (BLU Code); • International Maritime Dangerous Goods Code (IMDG Code); International Convention for Safe Containers (CSC)						
14.	Community Health and Safety	Impact due to influx of labour and movement of construction Vehicles	Construction Phase	• Traffic management plan (refer ***Annexure C***) should be implemented at site • The traffic movement for the project in the area will be regulated to ensure road and pedestrian safety. • Dedicated route for deployment of heavy-duty vehicles should be defined • A quantitative risk assessment (QRA) should be conducted for potential hazards, explosions, access control and a security plan should be developed based on the outcome of the QRA. • Emergency Response Plan (refer ***Annexure O***) developed for the Project should be implemented at the terminal and communicated to the JNPCT workers and nearby terminals. • Trucks/ dumpers should be covered by tarpaulin sheets during off site transportation • Community health and safety management plan (refer ***Annexure N***) should be implemented at the site • Signs of “no smoking” should be provided at designated locations.	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the Operation phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director

Sr. No.	Environmental/Social Resources	Impact/Issues	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
				• Entry of workers or vehicles of other terminals should be restricted at the proposed project • Put in place a grievance mechanism to allow for the workers and community members to report any concern or grievance related to project activities • Dedicated safety sign boards in local language should be provided around the project site • Vehicles used for transportation of construction material should be covered to avoid dust emission. • Pre medical checkup of all the workers should be carried out before hiring • Regular medical camps should be conducted amongst the workers and the community to aware them on diseases like Typhoid, malaria, tuberculosis, STD's, COVID-19, HIV Aids etc.						
		Impact due to influx of labour during operation phase	Operation Phase	• EPRP developed as part of IESE (refer ***Annexure O***) should be followed at the site and communicated to the project workers and to the nearby terminals • Appoint local workers to the extent possible including skilled and unskilled workers • NSFTPL should provide an orientation to the migrant workers on the local custom and tradition followed by the local population; • Pre medical checkup of all the workers should be carried out for the workers before hiring • Regular medical camps should be conducted amongst the workers and the community to aware them on diseases like Typhoid, malaria, tuberculosis, STD's, COVID-19, HIV Aids etc.	Appointed contractors and EHS&S professional of NSFTPL	Monthly EHS Inspection	Monthly during the Operation phase	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director
Biological Environment										
15.	Aquatic (Marine) Ecology	Habitat modification and loss	Construction and operation phase	Construction workers will be instructed about no disposal or dumping of any kind of waste into or in the vicinity of sea water Construction area will be bunded and provided with adequate drainage with silt traps to prevent runoff from construction area into the sea water The project shall ensure that the identified dredger type will result in minimizing the amount of silt and sediments A silt curtain will be installed around the dredge site The excavated material will not be disposed of at any other location than DS-3 It shall be made sure that no spillage will be occurred while transporting the dredged material Acoustic enclosure for D.G. set as required in the Power Generator MoEFCC's notification Strict adherence to maintenance schedule of generators, as specified by vendors Periodic inspection of the project equipment and cranes should be conducted Vehicle drivers should be instructed not to blow horns until necessary. Equipment and cranes should be shut down when not in use Implementing noise mitigation techniques for offshore pile driving, including bubble curtains, pile caps, and cofferdams (where practicable) to absorb/scatter pile driving energy Vibration dampers and sheet barriers will be used to effectively mitigate vibration during construction phase Storm water at the construction site should be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea Oil-water separators to be regularly monitored NSFTPL should ensure that vendor collects oily sludge from the vessel in vehicles, or central collection systems and storage tanks The capacity of oily waste collection should be established based on applicable MARPOL provisions Develop SOP on handling of garbage (on request) and sludge from the vessels Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, (2016) Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, (2016) Oil spill kits should be maintained to avoid oil spills and leakage into the sea Mopping system shall be deployed for cleaning of the oil from the surface waters An oil spill contingency plan should be developed in line with JNPA's Oil Spill Response Contingency Plan Marine water quality to be monitored monthly, to be ensured that water quality is not compromised, and all the parameters are well within the prescribed standards	Contractor's EHS representative	EHS Inspection	Monthly	Project EHS representative	NSFTPL EHS	Monthly report by Project EHS

Sr. No.	Environmental/Social Resources	Impact/Issues	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
16.	Terrestrial (Mangrove) Ecology	Habitat modification and loss	Construction and operation phase	Construction workers will be instructed about no disposal or dumping of any kind of waste into or in the vicinity of sea water Adequate instructions should be provided to the vendors arriving for disposal of sludge and garbage from vessels to avoid littering of garbage and accidental leakage of sludge into the sea and or coast Construction area will be bunded and provided with adequate drainage with silt traps to prevent runoff from construction area into the sea water Storm water at the construction site should be collected in holding tank to ensure suspended solids are removed before storm water is discharged into sea Oil-water separators to be regularly monitored Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, (2016) Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, (2016) During servicing/repair of equipment or vehicles, a suitable drip tray shall be used to prevent oil/grease spills onto the soil, especially in case of emergency repairs Oil spill kits should be maintained onsite to handle minor leaks and spillage Mopping system shall be deployed for cleaning of the oil from the surface waters NSFTPL should ensure that vendor collects oily sludge from the vessel in vehicles, or central collection systems and storage tanks The capacity of oily waste collection should be established based on applicable MARPOL provisions Develop SOP on handling of garbage (on request) and sludge from the vessels Unloading and loading protocols should be prepared for diesel, oil and used oil respectively and onsite workers should be trained to prevent/contain spills and leaks	Contractor's EHS representative	EHS Inspection	Monthly	Project EHS representative	NSFTPL EHS	Monthly report by Project EHS
17.	Migratory Birds	Habitat modification and loss	Construction and operation phase	Construction workers will be instructed about no disposal or dumping of any kind of waste into or in the vicinity of sea water The project shall ensure that the identified dredger type will result in minimizing the amount of silt and sediments Construction area will be bunded and provided with adequate drainage with silt traps to prevent runoff from construction area into the sea water A silt curtain will be installed around the dredge site The excavated material will not be disposed of at any other location than DS-3 It shall be made sure that no spillage will be occurred while transporting the dredged material Adequate instructions should be provided to the vendors arriving for disposal of sludge and garbage from vessels to avoid littering of garbage and accidental leakage of sludge into the sea and or coast Implementing noise mitigation techniques for offshore pile driving, including bubble curtains, pile caps, and cofferdams (where practicable) to absorb/scatter pile driving energy Acoustic enclosure for D.G. set as required in the Power Generator MoEFCC's notification Periodic inspection of the project equipment and cranes should be conducted Strict adherence to maintenance schedule of generators, as specified by vendors Vehicle drivers should be instructed not to blow horns until necessary. Equipment and cranes should be shut down when not in use Storm water drains to have oil - water separator and it is to be ensured that contaminated water is not discharged into the sea Oil-water separators to be regularly monitored Sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) until it is treated in STP Waste generated on site (hazardous and non-hazardous) should be handled in accordance with waste management rules, (2016) Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, (2016) NSFTPL should ensure that vendor collects oily sludge from the vessel in vehicles, or central collection systems and storage tanks The capacity of oily waste collection should be established based on applicable MARPOL provisions Develop SOP on handling of garbage (on request) and sludge from the vessels Oil spill kits should be maintained to avoid oil spills and leakage into the sea Mopping system shall be deployed for cleaning of the oil from the surface waters An oil spill contingency plan should be developed in line with JNPA's Oil Spill Response Contingency Plan	Contractor's EHS representative	EHS Inspection	Monthly	Project EHS representative	NSFTPL EHS	Monthly report by Project EHS

Sr. No.	Environmental/Social Resources	Impact/Issues	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibnts	Reporting Requireme
				Unloading and loading protocols should be prepared for diesel, oil and used oil respectively and onsite workers should be trained to prevent/contain spills and leaks. Marine water quality to be monitored during construction phase and it is to be ensured that water quality is not compromised, and all the parameters are well within the prescribed standards						
18.	Climate Change Vulnerability Assessment		Construction and Operation Phase	• Undertake risk screening pertaining to cyclones and their frequencies in next 30-50 years • Undertake weather risk assessments, contingency and response plans • Arrange partnership for accurate weather observation and solutions with real-time alerts to enable dynamic, just-in-time operations • Ensure there is a dedicated, forward-looking budget for mitigating weather-related risks • As the port is already in operations it leaves very little scope for adaptation measures, however there is a need to develop a climate road map and work towards implementing some of the recommended mitigation measures in a phased manner • Shore powering facilities or electrical hookups available (can be provided) to berthed ships that allow their engines to be shut off while at port. This can reduce air pollution from berthed ships significantly. • NSFTPL shall emphasize on use of existing rail connectivity as a major means for transportation. Also, to reduce emissions, some NSFTPL may explore truck replacement programs, replacing older trucks with models featuring cleaner burning and more efficient engines. • NSFTPL should evaluate the risks identified and consider adaptation options such as those annexed in Climate Change Risk Assessment in order to reduce climate change risks to the project. • NSFTPL should continue to monitor the evolving scientific understanding of climate change hazards and reassess climate change induced risks to specific project elements at regular intervals (e.g. every five years) in the future. • NSFTPL should continue to monitor the project components during the project lifetime to identify emerging threats from climate change. The components at most risk are those placed within paths of flash floods, at risk from high temperatures, or for which storm surge is a material hazard	Appointed contractors and EHS&S professional of NSFTPL	-	-	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director
19.	Cumulative Impact		Construction and Operation Phase	• In case of excessive fugitive dust, work should be phase down until source of dust is identified and suppression measures have been implemented • Periodic water sprinkling at construction site such as concrete or unpaved areas should be done to avoid dust emission • Periodic inspection of construction equipment and DG sets should be conducted • Soil heaps and other dust emitting sources shall be kept covered and away from marine water to avoid sand, silt, cement flow in water causing increase in turbidity of marine water • Ambient air and noise quality monitoring should be conducted at JNPCT (at the berth area and other under construction location) and reports to be shared at the corporate level and to the lenders • Substitute less volatile solvents such as aqueous solvents in furnishing materials • Construction material will be transported in covered vehicles to prevent any dust emission along the transportation route • Select equipment with lower sound power levels • Use noise barriers at the construction area and muffling devices for combustion engines • Provide acoustic enclosures for equipment causing radiating noise. • Periodic inspection of machineries and vehicles should be done and appropriate lubrication and tightening of moving parts should be done in case of increased noise levels during operation • Machine emitting high noise during operations should be inspected and regular lubrication of machine parts should be carried out to reduce noise levels • Marine water quality to be monitored and it is to be ensured that water quality is not compromised, and all the parameters are well within the prescribed standards • Display HSE Policy at dedicated locations and communicate the same to the workers • Develop and implement Occupational health and safety plan • All workers (regular and contracted) should be provided with training on Health and Safety policies in place with appropriate refresher courses throughout the life cycle of the Project • First aid kit with sufficient quantity of medicines to meet requirement of labors should be maintained at site. • Notice boards with all safety measures to be taken at site and accident-prone areas should be displayed at designated locations	Appointed contractors and EHS&S professional of NSFTPL	-	-	NSFTPL – EHS Team	NSFTPL – Project director	Reporting from contractors to EHS&S Team, and then to Project director

Sr. No.	Environmental/Social Resources	Impact/Issues	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
				• The assembly area, nearest hospital, ambulance, fire station and police station should be identified and displayed at designated area • Provide adequate PPEs such as masks, reflective vest, safety shoes etc. Provide adequate body suit for workers working at storage area of containers carrying explosives • Driver safety trainings should be provided to the workers involved in transportation • Sensitize workers on water conservation and encourage optimal use of water • Managing Project Induced in-migration • Labour Assessment • Stakeholder engagement • Appoint senior focal points in both Project and contractors with responsibility for ensuring that commitments and policies to prevent GBVH • Put in place monitoring systems at the highest levels for regular reporting on GBVH • Include requirements around GBVH in codes of conduct, policies and protocols for contractors, including training on policies and procedures once developed • Establish safe, confidential and accessible grievance mechanisms for local communities • Include options to report anonymously if preferred • Vet contractors for prior efforts to address GBVH through prevention and response • Ensure contracts include clauses on GBVH (for example all workers and staff sign codes of conduct) • Provide safe, secure and separate living spaces for male and female construction and operation workers					

9 Impact Summary and Conclusion

9.1 Introduction

This Initial Environmental and Social Examination (IESE) has been conducted to evaluate the impact associated with the Project. The impact assessment has been conducted in compliance with the requirement of administrative framework (refer to section 3).

9.2 Significance of Impacts

The IESE has focused on interaction between the Project activities and various resources/receptors that could result in significant impacts. The table provided below presents the outcome of the comprehensive assessment of identified impacts as a result of the various phases of the Project.

Note: *No minor residual impacts are anticipated for the project, however, scoping study (refer* ***Section 7.2****) presented impacts due to project activities on E&S resources and based on it, the resources where there may be negligible or very limited impact has been scoped out.*

Table 9-1: Impact Assessment Summary

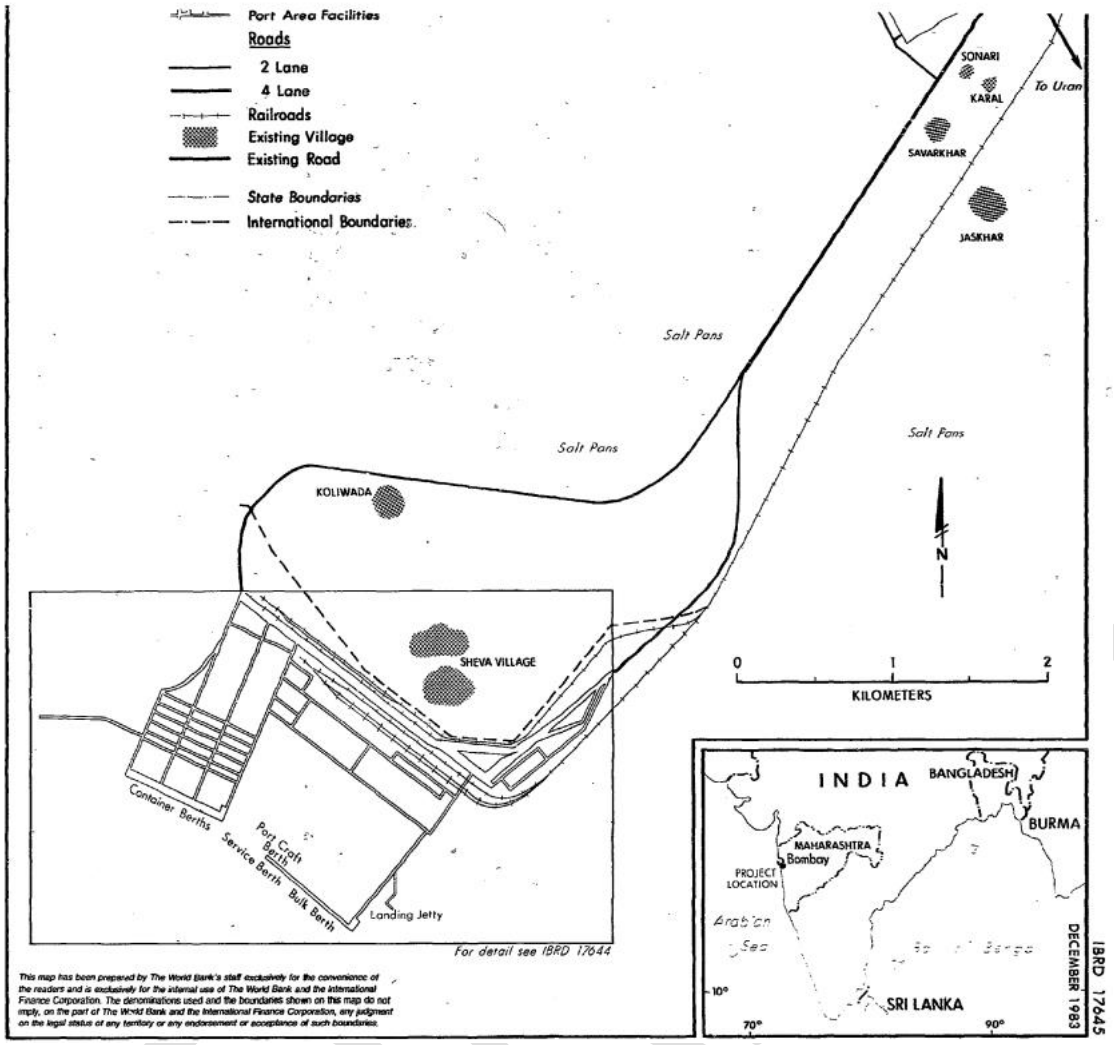
Impact Description	Impact Duration	Phase of the Project	Significance of Impact	
			Without Mitigation	With Mitigation
Physical Environment				
Air Quality	Short Duration	Construction Phase	Moderate	Minor
	Long Duration	Operation Phase	Moderate	Minor
Noise and Vibration	Short Duration	Construction Phase	Moderate	Minor
	Long Duration	Operation Phase	Moderate	Negligible
Land and Coastal Soil Environment	Short Duration	Construction Phase	Moderate	Minor
	Long Duration	Operation Phase	Moderate	Minor
Water Availability	Short Duration	Construction Phase	Minor	Negligible to Minor
	Long Duration	Operation Phase	Minor	Negligible
Marine Water Quality	Short Duration	Construction Phase	Moderate	Minor
	Long Duration	Operation Phase	Moderate	Negligible to Minor
Social				
Impact Due to influx of Migrant workers	Short duration	Construction and Operation Phase	Moderate	Minor
Stress on Local Resources	Short duration	Construction and Operation Phase	Moderate	Negligible
Labour Rights and Welfare	Short duration	Construction and Operation Phase	Major	Minor
Contractor and Supplier Management	Short duration	Construction and Operation Phase	Major	Minor
Gender-based violation and harassment	Short duration	Construction and Operation Phase	Minor	Negligible
Occupational Health and Safety	Short Duration	Construction Phase	Moderate	Minor
	Long Duration	Operation Phase	Moderate	Minor
Community Health and Safety	Short Duration	Construction Phase	Minor	Negligible
	Long Duration	Operation Phase	Minor	Negligible

Impact Description	Impact Duration	Phase of the Project	Significance of Impact	
			Without Mitigation	With Mitigation
Biological Environment				
Impacts on Aquatic (Marine) Ecology	Short duration to Permanent	Construction and Operation Phase	Moderate	Minor
Impacts on Terrestrial (Mangrove) Ecology	Short duration to Permanent	Construction and Operation Phase	Moderate	Minor
Impacts on Migratory Birds	Short duration to Permanent	Construction and Operation Phase	Moderate	Minor
Cumulative Impacts				
E&S Impacts due to presence of other projects within 5 km of the proposed project	Short duration	Construction and Operation Phase	Minor to Moderate	Negligible to Minor

Appendix 1: List of Documents Reviewed

1. Environmental Monitoring and Management Plan – JNPA
2. Green Port Initiatives – JNPA
3. JNPA Consent to Operate valid till Sept 2025
4. JNPA Annual (April 2021 to March 2022) progress report for Environmental Monitoring. Department of Civil Engineering, IIT Madras, Chennai - 600 036.
5. Jawaharlal Nehru Port Trust (JNPA) Sustainability Report (2020-21).
6. Jawaharlal Nehru Port Trust (JNPA) Environmental Impact Assessment (November 1981).
7. Jawaharlal Nehru Port Trust (JNPA) Environmental and CRZ clearance - harbour channel.
8. Environmental Clearance to Nhava Sheva Port Project (Jawaharlal Nehru Port).
9. Area Statement of JNPCT
10. Details of existing building and equipment
11. Feasibility Report
12. JNPA Form B fire prevention and life safety measures June'22
13. JNPCT Stack emission report October 2021
14. JNPA Environmental Statement Form V MPCB Aug 2022
15. Gazette of MoPSW
16. JNPA Fire Team and Fire Fighting Equipment
17. Final sop for handling of explosives IMDG class (1.4s) 26.03.2022. – JNPA
18. Proposed Project Expansion Details
19. JNPA resource conservation initiatives
20. Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii.

Appendix 2: Map from World Bank's Loan Proposal document vide report number 4826 – IN dated February 17, 1984 – showing Sheva and Koliwada village boundary



Source: World Bank's Loan Proposal document vide report number 4826 – IN dated February 17, 1984

Appendix 3: Management Plans

Attached as separate document